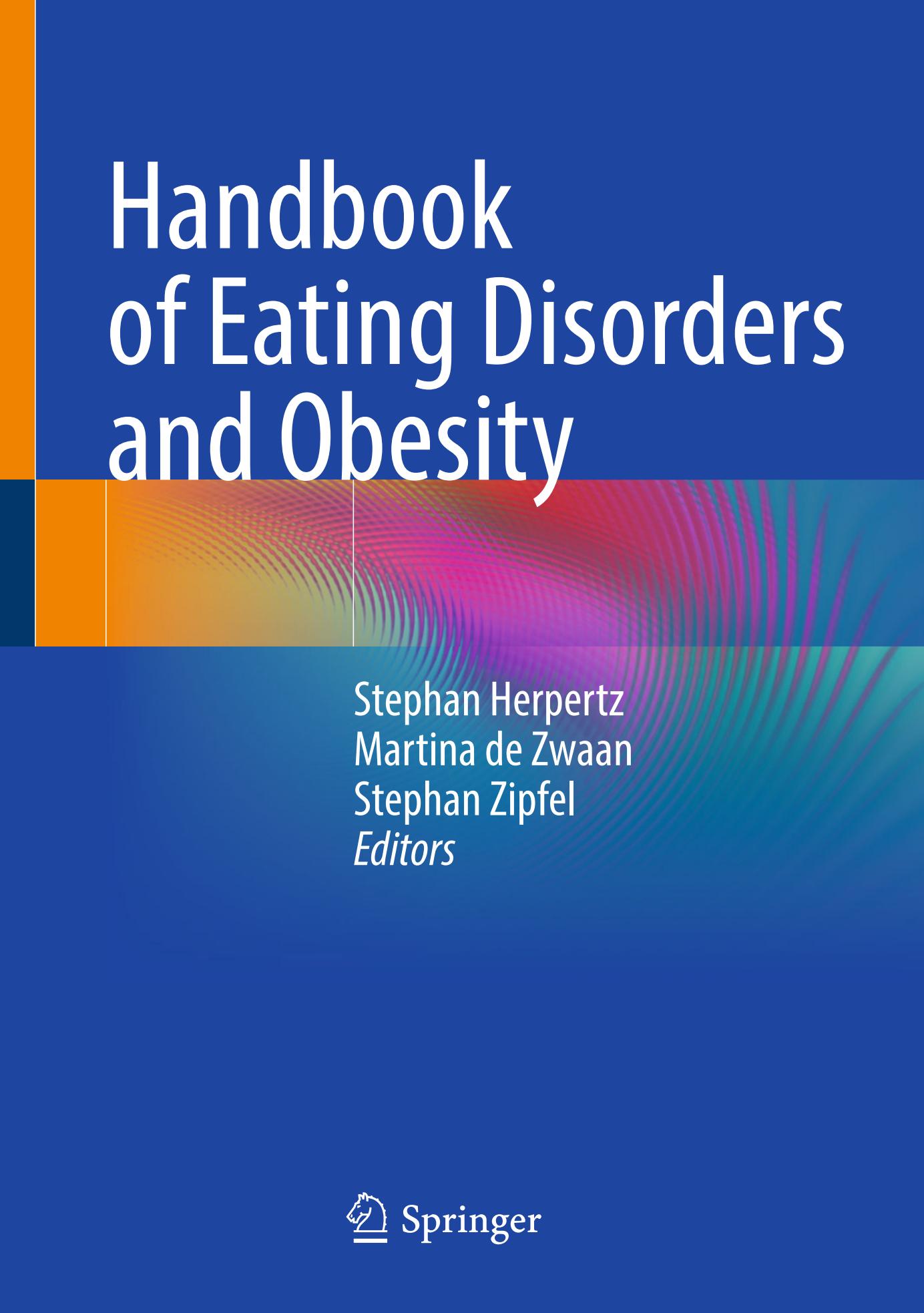


Handbook of Eating Disorders and Obesity



Stephan Herpertz
Martina de Zwaan
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Editors



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Springer

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Anorexia nervosa and bulimia nervosa predominantly affect women. Therefore, the editors decided to consistently use the female personal designation in Chapter I – Chapter VI, although a large number of men are also affected by binge eating disorder.

Preface to the 3rd Edition of the Handbook

In 2006, at a congress of the Eating Disorder Research Society (EDRS), an international scientific society for the research of eating disorders and obesity, the idea for this handbook was born in Port Douglas, a small Australian town in the far tropical north of the state of Queensland, Australia. In the fall of 2008, the book was published by Springer-Verlag with 59 chapters and more than 70 authors. Seven years later, the second edition was released, and now, in 2022, 14 years after the first publication of the handbook, the third edition can be published.

We, the editors, are very pleased that we were able to win back almost all authors of the first edition after such a long time to revise their respective chapters according to the latest scientific findings. The third edition of the handbook also contains additional chapters with new aspects on both the diagnosis and treatment of eating disorders and obesity.

The handbook is intended as a reference work for clinics and practices, as well as for systematic review by all professional groups involved and interested in the care and research in the field of eating disorders and obesity. It is also written for newcomers to the profession who want to learn in-depth about the two diseases, as well as for experienced colleagues who want to reflect on their insights in light of today's state of knowledge and the perspectives presented. It is also aimed at teachers who have the ambition to inform comprehensively.

Our thanks go to all authors for their active participation in the design of the book and to Wilma McHugh from Springer Publishing for her competent support.

Bochum, Hannover, Tübingen
April 09, 2022

Stephan Herpertz
Martina de Zwaan
Stephan Zipfel

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Part I

Diagnosis of Eating Disorders



Classification and Diagnosis: A Historical Perspective

Tilmann Habermas

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1.1 A Truly Biopsychosocial Phenomenon

Like other mental disorders, eating disorders are essentially caused by an interplay of social, psychological, and biological conditions. Eating and body shape lie at the intersection of nature and culture. Therefore, the prevailing self-control norms and body ideals, as well as the prevailing medical discourses, are reflected in the perception of the limits of normal eating and body shape and in the perception of the nature of pathological deviations. In historical or cultural comparisons, it is much easier to avoid the temptation to hypostatize the current understanding.

Eating behavior and body shapes, for example, are influenced by economic conditions. Only with the industrialization of food production and the mechanization of transportation in the 18th and 19th centuries was food supply ensured for the population of Europe. At the same time, the decrease in physical labor and, again, the mechanization of transport during the 19th and 20th centuries reduced individuals' energy expenditure. The increase in the availability of and the simultaneous decrease in the need for food, together with a deritualization and individualization of food intake, freed it from economic and biological constraints and opened it up to other needs and purposes (Habermas 1990; Chap. 2).

This chapter, however, is not about the sociocultural framework conditions, but about the interpretation of variations in food intake and body weight that we now call eating disorders and obesity. Both of these disease concepts

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emerged, in the narrower sense, in the 19th century.

1.2 History of Obesity Diagnosis

Extreme obesity has preoccupied medicine since its very beginnings. Ancient Greek medicine features many references to the need for moderation in eating and physical exercise, as well as considerations that obesity predisposes to diseases. However, up until the 19th century, medical attention remained focused on extreme obesity. Excess was considered a problem of self-control and morality, and gluttony was famously one of the seven deadly sins in the Middle Ages. In the second half of the 19th century, overweight became a growing public concern. Weight control programs and weight loss diets were commercially offered, and testimonials, polemics, and self-help literature appeared. Medicine addressed this popular concern by using formulas to expand the concept of obesity from extreme overweight to more moderate forms of overweight. Quetelet's formula Body weight in kg / (Body height in m)².

Today, this is referred to as the body mass index (BMI) and was temporarily replaced in the 20th century by the Broca Index and in the 1950s by ideal weight tables. These were based on surveys conducted by life insurance companies.

► **Important** From the mid-19th to the mid-20th century, an increasingly restrictive medical definition of overweight and obesity can be observed.

These more restrictive limits reflect a lowering of medically unobjectionable weight. As the tables of life insurance companies illustrate, part of this dynamic lies in the temporal stretching of the concept of health risk up to death. In the name of health prevention, popular body weight norms were medically legitimized and promoted. It was not until the 1970s—not least due to the rampant rise in eating disorders—that

there was some backpedaling from an overly restrictive to a more moderate medical definition of overweight ($BMI > 25$) and obesity ($BMI > 30$ according to the WHO).

1.3 History of Anorexia Nervosa and its Diagnosis

While obesity is defined merely by body weight in relation to body height, i.e., purely mathematically, anorexia nervosa (AN) is a mental disorder, as it is defined not only by severe underweight ($BMI < 18.5$ or age-specific lowest 5% percentile) but also by a specific motivation to intentionally achieve and maintain this underweight. This refers to the intense fear of being or becoming overweight despite being underweight. This central psychological criterion, which is essential from a differential diagnostic perspective, dates back to the early French works of the 19th century (Habermas 1989) as well as the works by Mara Selvini Palazzoli (1984) and Hilde Bruch (1973) in the 1960s. The fixed idea of becoming overweight despite being underweight simultaneously motivates behaviors targeted at controlling body weight, along with the otherwise atypical overactivity for underweight, and a lack or only very partial insight into the illness.

In research on the history of AN, most Anglo-Saxon authors reject today's psychological diagnostic criteria, and retrospectively classify either all unexplained states of malnutrition, or at least all malnutrition resulting from restricted food intake, as anorexic. From the resulting historical distribution of cases, they then conclude that AN has always existed (e.g., Keel and Klump 2003). This is partly due to the fact that the fear of being overweight was very late to find its way into English-language sources, but can already be found in French and German literature of the 19th century (Habermas 2015). On the other hand, it is also due to the conviction of these authors that AN has a genetic basis or even an essentially somatic cause. However, the presence of genetic influences does not

necessarily manifest itself in historical constancy of the clinical picture and its frequency of occurrence. Any attempt to define AN solely through somatic aspects abandons its diagnostic specificity and likens it to malnutrition due, for example, to depression, delusions of poisoning, cleanliness compulsions, or puberty asceticism.

► **Important** The diagnostic specificity of AN, the fixed idea of being or becoming overweight, can be related to the fasting-induced underweight from the second half of the 19th century (Habermas 1989).

This does not apply to the case descriptions of the physician Gull and the psychiatrist Lasègue from the 1870s, who are generally considered as the originators of the concept of AN. Gull's cases nowadays appear diagnostically ambiguous, while Lasègue described the typical denial of illness and overactivity but not yet the "idée fixe d'obésité" (Charcot). However, this idea appears shortly afterwards in the literature, especially in articles originating from the Salpêtrière. Charcot mentioned it as early as 1883 in a lecture. The fact that many authors did not notice the intentionality of weight loss was significantly promoted by the fact that those affected hid their fear of being overweight and their low food intake in order to avoid attempts to make them gain weight.

In historically earlier forms of intentionally induced extreme underweight (Vandereycken et al. 1990), at least two types can be distinguished. Ascetic-mystical fasters followed a model of female piety and even holiness (Saint Catherine of Siena), in which the "Imitatio Christi," the denial of any physical satisfaction, and hunger-induced mystical experiences had a clear religious significance—the motive of fasting was not aimed at body size or weight, but at an approach to God. A second type of extreme fasting can be found among the rather hysterical-seeming "fasting miracles", who survived without any food intake. While the first historical type shows psychological parallels with AN, as any extreme asceticism does, the second type

is clearly different. These women were often not underweight and were sick and bedridden over many years (Habermas 1990).

1.4 History of the Diagnosis of Binge Eating and Overeating

Eating large amounts of food in a binge-like manner has been known in medical history for over 2000 years. It has been referred to as bulimia, fames canina, kynorexia, and phagedena, and was considered an etiologically unspecific symptom, whereas polyphagia referred to the time-independent intake of large amounts of food (Ziolko and Schrader 1985). Binge eating was sometimes described as compensatory behaviors in the face of impending anxiety attacks. In relation to obesity, Stunkard (1959) described nocturnal eating (night eating syndrome) as well as binge eating at irregular intervals (binge eating syndrome). Only since the 19th century has binge eating, initially predominantly described in men, become a symptom more commonly found in women.

► **Important** The symptom of eating large amounts of food in a binge-like manner has long been known in medical history.

1.5 History of Bulimia Nervosa and its Diagnosis

Bulimia nervosa (BN) is distinguishable from binge-eating disorder. In addition to impulsive binge-eating episodes, which are experienced as alien and unwanted in retrospect, it is characterized by concerns about becoming overweight as a result of the binge-eating episodes, as well as the practice of compensatory behaviors such as self-induced vomiting, abuse of laxatives, appetite suppressants or diuretics, and finally—sometimes excessive—physical exercise. Shame due to the binge-eating episodes and immediate compensatory behaviors typically lead to the concealment of these practices and social

withdrawal. BN is usually associated with normal weight. If it occurs in combination with underweight, anorexia nervosa of the bulimic subtype is diagnosed, since, clinically speaking, the underweight and simultaneous fear of overweight are more in the foreground than the bulimic symptoms.

A case resembling BN was described by Binswanger in 1909, and the first probable cases were reported by Wulff in 1932, who attributed them to the depressive spectrum. In the following decades, isolated case descriptions appeared (Habermas 1989), but it was not until 1979 that Russell's description and naming of bulimia nervosa attracted huge interest, especially since it was immediately included in the DSM-III. Suddenly, a phenomenon appeared in public and medical perception that had hitherto remained unnamed and thus unnoticed.

1.6 Influences of Medical Disease Concepts on Eating Disorders

The distinctly modern eating disorders AN and BN emerged in the second half of the 19th and the first half of the 20th centuries, respectively. Compared to historically older eating disorders, they are characterized by excessive concerns about one's body weight and corresponding behaviors. The popular concern about weight control and the cultural technique of dieting spread in Europe in parallel with the emergence of anorexia in the second half of the 19th century. With the onset of medical engagement with overweight as a disease-predisposing condition, which itself required medical attention due to the preventive thinking of public health policy, and the establishment of thresholds of overweight based on medical authority, the predominantly aesthetically motivated concerns regarding even moderate overweight gained additional legitimacy and probably also additional momentum. This, in turn, may have contributed to the spread of AN and BN. With the growing frequency of AN in the 1960s and 1970s, it increasingly became a publicly known disease. This changed the disease itself,

insofar as young women no longer individually "invented" AN anew, but could unconsciously or consciously imitate it. Thus, the psychodynamics typical of AN, which aimed at autonomy and uniqueness, became less specific, as there were now "me-too anorexics" (Bruch 1973).

The defining of bulimic behaviors as a disease in 1980 changed the illness experience of those affected, as they were no longer held morally responsible for their "weakness of will" and "perversion," and were relieved of responsibility as sick individuals. At the same time, their behavior also changed, as they were entitled to medical help for the first time. However, a behavioral pattern was pathologized that many still considered a proven miracle cure for combining enjoyment and good looks (Habermas 1994).

Both anorexia and bulimia became publicly identifiable phenomena through the dissemination of their respective disease concepts. This made it possible to derive secondary benefits from them, although this actually contradicts the nature of fasting as a neurotic form of self-assertion in anorexia and the nature of shame and guilt feelings in bulimia. Specialized treatment centers and self-help groups had the unintended side effect of forming communities that offered support but also served to exchange tips on losing weight and hiding weight loss. Ultimately, the medical diagnoses of anorexia and bulimia made it possible to choose them as primary identities and even collectively develop them into positive identities, as is the case on pro-ana websites and on social media under corresponding hashtags.

1.7 Developments in Classification and Diagnosis

Eating disorders and obesity are a heterogeneous group of phenomena, as they are defined either solely by body weight or additionally by behaviors or ultimately also by motives for behaviors, such as fears. As can be seen from Table 1.1, this leads to overlaps. The distinctions are not systematic, but they still seem

Table 1.1 Definition criteria for diagnoses

Disorder	Soma	Actions	Body weight control practices	Psyche
	Body weight	Eating behavior		
Obesity	+++			
Binge-eating	+++ to normal	Binge eating episodes		
Bulimia nervosa	+ to normal	Binge eating episodes	Purgung (starving)	Yes
Anorexia nervosa	---	Restrictive (binge eating episodes)	Purgung (starving)	Yes
Avoidant-restrictive food intake disorder	- to normal	Restrictive		

reasonably meaningful today according to the clinical need for action.

Until the DSM-5 and ICD-11, the main problem was that up to over half of the eating disorders assessed as clinically relevant did not fit into any of the categories and were therefore classified as unspecified eating disorders labeled. The introduction of binge eating disorder only provides a place in the nosological system for a minority of atypical eating disorders. The eating disorders that did not fall into any diagnostic category until then are predominantly young women whose symptoms are not severe enough to meet the criteria. The DSM-5 attempts to solve the problem by liberalizing the criteria for anorexia (flexibilization of the weight criterion, removal of the intentionality of weight loss) and for bulimia nervosa (lower thresholds for frequency and duration of symptoms) and by broadly defining binge eating disorder.

The removal of the intentionality of weight loss corresponds to the trend of DSM-5 to define mental disorders without reference to mental aspects, thus blurring the specific features of the respective mental disorders. The ICD-11 avoids this relinquishment of the specificity of anorexia, as the intentionality of weight loss remains a criterion, although the fear of weight gain is no longer required. At the same time, a psychologically open category, avoidant-restrictive food intake disorder, was created to include selective food intake for other motives, in order to reduce the unspecified eating disorder diagnoses. However, as it excludes depressive and

paranoid motivated food restriction, it will likely primarily capture phobic and compulsive motivated food restrictions. Lowering the required severity level in both diagnostic systems achieves a certain reduction of unspecific diagnoses and an expansion of treatment eligibility, but at the expense of a loss of specificity, an increase in comorbidities, a growing pathologization of today's adolescents, and a medicalization of life problems.

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Dieting Behavior and Body Image in Societal Change

Romuald Brunner and Franz Resch

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Dissatisfaction with one's physical appearance, and especially feeling too fat, is a widespread phenomenon often associated with disordered eating. Attempts to achieve the ideal norm—often an unrealistic weight defined primarily by socio-cultural influences—lead to dieting attempts. The combination of a disturbed body image and dieting behavior often leads to a manifest eating

disorder with anorexic and/or bulimic symptoms, particularly in adolescents and young adult women, but also—albeit much less frequently—in the male gender. Explanatory models for the unequal gender distribution range from sociocultural to biological factors, although a sufficient explanation for these cross-cultural gender differences is still lacking. However, the gender-specific difference is much less pronounced in partial eating disorders. Weight-related problems such as overweight, disordered eating, unhealthy weight control measures, and “binge-eating” (repeated episodes of binge eating with loss of control) represent a significant problem in healthcare due to their high prevalence and negative consequences for physical and mental health. Data from the WHO (GBD 2018) indicate an increase in age-standardized disease burden as a measure of morbidity (years lived with disability, YLDs) of 6% for anorexia nervosa and 10% for bulimia nervosa between 2007 and 2017.

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2.1 How Common are Body Image Problems and Dieting Behavior? And How are They Related?

According to a review by Ricciardelli and McCabe (2001), epidemiological studies in the English-speaking world show that 38.2–49.9% of girls and 12.5–26% of boys have tried to reduce their weight through dieting or other methods. Investigating the frequency of various weight loss strategies, the authors found that 20–49% of girls (7–8% of boys) skipped meals, and 51–71% of girls (30–40% of boys) engaged in sports with the intention of losing weight rather than to achieve fitness. The use of diet pills was found in up to 17% of girls and 5% of boys, and abuse of laxatives in about 2% of girls and boys. Self-induced vomiting was reported in 1–8.3% of female adolescents and 0.4–1.7% of boys. The frequency of binge-eating behavior is considered insufficiently studied; estimates suggest that 7–33% of boys and girls exhibit such behavior episodically. Empirical studies show that engaging in sports with the goal of weight reduction and not fitness improvement is associated with manifest disordered eating behavior. Exercise addiction has also been described, with feelings of depression and guilt occurring when the activity is interrupted.

With regard to the frequency of diet attempts and disturbances in body image, data are available from 5849 adolescents (average age 15.2 years) who were examined as part of the Heidelberg School Study (Haffner et al. 2007). This representative study conducted in the Rhein-Neckar district in Germany examined 9th-grade students across all school types (from special education to higher-track secondary school). Overall, 48% of the girls reported feeling too fat, although they were of normal weight (body mass index, BMI: 17.5–24.5), demonstrating a discrepancy between the perceived and the desired body image in almost half of the female students. In contrast, only 16.7% of male adolescents felt too fat. Moreover, 15%

of underweight girls ($BMI < 17.5$) still felt too fat (1.6% overall prevalence). The subjectively perceived body image, particularly among girls, determines dieting behavior rather than objective weight. Almost all overweight individuals (85.7%, $BMI > 24.5$) had experiences of dieting, but so too did nearly half of girls with normal weight. Since being overweight in adolescence is a central risk factor for the development of a manifest eating disorder (e.g., anorexia nervosa), early treatment of obesity is a central intervention to reduce this risk (see Jebeile et al. 2019). The Heidelberg School Study also demonstrated that satisfaction one's with appearance was more strongly influenced by subjectively perceived physical attractiveness than by actual weight. In general, only 24% of girls (compared to 45% of boys) were satisfied with their appearance.

- ▶ It is not the actual weight, but rather the perception of being overweight, that is responsible for vulnerability to the development of disturbed eating behavior.

The Heidelberg study further revealed clear correlations between a negative body image and psychosocial factors (self-esteem; acceptance by peers, etc.).

- ▶ Satisfaction with one's outward appearance is associated with better relationships with peers and fewer social and emotional problems.

The emergence of dissatisfaction with one's physical appearance as a vulnerability factor for the development of disturbed eating behavior has been examined—also empirically—against the background of sociocultural theory formation. Halliwell and Harvey (2006) postulated that perceived pressure regarding appearance, mediated by media, family, and peers, would lead to a corresponding internalization of cultural ideals. Indeed, this internalization of cultural ideals led to dissatisfaction with one's physical appearance not only in girls but also in boys (predominantly in boys with low self-esteem), with subsequent weight loss measures

- Physical appearance comparisons with same-aged peers in both girls and boys leads to dissatisfaction with one's appearance and is associated with a susceptibility to disturbed eating behavior.

The development of body dissatisfaction and disturbed eating behavior in adolescence is not only related to the biological development during puberty but is also attributed to the fact that adolescence represents a critical period in which the internalization of cultural ideals regarding physical attractiveness is learned. Nevertheless, according to empirical studies, adolescent girls feel greater pressure to regulate their weight compared to boys, compare themselves more with their peers, have higher levels of body dissatisfaction, and show higher internalization of sociocultural attitudes regarding appearance as well as subsequent disturbed eating behavior. Self-concept and self-esteem seem to be more closely related to physical attractiveness in girls than in boys. Surprisingly, studies in the age range of 11–16 years showed no age-dependent differences among girls, indicating that body image problems and associated issues develop at an early age.

- Exposure to role models of slim women can be sufficient to initiate weight loss measures in girls, even if they were not previously dissatisfied with their weight.

Boys compare their appearance with same-sex peers to a similar extent to girls. However, while boys want to look as good as their attractive peers, girls want to look better than their attractive peers. Preventive approaches should therefore convey realistic objects of comparison in order to protect adolescents from the development of body dissatisfaction. There is increasing evidence that the availability of and communication on social media has a negative influence on the development of body image, resulting in disturbed eating behavior in adolescents (Uchôa et al. 2019), which has been found to be significantly more pronounced in girls compared to boys.

- Problematic attitudes and behaviors already develop in early adolescence. Therefore, preventive efforts must start in prepuberty, before the internalization of sociocultural values begins and body image problems develop.

Longitudinal studies show that eating disorders in adolescence—including subclinical manifestations—are associated with impaired development later in life, in terms of increased psychiatric morbidity such as substance-related disorders, suicidal and self-harm behavior, as well as pathological weight status and eating disorder-specific symptoms (Micali et al. 2015). The occurrence of the entire spectrum of eating disorders (anorexia nervosa; bulimia nervosa, binge eating disorder, atypical or otherwise specified eating disorders, including purging behavior and subclinical bulimic symptoms) in mid-adolescence proved to be a particularly strong predictor for the occurrence of anxiety disorders and depressive disorders and self-harming behaviors two years after the initial examination (Micali et al. 2015, ALSPAC study; N = 11,209 adolescents). A history of binge eating and bulimia nervosa was associated with obesity, and anorexia nervosa with underweight. Since subclinical disorders often do not lead to treatment initiation and thus cannot counteract a negative course, measures in the sense of indicated prevention in the general population appear particularly important (see Micali et al. 2015).

2.2 Do Body-Related Attitudes and Eating Behavior Change in the Transition from Adolescence to Young Adulthood?

A decrease in problematic behaviors in the further course of development was postulated under the assumption that adults derive their self-esteem less from body-related variables and more from other sources. Heatherton et al.

(1997) argued that the decrease in disturbed eating behavior also occurs against the background of a change in life goals, and the importance of physical attractiveness decreases. In a longitudinal study, Keel et al. (2007) demonstrated that disturbed eating behavior in females decreases significantly from late adolescence to middle age compared to males. Marriage and motherhood are strong predictors of a decrease in dissatisfaction with physical appearance. However, developmental trajectories show that this is only a relative decrease, and women continue to have a greater degree of dissatisfaction with their weight compared to men, engage in diets, and exhibit disturbed eating behavior.

The apparent relationship between the thinness ideal prevalent in Western culture, a disturbed body image, and disturbed eating behavior—especially in girls and young women—has led to the question of whether these phenomena, as well as the manifest eating disorders anorexia nervosa (AN) and bulimia nervosa (BN) represent culture-bound symptoms or syndromes (cf. Garner and Garfinkel 1980; Lee 1996). Although numerous studies have demonstrated possible genetic influences in the development of manifest eating disorders, the thesis of a culture-related syndrome is still maintained. A quantitative meta-analysis by Keel and Klump (2003) found that the incidence of AN has only increased very slightly in recent decades, while the incidence of BN increased significantly in the second half of the 20th century. Systematic analyses of historical cases of AN, however, indicate that AN was already common before the onset of the Western thinness ideal or thinness cult, albeit with a differently accentuated phenomenology. Only rarely were cases described that explicitly included a fear of becoming too fat. This phenomenon seems to have developed later or under the influence of the Western thinness ideal and become subject to globalization. Studies on the prevalence of AN in other cultures show that many countries, even without orientation to the Western-influenced culture, have similarly high prevalence rates of AN. The prevalence of AN in many Western and non-Western-oriented

cultures was, however, only approximately equal when excluding the diagnostic criterion “fear of becoming too fat.” Possible differences in the prevalence rates of eating disorders could also be partly due to culture-specific phenomenology, as the established diagnostic classification schemes, ICD-11 and DSM-5, are more oriented towards developments in industrialized societies (Becker 2007). A study in the Fiji Islands showed that the phenomenon of fear of becoming too fat as a reason for weight loss only developed under the influence of the Western body ideal. The emphasis on the criterion of feeling too fat has apparently pushed other motives for weight loss into the background and led to the postulation of the *Western culture-bound syndrome*. Keel and Klump (2003) conclude from this that weight problems develop culture-specifically in the sociocultural context of the thinness ideal, but that there are also other diverse motives and causes for the development of eating disorders. Studies in the Asian region show that “weight concerns” exist more in areas with high media influence and that there are fundamental differences in the urban-rural relationship. Research on social change in China suggests that exposure to the Western thinness ideal through access to Western media has promoted the development of body image problems and dieting behavior in girls. However, the clinical manifestation of AN seems to vary in different cultures. For example, patients with AN in China appear to have less pronounced body image disturbances compared to Western cultures and are characterized by less pronounced comorbid disorders (Keel and Klump 2003; Soh and Walter 2013). While in Western cultures, such as in England and Spain, increased comorbid psychopathological symptoms such as depressive disorders and anxiety symptoms were reported, patients in China seemed to report these symptoms less or deny them, which was interpreted in the context of different social attitudes (Agüera et al. 2017).

In contrast to AN, the occurrence of BN seems to be more closely tied to exposure to the Western body ideal (Striegel-Moore et al. 1986). While self-intended weight loss can

occur in various cultural circles, the development of bulimic symptoms seems to be linked to the availability of food and exposure to a body image in the context of the Western thinness ideal. Binge-eating/purging behavior seems to predominantly affect normal-weight women with “weight problems.” The context of a Western body ideal and the self-perception of weight problems are prerequisites for the development of BN. Cross-cultural studies show higher prevalence rates of AN than BN in non-Western-oriented countries. Exposure to the Western body ideal norm, living in urban centers, earlier stays in Western countries, and a higher socioeconomic status are often associated with the development of eating disorders in girls or young women in non-Western-oriented societies. Immigration to Western-oriented cultural circles promotes the occurrence of dieting behavior in women from different cultural backgrounds, e.g., from the Arab world (Melisse et al. 2020) and Eastern Europe (Shekrladze et al. 2019). Further studies on migrants point to a *culture-change syndrome*, i.e., especially young women often develop body image problems and eating disorders after moving to a Western cultural circle.

- While the sociocultural influences on a disturbed body image and disturbed eating behavior are considered well-established, this is only very limited for the manifest eating disorders. While the influence of sociocultural factors is very significant for the occurrence of BN, the occurrence of AN of the restrictive type only seems to be culture-dependent to a very limited extent.

Within the context of globalization, the world is continuing to undergo a transformation from traditional to modern eating habits, which are shaped by cultural factors and, above all, by the availability of industrially produced foods and additives. What and how people will eat in the future will undergo significant changes (Sproesser et al. 2019). An “nutrition transition” is emerging, characterized by a higher

proportion of sugar-rich and fat-rich foods and is being introduced worldwide by the food industry and marketing strategies (cf. Sproesser et al. 2019). From soft drinks to protein-rich supplements to industrially produced ready meals, eating habits have changed, especially those of children and adolescents. The consequences of this development on appetite and metabolic processes and their significance for the development of disturbed eating behavior have so far been insufficiently investigated (Ayton and Ibrahim 2020).

Conclusion

Body image issues and dieting are a common phenomenon, particularly among female children, adolescents, and young adults. This phenomenon appears to be closely linked to societal factors, especially the promotion of an unrealistic thinness ideal. Central risks include the sociocultural idealization of thinness (internalization of the thinness ideal through social pressure and expectations) and personality factors such as negative emotionality and perfectionism tendencies (cf. Culbert et al. 2015). The different conditioning framework requires an exact analysis of risk factors, which could also provide starting points for preventive strategies. Since dieting behavior and disturbed eating in the context of body image disturbance can have harmful health effects even without reaching a manifest eating disorder in the sense of a nosological classification, initiatives for primary prevention (e.g., school-based intervention already in prepuberty) and secondary prevention (early provision of help through professional counseling and therapy for affected children, adolescents, and young adults) should be intensified. The influence of social media, as well as changes in food supply and eating behavior in the context of globalization and the associated effects on the prevalence and phenomenology of disturbed eating, must receive increased attention in the future.

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Eating Disorders in the ICD-11 and DSM-5

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3.1 Introduction

The transition to the eleventh revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-11) entails significant changes for the chapter on

eating disorders. The ICD-11 follows the consolidation of feeding and eating disorders into a higher-level category already established in DSM-5, thus taking into account the entire lifespan for mental disorders predominantly related to food intake. The chapter on behavioral and emotional disorders with onset in childhood and adolescence has been removed in the ICD-11.

While the order of disorders in the DSM-5 is based on the primary age of manifestation, in the ICD-11, the disorders are arranged according to their psychopathology in relation to food intake. Regarding individual diagnoses, it should be noted that “binge eating disorder” has been included as a separate diagnosis. New, and again based on the DSM-5, is the inclusion of “avoidant-restrictive food intake disorder” (ARFID) as a separate diagnosis.

Currently, the descriptions of the psychopathology of individual disorders are still

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very brief and only partially helpful for a systematic review to make an initial diagnosis. The “International Classification of Mental Disorders” (Descriptions and Diagnostic Guidelines [CDDG] for ICD-10 Mental and Behavioural Disorders), with descriptions of the main clinical features and diagnostic guidelines, is expected to be published after the adoption of the overall version. There is also no official translation of the glossary-like definitions of the ICD-11 browser of the WHO; this has therefore been done by the authors.

3.2 Anorexia Nervosa

Anorexia nervosa (AN) is differentiated further in the ICD-11, on the one hand according to body weight (“significantly low” and “dangerously low”) and on the other hand based on the behavioral pattern (restrictive and binge-eating/purgung pattern). The latter was already found in the ICD-10 under the designations anorexia without active measures for weight loss (restrictive form of anorexia; ICD-10: F50.0) and anorexia with active measures for weight loss (ICD-10: F50.01). Furthermore, the diagnosis of anorexia nervosa in remission with normal body weight appears as a new diagnosis under 6B80.2.

The A-criterion of ICD-10 (actual body weight at least 15% below the expected weight [falling below the 10th age percentile in children and adolescents] or BMI below 17.5 kg/m²) has been changed to a threshold value of weight for adults of a BMI below 18.5 kg/m² and for children and adolescents below the 5th BMI age percentile. In the DSM-5, the same threshold values are only suggested; deviation is explicitly allowed according to clinical assessment, and the evaluation of body weight should be based on age, sex, previous development, and physical health.

The subdivision into a dangerously low weight (BMI < 14.0 kg/m² in adults or BMI < 0.3 age percentiles in children and adolescents) is not made in the DSM-5. However, in the American classification system, the current severity level in adults can also be determined

based on BMI limits (so-called severity specifiers, BMI ranges) (APA 2013):

- “Mild: BMI ≥ 17 kg/m²;
- Moderate: BMI 16–16.99 kg/m²;
- Severe: BMI 15–15.99 kg/m²;
- Extreme: BMI < 15 kg/m². ”

For children and adolescents, the corresponding BMI percentiles should be used here.

The absolute weight criterion defined in the ICD-11—with a BMI cut-off below 18.5 kg/m² for adults and falling below the 5th age percentile for children and adolescents—appears to be set too low for patients under 18 years of age. This is particularly critical in view of the fact that the consequences of a chronic state of hunger are even more severe for children and adolescents than for adults (Herpertz-Dahlmann and Hagenah 2015; Micali and Hebebrand 2015).

A larger proportion of those affected have a BMI between the 5th and 10th age percentile at the time of diagnosis (Engelhardt et al. 2021), and a Danish study also found anorexia-like symptoms in patients with a BMI above the 10th age percentile (Andersen et al. 2018). It seems important to be able to make the diagnosis in order to quickly recognize the disorder and provide appropriate treatment, especially since there is a significant positive correlation between weight at referral to inpatient treatment and premorbid BMI percentile (Engelhardt et al. 2021).

An excessively strict weight threshold means on the one hand that treatment can only begin once severe underweight is already present, and on the other hand that those affected are assigned to a diagnostic residual category and do not receive adequate treatment. Moreover, setting a too low threshold has the disadvantage that both the patient and their family might base recovery on this threshold. In this respect, it would be sensible—if underweight is to be maintained in the presence of anorexia nervosa—to specify a relatively high weight criterion. Based on the available data, the 10th or possibly even the 25th age percentile could be considered.

Patients who were overweight premorbidly often present with normal weight upon initial presentation, but with pronounced psychological and physical symptoms (such as bradycardia and amenorrhea). The diagnosis of anorexia nervosa should also be given to such patients, as they have a similarly pronounced severity of the disorder as patients who are below the weight cut-off (Swenne 2016).

Severe underweight is a strong predictor of unfavorable prognosis and high mortality; it is also often an indication for inpatient treatment (Engelhardt et al. 2021). However, other studies, including shorter time spans, found no empirical evidence to support the severity classification of AN according to DSM-5 criteria (Reas and Ro 2017; Smith et al. 2017), which might also apply to the classification formulated in the ICD-11. Using the ICD-11 classification of severity according to the 0.3 BMI age percentile, exactly half of all patients entered in the German Registry for Anorexia Nervosa had a dangerously low weight at admission (Engelhardt et al. 2021). It seems more than questionable whether the application of this threshold value will become clinically established.

In contrast to the ICD-10 (self-induced weight loss by avoiding “fattening” foods) and DSM-5 (restriction of energy intake relative to requirements), the ICD-11 does not include evaluations regarding the intentions and control of symptoms by the affected individuals themselves (criterion B) and describes a significantly low body weight in relation to height and developmental stage, which is not attributable to another disease or lack of food.

To cover the entire spectrum of cultural diversity regarding the rationale for restrictive eating behavior and excessive preoccupation with one's own body, the fear of weight gain (fat phobia) is no longer listed as a sine qua non criterion (Criterion C) according to the DSM-5 (Uher and Rutter 2012).

The D-criterion of ICD-10, comprehensive endocrine disorder of the hypothalamic-pituitary-gonadal axis, is no longer required in the ICD-11, in line with the DSM-5. The reason for this removal is the evidence that amenorrhea or

the disturbance of the reproductive axis was not detectable in all cases, and therefore the diagnosis of atypical anorexia had to be used (Reed et al. 2019). The criterion was also not applicable to men, premenarchal and postmenopausal women, or women taking contraceptives (Knoll et al. 2014).

Regarding the description of the severity of semi-starvation-related changes in the function of various hormonal hypothalamic-pituitary axes, the leptin serum level would be a suitable surrogate parameter for the impairment of the hormonal axes. However, it has not yet been included in the diagnostic criteria (Föcker et al. 2011). In addition, the hyperactivity in patients with AN seems to be at least partially attributable to hypoleptinemia or the functions of leptin (Hebebrand et al. 2019). Due to the importance of hyperactivity as a complicating symptom for successful refeeding, the introduction of a specification of the diagnosis with “no hyperactivity”, “mild hyperactivity”, “moderate hyperactivity” or “severe hyperactivity” would be important for initiating adequate therapy.

Excessive physical activity is a characteristic feature of the disease in a subgroup of patients, which should be taken into account (Hebebrand and Bulik 2011). However, neither the ICD-10 nor the DSM-5 has formulated a corresponding criterion. In the ICD-11, a causality between anorexia nervosa and motor hyperactivity is established, insofar as, in addition to low body weight, “persistent behavioral patterns to prevent the restoration of normal body weight (measures aimed at increasing energy expenditure, i.e. exaggerated physical activities)” are described. However, empirical evidence of the presence of this criterion in all affected individuals of all age groups and in all stages of the disorder is lacking. The formulation of the diagnostic criteria should convey that hyperactivity is at least partly biologically explainable by hormonal changes and pathophysiological control circuits (reward system, appetite-regulating systems) as well as genetic factors, as otherwise an exclusively voluntarily controlled process is assumed (Micali and Hebebrand 2015), from which therapeutic approaches may also

be derived (Milos et al. 2020). Ultimately, the formulation in the ICD-11 conveys that patients engage in physical activity in a goal-oriented manner; however, patients may also experience hyperactivity as uncontrollable or compulsive.

In a rodent model, hypoleptinemia was identified as an amplifier of excessive physical activity (Exner et al. 2000), and clinical studies also found a correlation between low leptin levels and higher activity levels (Holtkamp et al. 2006). Ultimately, in a small case series (three patients), it was shown that the urge to move can improve under short-term treatment with recombinant leptin; the distinction from expectation effects needs to be investigated in randomized controlled trials. However, to demonstrate such an effect, randomized controlled, double-blind trials are required (Milos et al. 2020).

The introduction of the diagnosis “Anorexia Nervosa in Recovery with normal body weight” addresses the problem that during the course of the disorder or increasing recovery, affected individuals go through phases in which they no longer meet the weight criterion. These patients would have previously received a new diagnosis of the type “Eating Disorder, Not Otherwise Specified” according to DSM-5, which would not have taken the course of the disorder into account, or an Atypical Anorexia nervosa according to the ICD-10.

In DSM-5, there is a classification into partial and full remission. In the context of partial remission, the weight criterion is no longer met for an extended period, but criteria B or C are still met. Full remission is characterized by the absence of all criteria for AN.

The diagnosis Atypical Anorexia (F50.1) can no longer be assigned according to the ICD-11. An eating disorder that does not meet all ICD-11 criteria for Anorexia nervosa would be coded as Other specific Anorexia nervosa or Other Anorexia nervosa. According to the DSM-5, the weight criterion is not met in Atypical Anorexia nervosa.

Table 3.1 compares the ICD-11 and DSM-5 criteria.

3.3 Bulimia Nervosa

Bulimia nervosa can be diagnosed according to the ICD-11 regardless of the patient’s current weight, as long as the BMI is not so low that the criteria for anorexia nervosa are met (Reed et al. 2019).

While according to the ICD-10, binge eating episodes are required to occur at least twice a week over a period of three months, the diagnosis can be made according to the ICD-11 after a period of one month and a frequency of at least once a week. The DSM-5 also requires only a once-weekly occurrence of binge eating episodes and compensatory behaviors. Several studies have shown that the severity and prognosis of the disorder do not differ between higher or lower frequency symptoms (Attia et al. 2013).

The diagnosis can also be based on subjectively perceived binge eating episodes, in which the patient experiences a subjective loss of control over eating and consumes significantly more or differently than usual, associated with distress, regardless of the actual amount of food consumed.

These changes are intended to reduce the frequency of assigning the ICD-11 diagnosis of “Unspecified feeding and eating disorder.”

The ICD-10 diagnoses “Atypical bulimia nervosa” (F50.3), “Overeating associated with other psychological disturbances” (F50.4), and “Vomiting associated with other psychological disturbances” (F50.5) are not included in the ICD-11.

Overeating associated with other psychological disturbances can be coded using the ICD-11 category 21 “Symptoms, signs or clinical findings, not elsewhere classified” and specifically through MB29 (“Symptoms or signs involving eating and related behavior”) and the subcode MB29.1 (“Binge eating”).

In addition, DSM-5 introduces, as with AN, the specification in partial and full remission and a severity grading based on the frequency of “compensatory behaviors” (e.g., vomiting) per week (APA 2013):

Table 3.1 Comparison of diagnostic criteria ICD-11 and DSM-5 for Anorexia nervosa (APA 2013, 2015; Cladino et al. 2019; WHO 2019)

ICD-11 Criteria	DSM-5 Criteria
Significantly low body weight in relation to height and developmental stage (body mass index (BMI) below 18.5 kg/m ² in adults or below the fifth BMI age percentile in children and adolescents), which is not due to another health condition or the unavailability of food.	A. Restriction of energy intake relative to requirements, leading to a significantly low body weight in the context of age, sex, developmental trajectory, and physical health. Significantly low weight is defined as a weight that is less than the minimum normal weight or, in children and adolescents, less than the minimally expected weight.
Persistent pattern of behaviors to prevent the restoration of normal weight, associated with corresponding fear of weight gain. These include reduced calorie intake (restrictive eating behavior), purging behavior (e.g., self-induced vomiting or laxative abuse), and behaviors aimed at increasing energy expenditure (excessive physical activities).	B. Intense fear of gaining weight or of becoming fat, or persistent behavior that interferes with weight gain, despite the significantly low weight.
A low body weight and shape have an undue influence on the self-evaluation of those affected, or there is a distorted perception regarding their own body in the sense of inaccurately perceiving it to be normal or overweight.	C. Disturbance in the way one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or persistent lack of insight regarding the seriousness of the current low body weight.
Additionally, the subtype should be specified:	
Anorexia nervosa with significantly low body weight In anorexia nervosa with significantly low body weight, all criteria for anorexia nervosa are met, and the BMI is between 18.5 kg/m ² and 14.0 kg/m ² for adults or between the 5th and 0.3 age percentiles for children and adolescents.	
Anorexia nervosa with significantly low body weight, restrictive type The restrictive type refers to individuals who meet the diagnostic criteria for anorexia nervosa with significantly low body weight and achieve weight loss and maintenance of a low body weight through restrictive eating behavior or fasting alone or in combination with increased energy expenditure (e.g., through excessive physical activities) and do not exhibit binge eating or inappropriate compensatory behavior (binge-purging behavior).	Restrictive type: During the last three months , the person has not had recurring binge eating episodes or purging behavior (i.e., self-induced vomiting or misuse of laxatives, diuretics, or enemas). This subtype describes manifestations in which weight loss is primarily achieved through dieting, fasting, and/or excessive physical exercise.
Anorexia nervosa with significantly low body weight, binge-eating/purging type The binge-eating/purging type refers to individuals who meet the diagnostic criteria for anorexia nervosa with significantly low body weight and present with binge eating or inappropriate compensatory behavior. The affected individuals achieve weight loss and maintenance of low weight through restrictive eating behavior, accompanied by compensatory behavior to dispose of ingested food (e.g., self-induced vomiting, laxative abuse, enemas). This type also includes individuals who exhibit binge eating without compensatory behavior.	Binge-eating/purging type: During the last three months , the person has had recurring binge eating episodes or purging behavior (i.e., self-induced vomiting or misuse of laxatives, diuretics, or enemas).

(continued)

Table 3.1 (continued)

ICD-11 Criteria	DSM-5 Criteria
Unspecified anorexia nervosa with significantly low body weight	
Anorexia nervosa with dangerously low body weight	
In the case of anorexia nervosa with dangerously low body weight, all criteria for anorexia nervosa are met, and the BMI is below 14.0 kg/m ² for adults or below the 3rd BMI age percentile for children and adolescents. Severe underweight is an important prognostic factor in the context of anorexia nervosa, as underweight is associated with a high risk of physical complications and increased mortality.	
Anorexia nervosa with dangerously low body weight, restrictive type	
Anorexia nervosa with dangerously low body weight, binge-eating/purging type	
Unspecified anorexia nervosa with dangerously low body weight	
Anorexia nervosa in recovery with normal body weight	<p>Partial remission: Criterion A has not been met for an extended period, while either B or C is still met.</p> <p>Full remission: None of the diagnostic criteria have been met for an extended period</p>
Other specific anorexia nervosa	Atypical anorexia nervosa (AN): All criteria for AN are met, but the person's body weight, despite significant weight loss, is within or above the normal range.
Other anorexia nervosa	

- Mild: 1–3 episodes
- Moderate: 4–7 episodes
- Severe: 8–13 episodes
- Extreme: 14 or more episodes

A partial remission means that some, but not all, criteria are met for an extended period. In the context of full remission, criteria for BN are no longer met.

3.4 Binge Eating Disorder

Binge eating disorder (BED) was included as a provisional diagnosis in the DSM-IV. Numerous studies have provided sufficient evidence for BED as a separate disorder category (Wonderlich et al. 2009; Uher and Rutter 2012), so it is listed as an independent diagnosis in

both the DSM-5 and ICD 11. BED is characterized by frequent, recurring binge eating episodes (once a week or more for several months).

The frequency criterion according to the DSM-5 is once a week for a period of three months.

Binge eating episodes are characterized in ICD-11 as a specific period during which the patient experiences a subjective loss of control over eating and consumes significantly more or differently than usual, feeling unable to stop or limit the type of food and amount of food. Binge eating is perceived as very distressing and is often associated with negative feelings such as guilt or disgust. Unlike BN, inappropriate compensatory behaviors are not regularly taken after binge eating episodes.

Applying the diagnostic criteria to binge eating episodes in childhood is viewed critically,

Table 3.2 Diagnostic criteria for Avoidant/Restrictive Food Intake Disorder according to ICD-11

1	Significant weight loss or lack of weight gain (other than expected in childhood or pregnancy)
2	Clinically significant nutrient deficiencies
3	Dependence on nutritional supplements or tube feeding
4	Or* other negative impacts on the health of the affected person or significant functional impairments
5	No concerns about body weight or shape
6	Restrictive eating behavior and its effects on weight, other health aspects, and performance cannot be better explained by lack of availability of food, effects of medication or substance use, or another illness

*In addition to criterion 1, criterion 2 and 3 or 4 must be met

as it is difficult to determine the objectively excessive amount of food required for diagnosis in adolescents with varying nutrient and energy needs. For the exploration of binge eating episodes in childhood and adolescence, it therefore seems more appropriate to use the perceived loss of control over eating rather than the actual amount of food consumed as a criterion (Tanofsky-Kraff et al. 2008). A loss of control can also occur with smaller meals and has proven to be more predictive of later overweight, as well as the development of depression and other mental disorders (Sonneville et al. 2013).

The definition of partial remission in BED includes that binge eating episodes occur on average less than once per week. Full remission is defined as the absence of all criteria over an extended period, as with the aforementioned disorders. The newly introduced severity grading is based on the frequency of binge eating episodes per week (APA 2013) and corresponds to that of bulimia nervosa (see above).

A comparable classification is missing in the ICD-11.

3.5 Avoidant/Restrictive Food Intake Disorder (ARFID)

Avoidant/restrictive food intake disorder (ARFID) was first officially recognized as a diagnosis in 2013 in the DSM-5 and has now also been included in the ICD-11. The prevalence is reported in the literature as 3–5%. Although a multifactorial genesis of the disorder is assumed, patients show some

demographic similarities: They are younger than non-ARFID eating disorder patients (main manifestation of ARFID in childhood, including infancy), they are more likely to be male, and report an average longer duration of illness than those with AN or BN. The current understanding of the disorder is based on studies with relatively small case numbers, which primarily included patients who presented themselves in specific centers or to practitioners with expertise in eating disorders. The disorder is characterized by abnormal eating or feeding behavior, resulting in the intake of an insufficient amount of food or variety of foods to cover adequate energy and nutrient content.

An overview of the diagnostic criteria is provided in Table 3.2.

3.6 Pica

Pica is characterized by the regular consumption of inedible substances, such as objects or materials (e.g., clay, soil, chalk, plaster, plastic, metal, and paper) or raw foodstuffs (e.g., large amounts of salt or cornmeal), which is persistent or severe enough to require clinical attention in individuals who have reached a developmental age at which the distinction between edible and inedible substances would be expected (about two years). The behavior causes health damage, functional impairments, or poses significant risks due to the frequency, quantity, or type of substances or objects consumed.

In the DSM-5, a duration of occurrence of at least one month is required, without specifying

the frequency. In the ICD-11, the temporal criterion is completely omitted. Regarding the age of affected individuals, the ICD-10 specifies a chronological and mental age of at least two years, which was changed to “approximately” two years in the ICD-11. In the DSM-5, there is no specific age indication, but rather a reference that the behavior is not appropriate for the developmental level.

3.7 Rumination and Regurgitation

Lack of weight gain, weight loss, or other clear health disturbances occur over a period of at least one month. The onset of the disorder occurs before the age of six. According to the DSM-5, the presence of symptoms for at least one month is also required. The criteria mentioned in the ICD-11 require frequent occurrence of the behavior (at least several times per week) over a duration of at least several weeks. The diagnosis should only be given from a developmental age of at least two years.

According to the DSM-5, the prevalence of both disorder patterns in the general population is unclear (APA 2013). Ambiguous prevalences of rumination and regurgitation are due, on the one hand, to the different use of terms, e.g., “regurgitation disorder” or “rumination syndrome,” to describe the same symptomatology and, on the other hand, to an unclear separation between behaviors and the full manifestation of the disorder or concealment of the symptomatology due to shame. In the context of the LIFE Child Study of the Leipzig Research Center for Civilization Diseases, Pica and Rumination were each explored with one question. Of 804 children aged between 7 and 14 years, 12.5% reported at least one occurrence of Pica behaviors and 12% reported rumination. Repeated occurrences were described by 5% and 1.5% of respondents, respectively. Pica occurred significantly more frequently in boys, whereas no gender differences were found for rumination. Both disorder patterns were significantly associated

with the diagnosis of avoidant/restrictive food intake disorder (ARFID) (Hartmann et al. 2018).

In the DSM-5, it is emphasized that the symptoms of a rumination disorder in the presence of an intellectual developmental disorder must be severe enough to warrant independent clinical attention.

3.8 “Other Specified Feeding or Eating Disorder” and “Unspecified Feeding or Eating Disorder”

Atypical and other specified feeding or eating disorders (OSFED) include disorder patterns that do not fully meet the criteria for a classic eating disorder (AN, BN, BED) but still show a clear, burdensome fixation on weight and shape as well as long-standing difficulties in dealing with food and eating.

In the ICD-11, both categories are not further specified, and the following changes were made in the development of the ICD-11 to reduce the assignment of unspecific diagnoses.

- Expansion of the criteria for anorexia nervosa (e.g., removal of weight phobia and endocrine disorder; significant weight loss in a short period; new diagnosis “anorexia nervosa in recovery”) and bulimia nervosa (expanded criterion binge eating) to include atypical and development-dependent variations of the clinical picture.
- Inclusion of “binge eating disorder,” as patients with recurrent binge eating without inappropriate compensatory behaviors represent the largest group who received the diagnosis “other eating disorders and unspecified eating disorder” according to the ICD-10 (Al-Adawi et al. 2013).
- Inclusion of “avoidant/restrictive food intake disorder” (ARFID), which can be understood as an extension of the ICD-10 category “feeding disorder in infancy and childhood” and improves the clinical application of the

category across the lifespan (the diagnosis is to be given to children as well as adolescents and adults) and maintains consistency with the DSM-5 (Uher and Rutter 2012; Al-Adawi et al. 2013).

In the DSM-5 (APA 2013), the category “Unspecified Feeding or Eating Disorder” is also not further specified, whereas the category “Other Specified Feeding or Eating Disorder” includes Atypical AN, BN of low frequency and/or limited duration, and BED of low frequency and/or limited duration. These three disorders exhibit the typical symptom patterns of the classic eating disorders AN, BN, and BED, but not all diagnostic criteria are fully met (e.g., regarding body weight, frequency and duration of binge eating episodes, or compensatory weight control behaviors measures). In addition, the category “Other Specified Feeding or Eating Disorder” also contains diagnostic criteria for Night Eating Syndrome (NES) and Purging Disorder (Table 3.3).

Summary

Previous research on DSM-5 and ICD-11 criteria shows that the frequency of diagnoses of the residual categories “Other Specified Feeding or Eating Disorder” and “Unspecified Feeding or Eating Disorder” has decreased compared to the DSM-IV category Eating Disorder Not Otherwise Specified (EDNOS), as the

criteria for AN and BN have been broadened. Unfortunately, contrary to these efforts, for children and adolescents, the weight criterion has become stricter in the ICD-11 (BMI < 5th percentile), so that young patients with symptoms corresponding to AN must resort to the diagnosis of Specified or Unspecified AN if the BMI is above the mentioned threshold. The definition of BED as an independent disorder and the inclusion of “Avoidant/Restrictive Food Intake Disorder” (ARFID) also result in a reduction in the frequency of diagnoses of this new residual category (Claudino et al. 2019).

Whether DSM-5 proves to be practical for diagnosing eating disorders in clinical practice and research, especially for children and adolescents, but also for adults, remains to be seen. Some formulations of the AN criteria offer a wide scope for interpretation, so that investigators will arrive at different diagnoses depending on a narrow versus broad interpretation. In particular, the unclear separation regarding the fulfillment of the weight criterion for AN in contrast to “atypical anorexia nervosa” could potentially lead to low reliability, with implications for research and clinical practice.

The ICD-11 working group on eating disorders proposes using a “rapid weight loss in a short period” as a substitute criterion for the above-defined weight threshold (BMI 18.5 or 5th BMI percentile) when all other criteria are met (Claudino et al. 2019). This makes sense in

Table 3.3 Comparison of the categories “Other Specified Feeding or Eating Disorder” and “Other Specified Feeding or Eating Disorder” in ICD-11 and DSM-5

ICD-11	DSM-5
Other Specified Feeding or Eating Disorder	Atypical Anorexia nervosa
	Bulimia nervosa of low frequency and/or limited duration
	Binge Eating Disorder of low frequency and/or limited duration
	Purging Disorder
	Night Eating Syndrome
	Avoidant/Restrictive Food Intake Disorder (ARFID)
	Rumination Disorder
	Pica

order to take into account the increasing number of patients who experience an acute and significant weight loss from a (relatively) high starting weight without reaching the above-defined threshold. Ultimately, this substitute criterion could imply that a patient meets the diagnosis of both obesity and AN.

The introduction of the diagnosis AN in recovery in ICD-11 with normal body weight represents, in our opinion, an improvement over the ICD-10 classification. A normal weight at discharge from clinical treatment is not a sufficient criterion for recovery. In this respect, it is also important for outpatient therapists to be able to assign this diagnosis to justify the continuation of their treatment. The requirement of a remission period of approximately one year after the end of intensive treatment seems reasonable (Avnon et al. 2018) for the assessment of a full remission.

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Clinical Aspects of Anorexia Nervosa, Bulimia Nervosa, and Avoidant-Restrictive Food Intake Disorder in Adulthood

Martin Teufel, Eva-Maria Skoda and Stephan Zipfel

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4.1 Classification of Anorexia Nervosa

The initially most striking finding of anorexia nervosa (AN) is the reduced nutritional status with often drastic weight loss. Patients with severe anorexia show a cachectic nutritional state. The outward appearance is pale, subcutaneous fat tissue may be missing, so that individual bones as well as muscles and muscle tendons

can be perceived. There is a desire for weight loss, and there seems to be no lowest weight limit. Weight loss is achieved through restriction of food intake, vomiting, excessive physical activity, or the use of laxatives or diuretics.

It is striking that patients often cannot adequately perceive their weight loss and deny it. In extreme cases, patients still feel too fat in the state of cachexia—predominantly affected are the abdomen, hips, and thighs. This disturbance of the body image is a diagnostic criterion of AN. In the context of disturbed body perception, there is often body-checking behavior, a behavior that patients often only admit to when asked. They check body proportions (e.g., limb circumferences, waist circumference) and feel their bones for their own reassurance. In this context, excessively frequent weighing behavior can also be observed. There is a great fear of weight gain (weight phobia).

Significant changes in the DSM-5 American Psychiatric Association (2013) and the ICD-11 for AN include the abolition of formulations that

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suggest intentional or arbitrary behavior on the part of patients, as it has been shown, among other things, that both patients and their families suffer from stigmatization. The diagnostic criterion of amenorrhea has been completely omitted, as the absence of menstruation primarily represents an organic consequence of AN. In addition, the absence of menstruation cannot be assessed before menarche, after menopause, when taking contraceptives, and in men.

Diagnostic criteria for anorexia nervosa, ICD-11 (Claudino et al. 2019)

- Significantly low body weight for the individual's height, age, developmental stage, and weight history, not attributable to the unavailability of food and not explained by another health condition. A commonly used guideline is a body mass index (BMI) of less than 18.5 kg/m² for adults and age-related BMI below the 5th percentile for children and adolescents. Rapid weight loss (e.g., more than 20% of total body weight within 6 months) can replace the low body weight-related guideline, as long as other diagnostic requirements are met. Children and adolescents may, instead of weight loss, show a failure to gain weight as expected based on their individual developmental trajectory.
- A persistent pattern of restrictive eating behavior or other behaviors aimed at achieving or maintaining an abnormally low body weight, typically associated with extreme fear of weight gain. The behaviors may aim to reduce energy intake by fasting, selecting low-calorie foods, excessively slow eating of small amounts of food, and hiding or spitting out food, as well as so-called "purging behavior," such as self-induced vomiting and the use of laxatives, diuretics, enemas, or the omission of necessary

insulin units in individuals with diabetes mellitus. The behaviors may also aim to increase energy expenditure through excessive exercise, motor hyperactivity, deliberate cold exposure, or the intake of medications (e.g., stimulants, weight loss medications, herbal products for weight reduction, thyroid hormones).

- Having a low body weight is of particular importance and is central to the person's self-evaluation, or the person inaccurately perceives their body weight or body shape as normal or even overweight. Preoccupation with weight and shape can be expressed, even if not explicitly addressed, through behaviors such as repeated checking of body weight (weighing), checking one's body shape (body-checking behavior) using measuring tapes or in the mirror, constantly monitoring the calorie content of foods, and seeking information on how to lose weight. On the other hand, there may be pronounced avoidance behavior, e.g., refusal to have mirrors in the home, avoidance of tight-fitting clothing, or refusal to know one's own weight or to buy/wear clothing items with specified sizing.

4.1.1 Subtypes of Anorexia Nervosa

Restrictive type (ascetic form)

In the restrictive type, there are no regular binge eating episodes. The underweight is achieved—without active behaviors for weight loss—through food restriction.

Binge-eating/Purging type (bulimic form)

In this subtype, regular binge eating episodes are accompanied by compensatory behaviors such as self-induced vomiting or the abuse of medications (to purge: cleanse).

4.2 Classification of Bulimia Nervosa

In contrast to AN, where the main symptom of underweight can be recognized with just a few glances, patients with bulimia nervosa (BN) initially appear inconspicuous, as they are of normal weight or overweight. In BN, there are typical binge eating episodes with loss of control. Large amounts of food are hastily devoured without the possibility of stopping. Subsequently, compensatory behavior occurs, which allows patients to maintain their weight and not gain weight. The most common is vomiting shortly after eating. In cases of maximum symptom severity, the entire day can consist of “cycles of eating and vomiting.” This often leads to financial difficulties and problems associated with obtaining food. Similar to AN, there are weight-phobic fears and a body schema disturbance. The disorder is often characterized by secrecy and shame. Outwardly, patients may at most show swelling of the salivary glands. The eating disorder may remain undetected in the environment for years.

Diagnostic criteria of Bulimia nervosa, ICD-11 (Claudino et al. 2019)

- Frequent, recurrent episodes of binge eating (e.g., once a week or more over a period of at least one month). A binge eating episode is defined as a discrete period of time during which the individual experiences a loss of control over their eating behavior. A binge eating episode occurs when a person eats significantly more and/or differently than usual and feels unable to stop eating or limit the type or amount of food consumed. Additional characteristics of a binge eating episode may include: eating alone out of shame, not in company; eating foods that are not normally part of the individual’s usual dietary habits;
- eating large amounts of food despite a lack of hunger and eating faster than normal.
- Repeated, inappropriate compensatory behaviors to prevent weight gain (e.g., once a week or more over a period of at least one month). The most common compensatory behavior for weight regulation is self-induced vomiting, which typically occurs within an hour of a binge eating episode. Other inappropriate compensatory behaviors include fasting or taking diuretics, using laxatives or enemas to reduce nutrient absorption in the intestine, omitting insulin units in individuals with diabetes mellitus, and excessive physical activity to increase energy expenditure.
- Excessive preoccupation with body weight and shape. If not explicitly addressed, the preoccupation with weight and shape can manifest through behaviors such as repeated checking of body weight (weighing), checking one’s own body shape (body-checking behavior) using measuring tapes or in the mirror, constantly monitoring the calorie content of foods and seeking information on how to lose weight. On the other hand, there may be pronounced avoidance behavior, such as refusing to have mirrors in the home, avoiding tight-fitting clothing, or refusing to know one’s own weight or to buy/wear clothing items with specified sizing.
- There is marked distress related to the pattern of binge eating and inappropriate compensatory behavior, or significant impairment in personal, family, social, educational, occupational, or other important areas of life.
- The symptoms do not meet the diagnostic criteria for anorexia nervosa.

4.2.1 Subtypes of Bulimia Nervosa

Only in DSM-IV was BN differentiated between the subtypes non-purging type and purging type. The clinical significance is controversial and was abandoned in the DSM-5.

4.3 Avoidant-Restrictive Food Intake Disorder

In the ICD-11, the form of avoidant-restrictive food intake disorder (ARFID) is described. This is a clinical picture in which, in addition to a reduction in the amount of food, malnutrition also occurs due to the limited variety. Those affected can often only be tube-fed, as balanced nutrition is no longer possible. Consequently, restrictions in almost all areas of life are the result. The focus is on avoidant restriction - the cognitions about weight and shape typical for AN or BN (e.g., fear of weight gain, body schema disturbance) are not present here.

It is characterized by the following diagnostic criteria.

Diagnostic criteria for avoidant-restrictive food intake disorder, ICD-11

1. Avoidance or restriction of food intake, leading to one or both of the following:
 - 1.1. Intake of an insufficient quantity or variety of foods to meet an adequate energy or nutrient requirements. Consequences are significant weight loss, clinically significant nutritional deficiencies, dependence on oral nutritional nutritional supplements or tube feeding, or other negative consequences for the person's physical health
 - 1.2. Significant impairment in personal, family, social, educational, occupational, or other important areas of life (e.g., due to avoidance or distress)

related to participating in social experiences involving eating).

2. The pattern of eating behavior is not motivated by preoccupation with body weight or shape or by a significant distortion of body image.
3. The restricted food intake and the resulting weight loss (or lack of weight gain) or other effects on physical health are not due to the unavailability of food, not to the manifestation of another medical condition (e.g., food allergies, hyperthyroidism), not to the effect of a substance or medication (e.g., amphetamine), including withdrawal, and not to another mental disorder.

4.4 Compensatory Behaviors

Patients with AN and BN exhibit similar behaviors to prevent weight gain or to lose weight. The individual methods and their "application" are quickly disseminated today through new media (internet forums and chats, blogs, and social media). Those affected easily access disorder-typical dysfunctional information and incorporate it into their behavioral repertoire. The most common behaviors are explained below.

4.4.1 Fasting

Patients periodically abstain from food intake (starvation) or are very restrictive in their eating behavior. Often, patients themselves define "forbidden foods." These are predominantly high in calories. "Allowed" are rather low-calorie, low-fat products. In the context of binge eating, these self-imposed rules and prohibitions are impulsively broken, and uncontrolled consumption of otherwise mostly "forbidden foods" can occur.

4.4.2 Vomiting

After food intake, self-induced vomiting serves to “get rid of” the ingested calories. It is also an attempt to alleviate the quickly perceived feeling of fullness and bloating. Vomiting occurs by self-induced triggering of the gag reflex, and in some cases, it can also happen spontaneously. The pressure to vomit ingested food can be so strong that social activities no longer take place, as such behavior is not possible in these contexts.

4.4.3 Abuse of Medications

The abuse of medications as compensatory behavior primarily involves laxatives. Due to an accelerated gastrointestinal passage, enteral absorption is reduced. As habituation phenomena can occur, a continuous dose increase is often observed, which can correspond to a multiple of the daily maximum dose of the respective medications. The use of laxative and diuretic teas is also observed. In addition, appetite suppressants, diuretics, and metabolism-activating substances (e.g., thyroxine) are abused.

4.4.4 Excessive Exercise

Through excessive exercise patients attempt to burn more calories. Some patients can hardly endure not being active for extended periods. The use of transportation is sometimes deliberately avoided, and all routes are traveled on foot or by bicycle. Sports are practiced excessively. The urge to move can lead to compulsive

exercise and include both intentional athletic activities and an increased level of involuntary movements.

4.4.5 Additional Compensatory Behaviors

There are numerous other behaviors that enable weight loss or prevent weight gain. This is usually done with the aim of activating metabolism. For example, patients may deliberately dress lightly, keep room temperature low, take cold showers, or consume ice cubes to increase their basal metabolic rate.

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Clinical Aspects of Binge-Eating Disorder

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5.1 Diagnostic Criteria

As early as (1959), Albert Stunkard described a subgroup of overweight patients characterized by repeated episodes of binge eating without compensatory behaviors. However, this form of eating disorder only came into the focus of scientific interest after the research criteria for “binge Eating disorder (BED)” were included in the DSM-IV in 1994 as an example of unspecified eating disorders. In the DSM-5, BED has finally been included as an independent diagnosis based on extensive research over many years. In the ICD-10 (WHO 1993), this diagnosis does not exist and can only be coded as “other eating disorder” (F50.8) or “unspecified eating disorder” (F50.9). The diagnosis will also be considered in the ICD-11. The etiology of BED is not

yet sufficiently clarified, but it is a complex mental disorder that is probably multifactorial and involves various mechanisms in its development as well as triggering and maintaining factors (AWMF 2018).

Diagnostic Criteria for Binge Eating Disorder according to DSM-5 (APA 2013)

A. Recurrent episodes of binge eating. A binge eating episode is characterized by both of the following:

1. Consumption of a large amount of food in a discrete period of time (e.g., within a period of two hours), which is significantly larger than the amount most people would eat in a similar period under similar conditions.
2. Feeling a loss of control over eating behavior during the episode (e.g., feeling unable to stop eating or having no control over the type and amount of food).

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- B. The binge eating episodes are associated with three (or more) of the following:
1. Eating much more rapidly than normal.
 2. Eating until feeling uncomfortably full.
 3. Eating large amounts of food when not feeling physically hungry.
 4. Eating alone because of embarrassment about the amount of food consumed.
 5. Feeling disgusted with oneself, depressed, or very guilty after overeating.
- C. Marked distress regarding binge eating is present.
- D. The binge eating occurs, on average, at least once per week over a period of three months.
- E. The binge eating is not associated with the recurrent use of inappropriate compensatory behaviors, as in bulimia nervosa, and not exclusively during the course of anorexia nervosa or bulimia nervosa.

► Binge eating disorder (BED) is classified as a syndrome in which regular binge eating episodes occur, according to the criteria described for bulimia nervosa (BN), but without any compensatory behaviors.

The severity of BED is determined by the frequency of binge eating episodes (mild: 1–3 episodes per week; moderate: 4–7 episodes per week; severe: 8–13 episodes per week; extremely severe: 14 or more episodes per week). If the number of binge eating episodes met the diagnostic criterion at an earlier time (at least one episode per week for three months), but fewer episodes occur at the current time, DSM-5 refers to a partially remitted BED. If all diagnostic criteria were met at an earlier time and are no longer present, a fully remitted BED is referred to. If a person meets some, but not

all criteria for BED, classification can be made through the category “Other Specified Feeding or Eating Disorders” by specifying the disorder, e.g., BED of low frequency and/or limited duration. If there is not enough information for a more accurate diagnosis or the diagnostician does not want to acknowledge it, the category “Unspecified Feeding or Eating Disorder” can be used for classification.

Since binge eating episodes in individuals with BED are not accompanied by compensatory behavior (e.g., vomiting, laxative use), they are often difficult to distinguish. They can also manifest as continuous, day-long food intake (*grazing, nibbling*) without fixed meals. To decide whether a specific case constitutes a binge eating episode or not, it is recommended to consider the context in which the eating occurs. For example, most people eat significantly more at a family celebration than at regular meals. Accordingly, the amount of food consumed can be considered an objectively large amount according to DSM-5 criteria in one context (e.g., during a regular meal), while not in another context (e.g., at a family celebration) (AWMF 2018). Binge eating episodes in overweight individuals with BED are typically smaller, ranging from 600–3000 kcal, than in girls and women with BN. They mainly consist of sugar- and fat-rich foods and occur on average 2.5–5 days per week.

In addition, the presence of certain behaviors is required, which are considered signs of impaired control (e.g., eating faster than usual, eating until an uncomfortable feeling of fullness, eating large amounts without being hungry, eating alone, feelings of disgust, sadness, or guilt after eating).

The main difference from BN is that in BED, no regular behaviors are undertaken to counteract weight gain. Some studies equate “regular” with an occurrence of at least once per week. As a result of the less frequent or non-existent compensatory behaviors, most patients with BED are overweight or obese. In contrast to BN and anorexia nervosa (AN), BED is also associated with a less pronounced and enduring restrained eating behavior used for weight loss (APA 2013). Restrictive eating behavior promotes the

occurrence of binge eating episodes, and the likelihood of a binge eating episode increases with the duration of attempted food restriction (Holmes et al. 2014).

5.2 Further Psychopathological Features

Although it is not mentioned in the diagnostic criteria, empirical findings suggest that individuals with BED have an overvaluation of shape and weight, as well as clinically relevant concerns about shape and weight or dissatisfaction with shape and weight, which can be relevant to self-esteem and precede binge eating episodes (Citrom 2019; Guerdjikova et al. 2019). The overvaluation of shape and weight is also associated with more pronounced eating disorder psychopathology and psychological distress and is negatively related to treatment success. BED is also often associated with self-esteem problems. Low self-esteem in patients with BED is related to a strong overvaluation of shape and weight. Furthermore, interpersonal problems are characteristic of BED and are associated with more pronounced symptomatology (Ivanova et al. 2015). Patients diagnosed with BED more frequently use dysfunctional and less frequently functional strategies for dealing with negative emotions. Recent findings show that in individuals with BED who exhibit a high degree of dysfunctional emotion regulation strategies, the overvaluation of shape and weight is also highly pronounced (Harrison et al. 2016). Binge eating episodes can be triggered by negative affect and serve emotion regulation (Leer et al. 2015); this has been demonstrated meta-analytically across various diary studies. However, the affect after a binge eating episode can also be more negative than before a binge eating episode (Haedt-Matt and Keel 2011).

5.3 Epidemiology and Course

In BED, the 12-month prevalence among adults is 1.6% for women and 0.8% for men (Galmiche et al. 2019). The proportion of men is

not as small as in many other eating disorders. Although women are more frequently affected by BED than men, the proportion of men among adults is 30–40%. BED is more common in people who are being treated for overweight or obesity.

Based on retrospective studies, the course of untreated BED is classified as chronic and persistent. However, the findings of a prospective longitudinal study on the untreated course of BED over a period of six months suggest a fluctuating course, which can include almost disorder-free phases as well as phases with pronounced symptomatology.

Predisposing factors for BED (AWMF guideline 2018; Hilbert et al. 2014; Kessler et al. 2016)

- Genetic factors
- Overweight or obesity in childhood
- Critical life events (e.g., separation of parents)
- Neglect
- Depressiveness or shyness
- Restrained eating behavior
- Emotional eating
- Restrictive parental feeding practices
- Dissatisfaction with one's figure
- Shape- and weight-related criticism
- Sexual and physical abuse
- Problems in the area of executive functions, affecting decision-making, impulse control, and action planning (Cury et al. 2020)

5.4 Comorbidities

5.4.1 Mental Comorbidity

In total, over 70% of individuals with BED have at least one comorbid mental disorder (Keski-Rahkonen and Mustelin 2016). These primarily include affective disorders such as major depression and bipolar disorder, as well as various anxiety disorders (e.g., generalized anxiety

pisorder, panic disorder, and various phobias). Other, but apparently less common, comorbid disorders are substance use disorder, posttraumatic stress disorder, body dysmorphic disorder, and various personality disorders (Kessler et al. 2013). There is also evidence that individuals with BED have increased suicidality, even after controlling for existing depressive symptoms (Welch et al. 2016). Increased impulsivity is discussed as a possible factor underlying both BED and increased suicidality (Boswell et al. 2020; Schag et al. 2013). Psychological abnormalities or comorbid disorders occur more frequently in individuals with BED than in those without BED but with comparable body weight, suggesting that the increased rate of other mental disorders may be associated with the extent of BED in addition to potentially comorbid overweight or obesity (Welch et al. 2016).

5.4.2 Obesity

In people with obesity who seek conservative weight loss treatment (clinical populations), the prevalence of BED is estimated at 20–30% (Aguera et al. 2020), and the likelihood of having BED seems to increase with higher BMI. The prevalence of BED in people with obesity before bariatric surgery is about 15–30% (Dawes et al. 2016). Studies on the prevalence of obesity in samples of individuals with BED report prevalence rates between 65% and 70%. Kessler et al. (2013) compared the weight of people with and without BED in their study of over 23,000 participants, and found that 32.8% to 41.7% of people with BED were obese, while obesity was present in only about 16% of people without BED. Thus, there seems to be a close connection between obesity and BED, although it is still unclear whether BED is a cause or rather a consequence of overweight and obesity. BED is also common in patients with type 2 diabetes mellitus (Chevinsky et al. 2020).

In contrast to people with obesity without BED, food and energy intake in people with

obesity and BED is higher both overall and specifically on days without binge eating.

Compared to people with obesity without BED, people with obesity and BED have an earlier onset of overweight, more frequent weight fluctuations, more pronounced body dissatisfaction, lower self-esteem, and lower quality of life. Depressive disorders, anxiety and phobic disorders, as well as harmful alcohol use and alcohol dependence are common comorbid disorders in individuals with obesity and BED (Citrome 2019; Guerdjikova et al. 2019). People with obesity and BED also suffer more frequently from a comorbid personality disorder, with prevalence estimates ranging between 7.5% and 30% (Gerlach et al. 2016).

People with obesity and BED seem to show less long-term weight loss in conservative weight loss programs than people with obesity without BED. The assumption that an improvement in psychological symptoms as well as eating disorder symptoms is accompanied by weight loss is not confirmed by the majority of studies. Successful treatment of BED shows only marginal long-term effects on weight development (Hilbert et al. 2020), suggesting that other factors, such as hypercaloric eating behavior between episodes of binge eating, may have a decisive influence on body weight.

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Atypical Eating Disorders and Eating Disorders Not Otherwise Specified

Astrid Müller and Andrea Sabrina Hartmann

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Since most empirical studies have recruited patients with the full picture of a classic eating disorder (anorexia nervosa, bulimia nervosa, binge eating disorder), knowledge about atypical, subsyndromal, or other feeding and eating disorders is still limited. However, the majority of therapy-seeking patients describe a persistent eating disorder symptomatology that does not meet all diagnostic criteria for a classic eating disorder. Nevertheless, their eating disorder-related psychopathology also requires treatment due to the strong fixation on weight and shape,

as well as persistent problems with eating and weight-regulating behaviors, and a problematic, inappropriate approach to certain foods. In addition, there are other specified feeding and eating disorders and those that are mainly observed in children or people with developmental disorders. These forms are also associated with substantial negative consequences such as nutritional deficiencies.

The DSM-5 (American Psychiatric Association, 2013) took these findings into account by significantly revising the chapter on eating disorders and renaming it “Feeding and Eating Disorders.” This category includes anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED). As part of the restructuring, the following feeding and eating disorders that for the most part begin in infancy or early childhood and sometimes persist into adulthood were also included in this category: Pica, rumination disorder, and avoidant/restrictive food intake disorder. Additionally, there

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is a DSM-5 category “Other Specified Feeding and Eating Disorders,” which includes Atypical AN, BN and BED of limited frequency and/or limited duration, Purging Disorder and Night-Eating Syndrome.

This chapter provides information on atypical, subsyndromal forms of classic eating disorders, other specified feeding and eating disorders (purging disorder, night eating syndrome), as well as pica, rumination disorder, and avoidant/restrictive food intake disorder.

6.1 Atypical, Subsyndromal Eating Disorders

In atypical, subsyndromal eating disorders, characteristic features are present, but not the full picture of AN, BN, or BED. If the weight remains in or above the normal range despite weight loss, but all other criteria for AN are met (see Chap. 3), it is referred to as Atypical AN. Subthreshold BN can be diagnosed if all the characteristics of classic BN are present, but the frequency and duration of eating episodes and compensatory measures are lower (<1 time/week and/or <3 months). Therefore, this disorder is also referred to as BN of low frequency and/or limited duration in the DSM-5. Similarly, there is BED of low frequency and/or limited duration. Here, apart from the frequency and duration of eating episodes, which occur less frequently and for shorter periods (<1 time/week and/or <3 months), all features of the classic BED are present (Chap. 5). The 12-month prevalence for atypical or subthreshold forms of eating disorders in middle-aged women was 0.35% for Atypical AN, 0.44% for Subthreshold BN, and 0.38% for Subthreshold BED.

► **Important** Atypical, subsyndromal eating disorders include Atypical anorexia nervosa,

Subthreshold bulimia nervosa of low frequency and/or limited duration, and Subthreshold binge eating disorder of low frequency and/or limited duration.

6.2 Purging Disorder

Although some patients show recurrent compensatory behavior for weight regulation, they do not report regular binge eating with the intake of objectively large amounts of food and loss of control (no binge eating), as is typical for BN. Since these patients already perceive small meals as too large subjectively, they apply compensatory measures—so-called purging behavior—due to fear of weight gain (Keel 2019). This includes, for example, self-induced vomiting and the abusive use of laxatives, diuretics, or thyroid medications. While both binge and purging behavior occur in BN, purging behavior is the focus here, which is why the term purging disorder was chosen. Frequency estimates revealed prevalence rates between 0.2 and 4%, which can be explained by differently defined diagnostic criteria and threshold values for a clinically relevant purging disorder.

Proposed Criteria for Purging Disorder (Keel et al. 2005)

- A. Repeated compensatory measures to regulate weight after normal meals and snacks
- B. Absence of objectively large binge eating episodes
- C. Absence of loss of control over eating

6.3 Night Eating Syndrome

Albert Stunkard et al. first described in 1955 in 25 overweight patients an eating behavior called night eating syndrome (NES). NES is assumed when patients report recurrent episodes of

nocturnal eating of small amounts of food after awakening from sleep (e.g., leftovers from daytime meals). The regular excessive intake of food after the actual dinner can also be classified as NES. Affected individuals are aware of the nocturnal eating and can remember it. It should be noted that the nocturnal eating episodes must be accompanied by clinically significant distress and impairment in psychosocial functioning.

The main criterion of NES seems to be a shift in the day/night rhythm regarding eating behavior. There is probably a dissociation between the circadian rhythm of sleep and food intake (Shoar et al. 2019).

In 2010, diagnostic criteria for NES were proposed and published for further research (Allison et al. 2010). The NES criteria in DSM-5 are not as detailed. Either evening eating (food intake after dinner) or nocturnal eating (nocturnal awakening with food intake) or both can be present to meet the diagnostic criteria for NES. Neither large amounts of food are consumed during evening nor nocturnal eating episodes (in contrast to BED). NES must therefore be distinguished from BED and from sleep-related eating disorder, which is described in sleep medicine. Likewise, external influences (shift work, regional social norms) as well as physical illnesses or medications as a cause for evening or nocturnal eating must be ruled out.

The prevalence in the general population is 1–1.5%, with higher prevalence rates found in individuals with obesity, diabetes mellitus, and those with other mental disorders (de Zwaan et al. 2014; Abbott et al. 2018; Bruzas and Allison 2019).

Proposed Criteria for Night Eating Syndrome (Allison et al. 2010)

A. Excessive eating in the evening/night:

- >25% of daily calorie intake after dinner and/or
- Nighttime awakening with food intake at least two nights per week

- B. The evening or nighttime event can be remembered
- C. At least three of the following criteria:
- Low food consumption in the morning and/or skipping breakfast on four or more days per week
 - Strong urge to eat between dinner and falling asleep and/or during the night
 - Difficulty falling asleep and staying asleep on four or more nights per week
 - Belief that one cannot fall (back) asleep without eating
 - Frequent depressive mood and/or mood decline in the evening
- D. Significant distress and/or decline in performance
- E. Duration of at least three months
- F. Disorder is not a consequence of substance abuse or dependence, somatic diseases, medication side effects, or mental disorders. The disturbed eating behavior cannot be better explained by a BED.

► **Important** Purging disorder and Night eating syndrome are assigned to the category “Other specified feeding and eating disorders” in DSM-5.

6.4 Pica

A typical feature of pica is the consumption of non-nutritive substances that are not intended for eating and therefore do not constitute food. These include, for example, paper, hair, soil, chalk, paint, or clay. This eating behavior is not appropriate for the developmental level of the affected person and social norms. In most cases, there is no general aversion to conventional foods. The unusual cravings for the rather inedible substances may be related to the specific taste or the particular consistency of the respective substance or may be used for self-soothing,

e.g., in people with intellectual disabilities. Pica is rare (even if evidence of prevalence of full-syndrome pica is missing), and occurs most likely in children. However, it can also be observed in people with developmental disorders or intellectual impairments, institutionalized individuals, adult women during pregnancy or postpartum period, and in regions with low socio-economic status.

6.5 Rumination Disorder

The predominant characteristic of rumination disorder is the repeated regurgitation of previously swallowed and possibly partially digested food. The regurgitated food is chewed again, swallowed, or spit out. Accompanying symptoms may include coughing and contractions of the tongue or abdomen. In infants, this may also include arching of the back, including jerky movements. It is a voluntary process that is not a consequence of a physical illness (e.g., esophageal reflux, pyloric stenosis, nausea). If the symptoms occur exclusively in the context of AN, BN, BED, or avoidant/restrictive food intake disorder, these diagnoses should be given. There are no reliable epidemiological data on the prevalence of full-syndrome rumination disorder, although the disorder is more frequently observed in specific population groups (e.g., with intellectual impairments).

6.6 Avoidant/Restrictive Food Intake Disorder (ARFID)

Avoidant/restrictive food intake disorder (ARFID) represents an eating and feeding disorder that results in significant nutritional deficiency and negative health consequences, as the food and energy requirements are persistently not met. Possible consequences include severe weight loss, hypothermia, bradycardia, anemia, tooth decay, electrolyte imbalances, slowed growth, the necessity of enteral nutrition, dependence on dietary supplements, and significant psychosocial impairments. The pronounced

disinterest in eating and food is usually not based on significant body image concerns. Some affected individuals avoid food due to its sensory properties (e.g., consistency, color, smell, temperature, taste), while others do so due to an initial negative experience (such as choking) and the persistent fear of repetition, and a remaining rest simply has a lower interest in food and a smaller or non-existent appetite reaction. The disorder must be distinguished from culturally conditioned food avoidance (e.g., religious fasting) and physical illnesses (e.g., gastrointestinal, oncological) and should not occur exclusively in the context of AN or BN. The disorder with avoidance or restriction of food intake is usually first observed in early childhood, although there is a lack of empirical findings on the prevalence of full-syndrome ARFID (Zimmermann and Fisher 2017).

► **Important** Pica, Rumination disorder, and ARFID are assigned to the DSM-5 category “Feeding and Eating Disorders,” which also includes atypical or subthreshold forms of the classic eating disorders AN, BN, and BED.

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Orthorexia Nervosa

7

Reinhard Pietrowsky

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7.1 Concept and Definition

The term “orthorexia” derives from the Greek *orthos*, meaning “right, correct”, and *orexis*, meaning appetite. The term “orthorexia nervosa” was coined by the US physician Steven Bratman and is intended to refer to a psychogenic eating disorder, analogous to anorexia nervosa. Orthorexia nervosa is therefore understood as an eating disorder characterized by extreme value placed on a supposedly healthy diet and the establishment of arbitrary dietary rules for this purpose, the health benefits of which are often questionable and can lead to malnutrition and psychosocial problems in extreme cases

(Bratman and Knight 2000). In orthorexia, the focus is not on the amount of food consumed, as is the case with anorexia, bulimia, or binge-eating disorder, but on its quality. Orthorexia is currently not listed as an official disorder in the common classification systems of mental disorders.

► **Important** Orthorexic eating behavior refers to an extreme (and possibly pathological) fixation on healthy eating.

7.2 Symptomatology

The symptomatology of orthorexiastems from the desire for supposedly healthy nutrition and the rigid and sometimes compulsive implementation of this extreme healthy diet. Thus, affected individuals establish dietary rules that, in many cases, are exaggerated, bizarre,

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and not empirically supported, such as completely avoiding certain food components (e.g., fat), only consuming fruit within a maximum of 15 minutes after harvest, or not eating certain foods together but only at intervals of, for example, one hour. The individual expression of these dietary rules is very diverse and depends on the subjective definition of healthy nutrition. Experience shows that the subjective definition of healthy nutrition becomes increasingly strict over the course of the disorder, such that the number of allowed foods is increasingly reduced and the measures for food preparation become more differentiated (Barthels et al. 2015a). These dietary rules are often derived from well-founded recommendations for healthy nutrition but are exaggerated to such an extent that the health-promoting effect turns into a harmful effect and can lead to malnutrition with life-threatening consequences.

Another characteristic of orthorexia is that these dietary rules are followed in a rigid and often compulsive manner (Bratman and Knight 2000). Affected individuals find any deviation from their own dietary rules unbearable, and therefore invest a lot of time and effort in implementing their dietary rules. This can lead to significant psychosocial problems, as individuals can no longer go to restaurants or eat with friends if they are not certain that their dietary rules can be followed. In turn, this commonly results in a loss of social contacts or to socializing only with like-minded people (Bratman and Knight 2000). These characteristics are also accompanied by a lack of insight into the disorder. Sufferers consider their (pathological) eating behavior to be correct and appropriate and believe that people who do not eat like them are making nutritional mistakes. Accordingly, it is often difficult to convince them of the negative health and psychological consequences of their eating behavior (Barthels et al. 2015a).

Overview

In summary, orthorexic eating behavior is characterized by the following symptoms:

- Creation of subjective, supposedly healthy dietary rules
- Rigid adherence to these dietary rules
- Social restrictions due to following these dietary rules
- Lack of insight into the disorder

7.3 Nosological Classification

Orthorexic eating behavior shows links to eating disorders, obsessesive-compulsive behavior, but also to somatoform disorders (Barthels et al. 2015a; Cena et al. 2019; Pietrowsky 2012). The proximity to eating disorders is undoubtedly due to the fact that orthorexia is a conspicuous to disturbed eating behavior, in which the quality of the food is more important than the quantity. However, recent studies have demonstrated a close relationship between orthorexia and anorexia, insofar as a desire for weight reduction was originally present in orthorexia, or orthorexic eating behavior developed as a means of weight regulation in (formerly) anorexic patients (Barthels et al. 2017a).

The proximity of orthorexic eating behavior to obsessive-compulsive disorders is not clear. The rigid adherence to the established dietary rules has a partially compulsive character and can trigger extreme fears and concerns if the rules are not followed. However, following the dietary rules is experienced as ego-syntonic—in contrast to the ego-dystonic neutralizing behavior in obsessive-compulsive disorders. Studies also found no evidence of an increased tendency towards orthorexic attitudes in people with obsessive-compulsive disorder (Barthels et al. 2017b). Thus, from the aspect of obsessiveness-compulsivity, orthorexic behavior may be seen more as ego-syntonic behavior, corresponding to obsessive-compulsive personality disorder.

Relationships to somatoform disorders exist primarily in the presence of hypochondriacal fears and the preoccupation with physiological processes in orthorexia. Recent studies have shown that people with somatoform disorders

actually have an increased tendency towards orthorexic eating behavior (Barthels et al. 2021).

► **Important** In summary, orthorexia can primarily be seen as closely related to eating disorders, but it also shows aspects of ego-syntonic obsessive-compulsive symptoms and somatoform fears and concerns.

7.4 Diagnosis and Epidemiology

There are various screening instruments for orthorexia. The first, introduced by Bratman, was the “Orthorexia Self-Test,” which consists of ten questions (ORTO). However, the psychometric properties of this test and other derived screening questionnaires are not convincing. The independently developed Düsseldorf Orthorexia Scale (DOS, Barthels et al. 2015b) is a screening questionnaire that likewise consists of ten items, shows good psychometric properties, and is currently available in Chinese, English, German, Polish, and Spanish versions.

In addition to these screening instruments, there are several proposals for diagnostic criteria for orthorexia (Cena et al. 2019), which show a high correspondence with each other.

Overview

The diagnostic criteria of Dunn and Bratman (2016) are listed here by way of example.

Criterion A

- (1) An obsessive focus on “healthy” eating, as defined by a dietary theory or a set of beliefs whose specific details may vary;
- (2) Marked by exaggerated emotional distress in relationship to food choices perceived as unhealthy;
- (3) Weight loss may ensue as a result of dietary choices, but this is not the primary goal.

Criterion A is evidenced by the following behaviors:

- A1. Compulsive behavior and/or mental preoccupation regarding affirmative and restrictive dietary practices believed by the individual to promote optimum health
- A2. Violation of these self-imposed dietary rules causes exaggerated fear of disease, a sense of personal impurity and/or negative physical sensations, accompanied by anxiety or shame
- A3. Dietary restrictions escalate over time, and may come to include elimination of entire food groups and involve progressively more frequent and/or severe “cleanses” (partial fasts) regarded as purifying or detoxifying. This escalation commonly leads to weight loss, but the desire to lose weight is absent, hidden or subordinated to ideation about healthy eating.

Criterion B

The compulsive behavior and mental preoccupation becomes clinically impairing by any of the following:

- B1. Malnutrition, severe weight loss, or other medical complications from restricted diet
- B2. Intrapersonal distress or impairment of social, academic or vocational functioning secondary to beliefs or behaviors about healthy diet
- B3. Positive body image, self-worth, identity, and/or satisfaction excessively dependent on compliance with self-defined “healthy” eating behavior.

Some studies have shown a higher prevalence in women while others found no gender difference in terms of prevalence. In men, orthorexic behavior seems to be particularly associated with the practice of certain sports (especially bodybuilding). Orthorexic behavior does not

appear to be predominantly present in specific age groups. However, there is a tendency for orthorexic eating behavior to be observed at a younger age in women.

The prevalence of orthorexia is difficult to estimate. Based on surveys using the DOS, prevalence rates of 1–2% have been estimated for Germany. Orthorexia appears to be more common in certain subgroups, particularly among individuals who work professionally with nutrition (e.g., dietitians; cf. Kinzl et al. 2006; Korinth et al. 2010), athletes (Eriksson et al. 2008), and individuals who follow a specific diet for other reasons (e.g., vegetarians or vegans; Barthels et al. 2018). In addition to individuals with current or past anorexia, orthorexic behavior is also frequently found in patients with somatoform disorders (Barthels et al. 2021). Surveys among nutritionists and dietitians also appear to show an increase in the prevalence of treatment (Barthels et al. 2019; Vandereycken 2011). Individuals with orthorexia are more likely to seek help from nutritionists and dietitians than from psychotherapists or physicians.

7.5 Etiology

The desire to eat healthily undoubtedly arose from the increasing industrial production of food and the numerous food scandals of recent years, as well as the societal emphasis on healthy eating and the linking of psychological motives and social values with the type of diet (Pietrowsky 2019). However, this alone cannot explain the transition from healthy to orthorexic eating, and additional psychological factors must be assumed. Two aspects seem relevant: an obsessive-compulsive personality structure and/or control over one's own body and health. Adhering to a healthy diet has a self-rewarding and self-reinforcing effect, leading to an intensification and extension of this behavior. Thus, an initially healthy diet (characterized by a balanced diet) can become increasingly restricted,

and new, self-imposed dietary rules develop, which in the case of an obsessive-compulsive personality structure, then assume the role of ego-syntonic overvalued ideas, leading to the development of orthorexia.

On the other hand, health anxieties or preoccupation with physical symptoms can lead individuals to gain more control over their body and what is ingested in order to reduce these fears and concerns. Orthorexia thus develops as a (dysfunctional) coping mechanism to gain control over health and health anxieties. As with most mental disorders, a multifactorial etiology can be assumed in the development of orthorexia, in which cultural, social, and psychological factors interact. Currently, however, there is no established etiological model for the development of orthorexia nervosa.

7.6 Relation to Other Eating Disorders

Orthorexia, like other eating disorders, is characterized by disturbed eating behavior that can lead to physical and psychosocial problems. However, unlike eating disorders, the disturbed eating behavior in orthorexia is less about the quantity of food intake and more about its quality. These differences are minimized upon closer examination, as in bulimia nervosa and especially anorexia nervosa, the consumed or avoided foods are also selected based on qualitative (albeit not primarily health-related) aspects. Moreover, aspects of body weight and physical appearance seem to be more significant in individuals with orthorexic eating than originally assumed. Orthorexic eating behavior can develop in formerly anorexic individuals as a way to continue controlling their eating behavior in a very restrictive way through supposedly extremely healthy nutrition. It can also develop primarily, as described above, to gain control over one's body and appearance, which is also a fundamental motive in anorexia and bulimia nervosa.

As studies have shown, there seems to be a particular closeness between orthorexia and anorexia nervosa, and a continuum between these two disorders can be suspected (Barthels et al. 2017a).

7.7 Treatment

Currently, only a few statements can be made about the treatment of individuals with orthorexic eating behavior. This is because affected individuals rarely consult physicians or psychotherapists, partly due to a low awareness of the disorder and a lack of differentiated treatment recommendations given that it is not an officially recognized disorder. The following treatment measures seem sensible and appropriate:

- Conveying a disorder model and psychoeducation about the disorder model
- Promoting awareness of the disorder and motivation to change eating behavior
- Normalization of eating behavior through nutrition plans, possibly involving nutritionists or dietitians, and breaking down rigid dietary rules
- Addressing underlying problem areas, such as illness anxiety or body dissatisfaction
- Developing functional alternatives for dealing with illness anxieties or body dissatisfaction

These measures can draw on the usual and successful methods for treating eating disorders and somatoform disorders. In the future, concrete research on specifications and extensions of these approaches for the treatment of orthorexia would be desirable.

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Body Image Disturbances

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8.1 Body Image Issues in Eating Disorders

Body image disturbances are a central symptom of the eating disorders anorexia nervosa (AN) and bulimia nervosa (BN), and are thus a necessary diagnostic criterion for AN and BN in the most recent classification system (DSM-5) of the American Psychiatric Association (APA 2013). According to the DSM-5 criteria, pronounced fears of weight gain, disturbance in the experience of body shape or weight, an undue influence of weight or body shape on self-evaluation, and denial of the seriousness of low body

weight are mentioned as symptoms of body image disorders in AN. In contrast, for BN, only the undue influence of body shape or weight on self-evaluation is described as a diagnostic criterion regarding body image problems.

In the clinical application context in German-speaking countries, the ICD classification system (ICD; International Statistical Classification of Diseases and Related Health Problems of the World Health Organization [WHO 2020]) is more commonly employed. As in the DSM-5, the latest version of the ICD (ICD-11)¹ also defines the central influence of low body weight or a corresponding body shape on self-evaluation, or disturbances in the perception of one's own weight or body shape, as symptom criteria

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¹This is the latest version of the International Classification of Diseases and Related Health Problems, adopted by the World Health Organization (WHO) since 2019 and will come into force in 2022. It is not yet available in German translation. The English version can be accessed for free at www.who.int/classifications/icd/en/.

regarding body image disturbance in AN. For BN, preoccupation with body shape and weight is described as a symptom criterion related to body image problems.

The clinical picture of binge eating disorder (BED) is listed as a separate diagnosis in both the DSM-5 and the ICD-11. Typical for BED are repeated binge eating episodes, which, unlike BN, are usually not followed by compensatory behavior. Symptoms related to body image disturbances are not provided as diagnostic criteria for BED in either the DSM-5 or ICD-11. However, some empirical findings suggest that at least in a subgroup of patients with BED, there is an overvaluation of body shape and weight, as well as clinically relevant preoccupation with body shape and weight or body dissatisfaction, which can also be relevant to self-esteem. In addition, body-related rumination is considered one of the most common triggers for depressive moods before binge eating episodes in patients with BED.

8.2 Body Image Disturbance: Theoretical Conceptions and Definition Attempts

In the research literature on body image and body image problems, numerous terms and definitions of body image disturbance can be found (e.g. body schema disturbance; body dissatisfaction). It is generally accepted as being multidimensional in nature and conceptualized as including

- a perceptual component of body image,
- a cognitive-affective or cognitive-evaluative component, and
- a behavior-related component.

8.2.1 Perceptual Component

According to the studies conducted to date, the perceptual component describes a disturbance in the accuracy of perception of one's body. Accordingly, in the clinical-psychological

context, disturbances in body perception should manifest as an overestimation of the dimensions of the body or parts of the body. However, in our view, the current understanding of perceptual body image disturbances in terms of inaccurate or faulty visual body width estimation is too narrow and ultimately not helpful. In addition to the perceptual component, body image disturbances are further characterized by other cognitive processes, such as **attention allocation** (e.g. turning towards vs. turning away) towards one's body (e.g. eye movements when viewing one's body in the mirror). The extent to which these cognitive processes mediate the perception of one's own body and whether they occur voluntarily or involuntarily is currently being researched in various research centers.

8.2.2 Cognitive-Affective or Cognitive-Evaluative Component

Cognitive processes of information processing, such as **attention allocation** (see above) and **interpretation bias**, regarding one's body are assigned to the cognitive component of body image disturbances and, according to current research, play a significant role in maintaining body image disturbances and associated dysfunctional thoughts and negative feelings. **Negative feelings** (e.g. disgust, rejection) towards the body and corresponding dysfunctional thoughts and evaluations regarding one's outward appearance also relate to the cognitive-affective or cognitive-evaluative component of body image disturbances. In the relevant research literature on this aspect of body image problems, the reported findings are largely derived from surveys of affected individuals, based on the assumption that they are able to provide information on cognitive-affective or cognitive-evaluative aspects through self-reflection. However, this is only true if individuals are consciously aware of the corresponding processes, which is probably only partially the case. In particular, the question arises as to whether unintended cognitive-affective or

cognitive-evaluative aspects can also be captured by self-reports. It is currently being investigated to what extent implicit-evaluative processes, which relate to the cognitive-affective or cognitive-evaluative component of body image, can also be recorded on a more automatic and therefore less voluntarily controlled level using experimental-psychological paradigms (e.g. Brockmeyer et al. 2018; Legenbauer et al. 2020).

8.2.3 Behavioral Component

On the one hand, the behavioral component of body image disorders can manifest in the form of **voluntary** avoidance behavior. For instance, affected individuals may try to conceal negatively evaluated body areas by wearing loose clothing. Moreover, individuals may avoid looking at their body as much as possible, and this avoidance behavior can be both conscious and voluntary (e.g., not having mirrors in one's apartment) or more or less **involuntary** (e.g., turning one's head away when accidentally catching one's reflection in a shop window). A body image problem at the behavioral level can further manifest in the opposite direction as **preoccupation** with one's body or figure, e.g., in checking behavior. Here too, there can be varying degrees of conscious control over these behaviors (e.g., weighing oneself several times a day; frequently checking relevant body parts [body checking]).

Body Image Disorders in the Context of Information Processing Theories

In summary, body image disorders are conceptualized from the authors' perspective as cognitive-affective disturbances that can manifest in various phases of body-related information processing (e.g., attention, memory, inferential thinking), occur to varying degrees involuntarily or voluntarily, and can be accompanied by pronounced negative emotions (e.g., anxiety, disgust, aversion) and corresponding behavioral tendencies (e.g.,

avoidance or checking behavior). The distinction often found in the literature between perceptual vs. cognitive aspects of body image disturbance is misleading insofar as perceptual processes are also an aspect of a cognitive process. The definition of body image disorders introduced here, with regard to various phases of body-related information processing, overcomes this conceptual imprecision.

8.3 Body Image Disturbances as Core Symptoms of Eating Disorders: Research Approaches and Empirical Findings

Research on body image disturbances in the field of eating disorders initially focused on the aspect of **visual body width estimation** or on the investigation of **distortions in body perception**. Various methods were developed and used for this purpose (e.g., video or photo distortion techniques). A meta-analysis (Cash and Deagle 1997) revealed, in line with expectation, that female patients with an eating disorder diagnosis more frequently exhibit perceptual distortions than do healthy control participants. Control conditions for evaluating neutral objects made it clear that the differences found in the perceptual component of body image disturbances (i.e., visual body width estimation) do not reflect a general sensory-perceptual deficit in patients with eating disorders, but specifically relate to the perception of one's body. These results were replicated in a more recent meta-analysis (Mölbert et al. 2017). Group differences between individuals with an eating disorder and individuals without any mental disorder diagnosis were particularly pronounced with regard to **body dissatisfaction**—in the sense of the cognitive-affective or evaluative aspect of a body image disturbance. It may therefore be that the cognitive-affective or evaluative aspect of body image disturbances takes precedence over the perceptual component (i.e., visual body width estimation) in terms of clinical relevance. This

is also suggested by therapy studies in which patients with BN and AN did not differ in their estimation of body circumference before or after therapy. However, it has also been shown that certain attitudinal measures (e.g., dissatisfaction with one's figure) do not consistently differentiate between clinical groups and healthy control groups, partly because dissatisfaction with one's figure can be as widespread among female healthy control samples as in clinical groups (Cash and Deagle 1997). This is particularly true for questionnaire studies, while experimental research methods have sometimes revealed significant group differences between women with an eating disorder and healthy control women in terms of body-related thoughts and affects. Experimental psychological methods might therefore be more sensitive to detecting some of these differences in body perception or in the processing of body-related information compared to self-report methods.

Consequently, more recent research on body image disturbance has increasingly focused on experimental psychological methods that can directly capture behavioral measures, for example, by examining selective attention processes towards the body. Previous research suggests a **disorder-specific information processing** ("negativity bias") towards one's body or figure in patients with eating disorders as well as in groups at risk of developing of an eating disorder, which is presumably important for maintaining body dissatisfaction. In eye-tracking studies, we were able to show—analogous to the findings of Jansen et al. (2005) in women with subclinical symptoms of an eating disorder—that during an experimental mirror exposure task, patients with AN and BN preferentially direct their gaze—i.e., longer and more frequently—to their self-evaluated "ugliest" body part, as compared to controls (Tuschen-Caffier et al. 2015). Conversely, they showed a shorter and less frequent fixation pattern on their self-evaluated "most beautiful" body part. A deficit orientation towards subjectively perceived "ugly" body parts was also found in an eye-tracking study in adolescent patients with AN and BN (Bauer et al. 2017). The more

pronounced the self-reported body dissatisfaction, the stronger this attention pattern. A similar pattern of attention allocation was also shown in overweight women with BED compared to overweight, healthy women (Svaldi et al. 2011a).

This distortion of visual attention when viewing one's body was particularly observed after an experimental induction of negative, compared to positive, mood in patients with AN (Svaldi et al. 2016) and BN (Naumann et al. 2019). Control subjects, on the other hand, did not show this pattern. This is particularly important for therapeutic work, as it has also been shown that patients with AN and BN more frequently use maladaptive strategies of emotion regulation (such as rumination) and therefore potentially experience negative mood more frequently and/or for longer periods (Naumann et al. 2016), which in turn could lead to increased attention to "ugly" body parts.

This suggests a close interplay of affective and cognitive mechanisms in maintaining body image disturbances and body dissatisfaction.

Furthermore, we were able to show that patients with BED remember positive body-related words less well than do overweight comparison subjects without a diagnosis of BED (Svaldi et al. 2010). Another study showed that patients with AN, compared to controls, tend to interpret ambiguous body-related information more negatively (Brockmeyer et al. 2018). Overall, these empirical findings support the role of evaluative-cognitive processes underlying body image disturbances.

► **Important** Selective memory, negative interpretation of body-related information, maladaptive coping with negative mood, and attention allocation to negative body-related information are factors that may contribute to the maintenance of eating disorders and, in particular, symptoms of impaired body image.

Furthermore, findings in patients with AN and BN suggest that when presented with a photo of their own body (self-photo) versus a photo of a matched control (other-photo; both

full-body images without the person's face or head), patients with AN direct their attention more quickly to self-photos than to other-photos (Blechert et al. 2010). This **vigilance effect** towards the self-photo was more pronounced the more dissatisfied the women with AN were with their bodies, i.e., dissatisfaction with one's own body was correlated with the speed of eye movements towards the self-photos. Thus, rather than showing avoidance behavior towards their bodies, patients with AN seem to fixate their bodies with their gaze. In relation to a "negativity bias" (focusing on subjectively perceived "ugly" body areas), vigilance towards one's own body could contribute to the maintenance of body image disturbances in AN.

In contrast, women with BN showed a tendency for a reverse pattern: Eye movements were faster towards other-photos than towards self-photos, which might be interpreted as avoidance towards the perception of self-images (Blechert et al. 2010). Studies on **experimental figure exposure** have shown, among other things, that particularly when using video-based body exposure, which seems to allow less avoidance behavior than imagery-supported exposure, pronounced negative affective reactions are evoked (Tuschen-Caffier et al. 2003). Interestingly, it is shown that patients with a BN diagnosis took less time to describe so-called problem areas (abdomen, hips, buttocks) than did women in a control group who did not have an eating disorder diagnosis. This can be interpreted as an indication that patients with BN show subtle forms of avoidance when confronted with their perceived unattractive body areas, despite the very direct exposure to their bodies. Avoidance behavior may also contribute to the intensification of the overvaluation of shape and weight and to the maintenance of the psychopathology of eating disorders. Consequently, avoidance behavior might be an important mechanism for maintaining clinically relevant body image disturbances, which in turn would have important implications for the psychotherapy of body image disturbances.

Furthermore, a recent experimental study in women with BED using a subliminal, i.e.,

unconscious, self-esteem induction demonstrated a causal relationship between self-esteem and body dissatisfaction. Implicit negative manipulation of self-esteem in women with BED led to a significant increase in body dissatisfaction; in contrast, body dissatisfaction did not increase when there had been an implicit, i.e., also unconscious, positive self-esteem influence beforehand (Naumann et al. 2015). Results suggesting a causal relationship between self-esteem and body satisfaction (Hoffmeister et al. 2010; Svaldi et al. 2011b) have also been found in preclinical studies in women with pronounced body dissatisfaction. This further supports etiological assumptions regarding the development of eating disorders, which draw on the relation between low self-esteem and the development of body image problems. However, findings in this area are still contradictory (e.g., Kästner et al. 2019; Linardon et al. 2019), underlining the need for more intensive research on the role of self-esteem for eating disorder symptoms and, in particular, body image disturbances.

► **Important** In the psychotherapy of body image disturbances, it is important to focus on avoidance behavior.

However, based on the current state of research, the mechanisms of maintaining and changing clinically relevant body image disorders are still largely unknown. In light of the definition of body image disturbances as a disturbance in various phases of body-related information processing (see above), it seems reasonable to place more emphasis on the investigation of various aspects of body-related information processing (e.g., attention processes, implicit evaluative processes) in future research.

Previous findings suggest that, among other things, a specific eye movement pattern (vigilance towards body areas perceived as unattractive) may be partly responsible for maintaining body image disturbances.

On the other hand, there is also evidence that avoidance behavior may be an important maintaining factor of body image disorders: It has been shown that both body checking and body

avoidance are more pronounced and more frequent in patients with eating disorders than in non-clinical individuals (Nikodijevic et al. 2018; Walker et al. 2018). Comparing one's own body with that of others, touching the abdomen and thighs, and inspecting them in the mirror are most frequently mentioned as checking behaviors by patients with eating disorders. In addition, meta-analyses have shown strong correlations between avoidance and checking behaviors and the overvaluation of shape and weight in both subclinical and clinical groups with eating disorder pathology (Nikodijevic et al. 2018; Walker et al. 2018).

As a working hypothesis, it can be concluded that both vigilance and checking (e.g., focus on negatively evaluated body areas) as well as the avoidance of body-related information may contribute to the maintenance of clinically relevant body image disturbances in different phases of information processing.

Body Image Disturbances: Empirical Findings on Maintenance Mechanisms

In line with the definition of body image disturbances as disturbances in various phases of body-related information processing, it seems worthwhile to investigate processes of information processing, such as visual attention towards or away from body-related information. Possibly, both vigilance and checking behavior as well as avoidance behavior can be considered as significant mechanisms in the maintenance of clinically significant body image disturbances. Such knowledge from basic research has important implications for the psychotherapy of body image disorders.

8.4 Evaluation of Existing Findings

In conclusion, the question arises as to what contribution findings from basic research can make in optimizing body image therapies. If one understands evidence-based psychotherapy not only as the empirical foundation of the

intervention strategies used, but also in the sense of an empirical foundation of etiological models, then the evidence-based investigation of the maintaining mechanisms of body image disorders forms the necessary basis for deriving tailored intervention principles for changing body image disturbances. With regard to the reported findings on eye movement patterns in patients with eating disorders when confronted with their bodies, the question arises, for example, whether body image exposure can be the right form of changing these gaze patterns that contribute to an unfavorable form of body-related information processing (e.g., directing attention to non-accepted body areas).

In our opinion, this is the case if the exposure is carried out as therapeutically guided exposure, in which the patient's attention is directed to both accepted and less accepted body areas. In this way, a balanced body-related information processing can be established through exposure (Hilbert and Tuschen Caffier 2004; Hilbert et al. 2002; Vocks et al. 2018). However, the effectiveness of body exposure can hardly be reduced to extinction through habituation. It is likely that the systematic directing of attention to accepted and less accepted body areas triggers information processing processes that contribute to a more balanced body perception and evaluation. The question of the mechanisms of action of body therapy should be given increased attention in future research.

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Diagnosis of Eating Disorders

9

Ulrich Schweiger

Contents

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9.1 Screening for Eating Disorders

To optimize the success of treating an eating disorder, patients with eating disorders should receive help early on. Patients should not be identified only when they themselves or persons close to them show an active desire for change or when obvious health consequences have occurred. To promote early detection, public availability of valid information about the nature of eating disorders and the possibilities for treatment is important. The first point of contact for patients with eating disorders is often not with psychiatrists, psychosomatic specialists, or psychotherapists, but with other doctors, such as general practitioners, dentists, and gynecologists. Therefore, all of these professional groups in the healthcare sector need to be vigilant to eating disorders.

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► **Important** Every doctor or psychologist should consider the possibility of an eating disorder in new patients, determine height and weight, and ask some screening questions.

► **Important** For early detection of eating disorders in a general practitioner setting, the following two questions should be considered first:

- “Do you have a problem with eating?”
- “Are you worried about your weight or your diet?”

Possible additional screening questions for the identification of eating disorders

- Are you satisfied with your eating behavior?
- Do you have an eating problem?
- Are you worried about your weight or your diet?

- Does your weight affect your self-esteem?
- Are you concerned about your figure?
- Do you eat in secret?
- Do you vomit when you feel uncomfortably full?
- Are you worried because you sometimes can't stop eating?

If none of these questions are answered in the affirmative, the false-negative rate is 8%; if at least one question is answered in the affirmative, the false-positive rate is 44% (Mond et al. 2008).

Special attention should be given to the following groups of people at risk.

Risk Groups for the Development of Eating Disorders

- Patients with low body weight or significant weight loss
- Patients with amenorrhea or infertility
- Patients with dental damage
- Patients who attend a consultation with concerns about their weight but are of normal weight
- Patients who are overweight and come to the doctor, for example, because diets have failed
- Patients with gastrointestinal disorders that cannot be clearly attributed to another medical cause
- Children and adolescents with growth delay
- Patients who work in the entertainment, fashion, or nutrition industry
- Patients who engage in competitive sports
- Children and adolescents whose parents show concern about their weight and eating behavior

9.2 Detailed Psychological Assessment for a Suspected Eating Disorder

9.2.1 Search for Physical, Psychological, or Behavioral Characteristics of an Eating Disorder

9.2.1.1 Underweight or Overweight

The patient should be weighed and measured in underwear and without shoes using calibrated instruments. The evaluation and assessment of the measured values should be carried out using suitable formulas ($BMI = \text{kg}/\text{m}^2$), normal ranges, or age-related percentile curves. In addition to the current weight, the weight course (e.g., speed of weight loss) is also significant.

9.2.1.2 Psychological and Behavioral Characteristics

These include:

- intense mental preoccupation with food and food-related topics,
- fear of being too fat—despite being underweight or of normal weight—,
- undue influence of body weight on self-esteem—use of eating behavior for emotion regulation (e.g., restrictive eating to avoid body-related shame despite normal weight).

The assessment of the patient's information requires knowledge about normative age-related attitudes and the cultural background. Restrictive eating can also be motivated by ascetic ideals, i.e., the idea of approaching spiritual goals through self-control and renunciation. Differential diagnosis should consider genuine loss of appetite in the context of severe depressive episodes or physical illnesses.

The aspect of inappropriateness or pathology does not arise solely from this self-appraisal, but

from the fact that such thoughts occupy considerable space, the affected individuals cannot gain any critical distance from them, and the self-esteem of the affected individuals is significantly reduced or significant dysfunctional behavior is maintained by these thoughts.

► **Important** A self-assessment as “too fat” is also common among healthy young women and men in the Western world.

In patients with eating disorders, social comparison processes are often paramount in directing attention. For example, when entering a room or joining a group, they immediately establish a ranking of the figure of the present same-aged women and compare themselves to the slimmest person.

9.2.1.3 Restriction of Calorie Intake

In eating disorders, there is typically a cluster of goal-oriented behaviors that serve to restrict calorie intake:

- Checking behavior, e.g., frequent weighing to closely monitor changes in body weight,
- Avoidance of high-calorie, fatty, or carbohydrate-rich foods,
- Skipping meal components such as dessert or entire meals,
- Chewing and spitting out food,
- Balancing meals by acquiring calorie knowledge and calorie counting, as well as weighing all food,
- Avoidance of foods whose calorie content cannot be clearly determined, such as complex dishes prepared by others,
- Use of sweeteners, fat substitutes, and “diet” products,
- Use of pharmacological appetite suppressants, nicotine, cocaine, or other stimulants for appetite control,
- Changes in mealtime schedules, for example by limiting intake to a single meal per day or by imposing a self-imposed structure with a multitude of small meals,

- Excessive consumption of fluids before meals to limit food intake,
- Fluid restriction to limit food intake, e.g., by causing a dry mouth,
- Selection and intake of unattractive food or food rendered unattractive, for example by adding excessive salt or hot spices,
- Use of disgust conditioning to block the intake of attractive foods, e.g., imagining chocolate being contaminated with mouse droppings,
- Avoidance of eating in the company of others to avoid distraction during meals or other social influences,
- Use of constricting abdominal belts, restrictive clothing, or tensing the muscles to create a premature feeling of fullness during meals,
- Use of tongue piercings or self-injury in the oral cavity to make food intake more difficult.

9.2.1.4 Binge Eating

The term “binge eating” describes an episode of food intake in which the usual control over eating behavior is lost or not exercised. In an objective binge eating episode, amounts of food are consumed that, in terms of their calorie count, exceed the scope of a normal meal. An exact calorie limit is not defined in the diagnostic manuals of DSM or ICD. In scientific studies, 1000 Kcal is often taken as the lower limit. The typical calorie count is between 3000 and 4500 Kcal. Food intake that is unplanned or unwanted, subjectively insufficiently controlled, but objectively does not represent excessive amounts, can also be perceived as binge eating. In the case of a long-standing eating disorder, binge eating episodes are usually planned, meaning that suitable foods are purchased, stored, and care is taken to ensure that no one disturbs the person during the binge eating episode.

9.2.1.5 Compensatory Behavior

This refers to a spectrum of goal-oriented behaviors aimed at rapidly removing absorbed energy or fluids from the organism:

- Vomiting can occur automatically, after mechanical irritation of the pharynx, or supported by chemical substances that promote vomiting, such as Radix Ipecacuanae or salt solutions,
- Intake of plant-based or synthetically manufactured laxatives,
- Intake of plant-based or synthetically manufactured diuretics,
- Intake of thyroid hormones (to increase basal metabolic rate),
- Exercise and exposure to cold,
- Omission of insulin in patients with type 1 diabetes to induce renal loss of glucose.

All measures that promote vomiting or diarrhea are summarized as purging behavior.

9.2.2 Assessment of Impairment due to Disturbed Eating Behavior

Individual behaviors that occur in eating disorders are also observed in healthy men and women, particularly in adolescence (e.g., dieting, induced vomiting, intense exercise for weight control). The assessment of behaviors as pathological cannot be based solely on frequencies or intensities. Rather, in each individual case, it must be examined whether the specific behavior results in a relevant impairment or endangerment of physical health, psychosocial functioning, or significant subjective distress.

9.2.3 Operationalized Diagnostics

If the suspicion of an eating disorder persists after the previous steps have been taken, it should be formally checked whether the criteria for an eating disorder according to an operationalized diagnostic system such as ICD-11 or DSM-5 are met. Checklists or structured interviews are used for this purpose. In order to provide adequate help to all women and men

suffering from an eating disorder, it is important to also apply the diagnostic categories of atypical eating disorders or eating disorders not otherwise specified.

Suitable for operationalized diagnostics are:

Interview-based cross-disorder instruments for categorical diagnostics These instruments have the advantage of covering a broad spectrum of important comorbid conditions. They have the disadvantage of only querying the criteria relevant to DSM or ICD diagnoses, making the detection of atypical eating disorders or eating disorders not otherwise specified somewhat more difficult. Important examples are: Structured Clinical Interview for DSM-5 (SCID), Diagnostic Interview for Mental Disorders (DIPS), International Diagnostic Checklists (IDCL).

Interview-based eating disorder-specific categorical instruments These have the advantage of not only covering the diagnostic criteria but also accurately depicting various aspects of the specific psychopathology of the eating disorder. Symptoms that can be attributed to comorbidity are also recorded, but there is no systematic recording of the criteria for comorbid disorders. Important examples are: Eating Disorder Examination (EDE), Structured Inventory for Anorexic and Bulimic Disorders for Expert Assessment (SIAB-EX).

Questionnaire-based instruments for dimensional diagnostics in adults These instruments are suitable for further detailed recording of the specific psychopathology of the eating disorder, also in the course of the disorder, and in some cases also cover aspects that are not the subject of the categorical interviews. Important examples are: Eating Disorder Examination-Questionnaire (EDE-Q), Eating Disorder Inventory (EDI, EDI-2), Questionnaire on Eating Behavior (FEV), Structured Inventory for Anorexic and Bulimic Eating Disorders for Self-Assessment (SIAB-S), Munich Eating

and Feeding Disorder Questionnaire (Munich ED-Quest).

For a detailed description of the psychometric properties and the sources of these questionnaires, see the S3 Guideline Eating Disorders (Vocks et al. 2019).

9.3 Medical Diagnostics for Eating Disorders

The main purpose of medical diagnostics is to prevent danger by detecting complications of the eating disorder, and in rarer cases, for differential diagnostic clarification.

Anthropometry in eating disorders

Patients with the onset of an eating disorder in adolescence often fall behind in their linear growth. In adults with a $\text{BMI} < 15 \text{ kg/m}^2$, hospital treatment should be considered. A $\text{BMI} < 12 \text{ kg/m}^2$ represents a particular risk factor for mortality. In children and adolescents, the pubertal status should be assessed according to the Tanner classification.

Heart Rate, Blood Pressure, and Orthostatic Test

Bradycardia with a heart rate below 40 per minute, tachycardia with a resting heart rate above 110 per minute, a blood pressure of less than 90/60 mmHg, a drop in blood pressure of more than 20 mmHg, or an increase in heart rate of more than 20 in the orthostatic test are risk indicators and should prompt a review of the need for inpatient treatment. Approximately 43% of patients with AN have a heart rate below 60 per minute, about 17% below 50 per minute.

Electrocardiogram

A prolonged QTc interval can occur in patients with eating disorders in connection with electrolyte disturbances caused by vomiting and other forms of purging behavior. Psychopharmacotherapeutic interventions can also contribute to QTc prolongation. The phenomenon is relevant due to the association

between QTc prolongation and sudden cardiac death.

Body Temperature

Hypothermia, with a temperature below 36.0°C , occurs in up to 22% of patients with AN.

Thorax

Mitral valve prolapse is more common in AN.

Abdomen

Changes in gastrointestinal motility are common in all forms of eating disorders. Acute abdomen, for example, due to acute gastric dilatation, is rare.

Vascular Status

Acrocyanosis is common in AN.

Oral Cavity, Salivary Glands

Patients who vomit, in particular, have a higher frequency of tooth damage and enlargement of the parotid glands and lingual salivary glands. The concentration of salivary amylase in serum is increased in patients with eating disorders depending on the bulimic symptoms.

Skin Surface

Dry skin, hair loss, acne, skin pigmentation disorders, yellowing of the skin due to hypercarotinemia, petechiae, neurodermatitis changes, livedo vasculitis, intertrigo, generalized itching, skin infections, and striae distensae are observed in all forms of eating disorders. Underweight patients often have typical lanugo hair. Patients who induce vomiting may have calluses on the back of the dominant hand (Russell's sign).

Blood Count

About 34% of patients with AN have mild leukopenia, rarely a pronounced leukopenia. Thrombocytopenia occurs in about 5%. Hematocrit and mean corpuscular volume (MCV) are usually in the lower reference range.

Electrolytes

Rapid changes in electrolyte concentrations can occur in the case of intense vomiting, but also

during refeeding. In particular, potassium in serum can be within the reference range during dehydration, but intracellular potassium can be significantly reduced. About 20% of patients with eating disorders have hypokalemia, about 7% have hyponatremia, and about 6% have low concentrations of calcium. Hypophosphatemia mainly occurs during parenteral refeeding but can also result from high carbohydrate consumption after a prolonged period of fasting. Similar associations also apply to hypomagnesemia.

Blood Glucose

Even with severe malnutrition, blood glucose is usually in the lower reference range. In combination with other factors such as infectious diseases or intoxications, life-threatening hypoglycemia can occur. A blood glucose level lower than 60 mg/dl is considered an indicator of risk.

Kidneys

Due to the reduced muscle mass, creatinine concentrations in AN are typically in the low reference range. Chronic hypokalemia, especially in the case of persistent vomiting and laxative abuse, can lead to kidney failure due to hypokalemic nephropathy in individual patients with an eating disorder.

Liver

About 12% of patients have elevated concentrations of liver enzymes. Acute severe damage to the liver can occur in AN.

Adrenal Glands

The secretion of the stress hormone cortisol is regularly increased in AN and in individual cases of other forms of eating disorders.

Thyroid

Reduced concentrations of triiodothyronine (T₃) ("Low T₃ Syndrome") are found regularly in AN and in individual cases of BN.

Sex Hormones

In AN, there are regularly reduced concentrations of estradiol, progesterone, and luteinizing hormone (LH). Other forms of eating disorders also often show disturbances in sex hormone secretion.

Bone Density

Bone density is significantly reduced early on in AN.

Brain Imaging Studies

Common findings in AN and BN are enlargements of the outer and inner cerebrospinal fluid spaces.

9.4 Differential Diagnostic Considerations

The diagnosis of an eating disorder is rarely a diagnosis of exclusion. AN is the most common cause of pronounced underweight in Western society. One difficulty lies in distinguishing AN with mild underweight from constitutional forms of underweight. Women with constitutional underweight are usually only borderline underweight. The psychological features of an eating disorder are absent, endocrine functions are inconspicuous, and in particular, there is no amenorrhea. It is difficult to distinguish between BED and overweight that is not caused by an eating disorder. In this case, it is important to check whether the psychological features of binge eating required by the DSM are actually present. Furthermore, it should be investigated which risk factors for the development of obesity are present (e.g., physical activity, food quality, substance use, medical factors). Neurological or endocrinological diseases that mimic the physical and psychological features of a bulimic eating disorder are rare.

Differential diagnoses for underweight

- Tumor diseases (brain, stomach, pancreas, lung, lymphomas, leukemia)
- Endocrine disorders (diabetes, hyperthyroidism, adrenal insufficiency)
- Gastrointestinal disorders (celiac disease, cystic fibrosis, esophageal stenosis, chronic occlusion of the superior mesenteric artery, Crohn's disease, ulcerative colitis)
- Infectious diseases (tuberculosis, parasitic infections, systemic fungal infections, HIV)
- Psychiatric disorders (depression, anxiety, and obsessive-compulsive disorders, somatoform disorders, schizophrenia)
- Drugs and substance abuse (multiple drug use, heroin, amphetamines)

However, the diseases mentioned in the overview rarely result in a similar temporal pattern of vomiting to that found in a typical eating disorder.

Differential Diagnoses for Overweight

- Lack of exercise—sedentary lifestyle, a large number of hours in front of a screen—, unfavorable dietary composition
- Poor food quality (“junk food”, sugary drinks, high-fat diet)
- Consumption of alcohol, cannabis, or other appetite-increasing substances
- Endocrine disorders (Cushing's syndrome, hypothyroidism, insulinomas)
- Neurological disorders (damage to the medial hypothalamus, craniopharyngioma)
- Genetic syndromes

Differential diagnoses for vomiting

- Brain tumor diseases (especially hypothalamic tumors)
- Endocrine diseases (diabetes, pregnancy vomiting)
- Gastrointestinal disorders (gastric or duodenal ulcers, chronic pancreatitis, intestinal parasitic infections, connective tissue disorders involving the gastrointestinal tract such as scleroderma)

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Part II

**Epidemiology, Etiology, and Course of
Eating Disorders**



Prevalence and Incidence of Anorectic and Bulimic Eating Disorders

Manfred Fichter

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Epidemiology deals with the distribution of diseases in space and time and with factors that influence this distribution. In the following, some important terms of epidemiology are defined and explained. Often, epidemiology is interested in the frequency and distribution of certain diseases in complete populations (e.g., all people aged 15 – 25 years). However, since complete surveys in large populations are very complex, often one (or more) sample(s) is drawn, which is supposed to be representative of the underlying population. If the sample is representative, the determined results can be generalized to the population. If we want to capture a specific disease in a representative population sample, it is necessary that the disease is clearly defined and that measurement instruments are available that can reliably and validly capture this disease. In the case of a slightly underweight anorexic person who also denies the

illness upon questioning, case identification can become difficult.

Other important terms in epidemiology are prevalence, incidence, and mortality rates.

Prevalence Prevalence refers to the total number of cases in the population (usually expressed as a percentage). Depending on the time period to which the prevalence refers, we speak of point prevalence (refers to a specific cross-section of time, e.g., today) or period prevalence (refers to a time period, e.g., one year). Thus, the one-year prevalence corresponds to the number of cases observed during one year. The lifetime prevalence corresponds to the number of cases that occur during an entire lifespan. Since the prevalence rate includes the total number of diseases at a specific point in time or a specific time period, it is important for planning in healthcare.

Incidence rate Another important term is the incidence rate (new case rate). This is the number of new cases of a specific disease in the population occurring within a defined time period. A common unit for incidence is the number of new cases per 100,000 people in the population

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per year. The one-year prevalence corresponds to the point prevalence plus the annual incidence rate. In some cases, conclusions about the etiology of a disease can be drawn from the incidence rate.

Mortality Regarding mortality, a distinction is made between a “Crude Mortality Rate” (CMR) and a “Standardized Mortality Ratio” (SMR). CMR is usually expressed as a percentage of deceased persons in a sample. The standardized mortality rate is the number of observed deaths in individuals with a specific disease compared to the expected death rate in the comparison population.

For a topic like eating disorders, the change in prevalence, incidence, and mortality over time is also of interest. Are these diseases decreasing or increasing? Are mortality rates decreasing due to improved treatment options? When using prevalence and incidence figures from other decades, it should be noted that these were usually recorded with different survey instruments and diagnostic concepts, so the figures are often not directly comparable. Since bulimia nervosa was first described in 1979, there are no epidemiological studies on this disease before this time, which does not necessarily mean that it did not exist or only existed to a minor extent. The question cannot be answered scientifically with precision.

There are various methods to obtain a representative sample as accurately as possible.

- Assuming that all patients will eventually visit a doctor or clinic (which is not really the case with eating disorders), case registers have been set up in various locations and maintained over many decades. Based on the statistics of the case register, statements can then be made about the prevalence and incidence of defined diseases.
- In some countries, such as England, almost every citizen is assigned to a “General Practitioner” (GP), and the register of the GP or several combined GP registers is used as the basis for calculating prevalence and incidence rates.

- In some institutions, such as schools or colleges, most individuals of certain age groups are grouped together, so that complete surveys of one or more schools can make statements about the total population of this age group. However, a high school class would not be representative of the total population because most students of that age group do not attend high school. In addition, (sick) students may be absent at the time of the survey, thus distorting the results.
- The cleanest approach is to draw a representative population sample from the municipal register, which is possible in Scandinavian countries and Germany due to the obligation to register, if there is a demonstrable public interest in a study.

In some of these representative population samples, all individuals of the total population are examined (e.g., all women of a defined age group in a city). Because this is very time-consuming for large populations (= total population), a two-stage procedure is often used. In the first stage, a screening can be carried out in a population sample (e.g., recording of weight and height and completion of a questionnaire screening for eating disorders). In the second stage, those individuals with weight abnormalities or questionnaire results above a cut-off in the screening are personally re-examined using a structured interview.

10.1 Prevalence

Table 10.1 provides an overview of selected important studies on the prevalence of anorexia nervosa (AN), bulimia nervosa (BN), binge-eating disorder (BED), and unspecified eating disorders (ED-NOS). The prevalence rates for women with eating disorders are significantly higher than for men. Particularly, men with anorexia or bulimia nervosa exhibit doctor-averse behavior. Many men with eating disorders avoid seeing a doctor or therapist altogether. The frequencies listed in the tables are mainly based

Table 10.1 Prevalence of anorexia nervosa (a), bulimia nervosa (b), and binge-eating disorder (c) according to the criteria of DSM-III-R, DSM-IV (TR), and DSM-5
(© M.M. Fichter)

Authors	Persons	Source	Age (Y)	N	Method	Prevalence		
						Screening ^{a)}	Criteria	Total
a) Anorexia Nervosa								
Wittchen et al. (1998)	Population sample (Germany)	14–24	1528	M-CIDI	DSM-IV	0.10 ^{b)} 0.60 ^{c)}	0.00 ^{b)} 0.10 ^{c)}	0.30 ^{b)} 1.00 ^{c)}
Fichter et al. (2005)	Female students (Greece)	13–19	2920	ANIS/SIAB-EX	DSM-IV	0.30 ^{a)}	0.00 ^{a)}	0.59 ^{a)}
Bulik et al. (2006)	Swedish twin cohort 1935–1958	28–39		DSM-IV	narrow diagnostic criteria broad diagnostic criteria	–	–	1.20 ^{c)} 2.40 ^{c)}
Wade et al. (2006)	Australian twin cohort 1935–1958	12–23	2028	EDE-S	DSM-IV	narrow diagnostic criteria broad diagnostic criteria	–	1.90 ^{c)} 4.30 ^{c)}
Machado et al. (2007)	Female students (Portugal)	>18	2980	WHO-CIDI	DSM-IV	–	–	0.39 ^{a)}
Hudson et al. (2007)	Population sample (USA)					0.00 ^{b)} 0.60 ^{c)}	0.00 ^{b)} 0.30 ^{c)}	0.00 ^{b)} 0.90 ^{c)}
Jacobi et al. (2014)	Population sample	18–79	5318	DEGS-CIDI	DSM-IV	0.20	0.10	0.30
Keski-Rahkonen et al. (2007) Raevuori et al. (2009) ^{d)}	Twin cohort (Finland) 1975–1979	25	2881	EDI/Short-SKID	DSM-IV (narrow) DSM-IV (broad)	–	–	2.20 ^{c)} 4.20 ^{c)}
Preti et al. (2009)	Population sample (Europe)	18+				–	0.00 ^{c)}	0.90 ^{c)}
Swanson et al. (2011)	Population sample (USA)	13–18	10,123	CIDI	DSM-IV	–	0.10 ^{b)} 0.20 ^{c)}	0.20 ^{b)} 0.30 ^{c)}
Favarro et al. (2003)	Population sample (Italy)	18–25	934	SCID-I	DSM-IV	–	–	2.00 ^{c)}
Mohler-Kuo et al. (2016)	Population sample (Switzerland)	15–60	10,038	–	DSM-IV	0.7	0.2	1.7
Smink et al. (2014)	Population sample (NL)	Adolescence	2,149	–	DSM-5	–	0.1	1.7
b) Bulimia Nervosa								
Garfinkel et al. (1995)	Population sample (Ontario)	15–65	8116	WHO-CIDI	DSM-III-R	–	0.10 ^{c)}	1.10 ^{c)}
Wittchen et al. (1998)	Population sample (Germany)	14–24 14–24	1528 1493	M-CIDI	DSM-IV	0.30 ^{b)} 0.90 ^{c)}	0.00 ^{b)} 0.00 ^{c)}	0.70 ^{b)} 1.70 ^{c)}
Favarro et al. (2003)	Population sample (Italy)	18–25	934	SCID	DSM-IV	–	–	4.60 ^{c)}

(continued)

Table 10.1 (continued)

Authors	Persons			Method			Prevalence		
	Source	Age (Y)	N	Screening ^{a)}	Criteria	Total	Men	Women	
Fichter et al. (2005)	Female students (Greece)	13–19	2920	ANIS/GHQ	(DSM-IV)	0.93 ^{a)}	0.68 ^{a)}	1.18 ^{a)}	
Hudson et al. (2007)	Population sample (USA)	≥18	2980	WHO-CIDI	DSM-IV	0.30 ^{b)}	0.10 ^{b)}	0.50 ^{b)}	
Keel et al. (2006)	College students	College age	2491	EDI	DSM-III-R	—	1.1 ^{a)}	4.20 ^{a)}	
					1982	—	0.4 ^{a)}	1.30 ^{a)}	
					1992	—	0.0 ^{a)}	1.70 ^{a)}	
					2002	—			
Swanson et al. (2011)	Population sample (USA)	13–18	10,123	CIDI	DSM-IV	0.60 ^{b)}	0.30 ^{b)}	0.90 ^{b)}	
Kessler et al. (2013)	Population sample 14 countries	≥18	24,124	CIDI	DSM-IV	0.90 ^{c)}	0.50 ^{c)}	1.30 ^{c)}	
Smink et al. (2014)	Population sample (NL)	Adolescence	2149	—	DSM-5	0.40 ^{b)}	—	—	
Lifetime prevalence						1.00 ^{c)}	—	—	
c) Binge-Eating Disorder (BED)									
Favaro et al. (2003)	Population sample (Italy)	18–25	934	SCID-I	DSM-IV	—	—	0.60 ^{c)}	
Hudson et al. (2007)	Population sample (USA)	≥18	2980		DSM-IV	1.20 ^{b)}	0.80 ^{b)}	1.60 ^{b)}	
						2.80 ^{c)}	2.00 ^{c)}	3.50 ^{c)}	
Swanson et al. (2011)	Population sample (USA)	13–18	10,123	CIDI	DSM-IV	0.90 ^{b)}	0.40 ^{b)}	1.40 ^{b)}	
Kessler et al. (2013)	Population sample 14 countries	≥18	24,124	CIDI	DSM-IV	1.60 ^{c)}	0.80 ^{c)}	2.30 ^{c)}	
Keski-Rahkonen et al. (2009)	Twin registry (Finland)	25	2881	EDI/Short-SCID	DSM-IV narrow DSM-IV broad	0.80 ^{b)}	—	—	
						1.00 ^{c)}	—	—	
Swanson et al. (2011)	Population sample	13–18	10,123	CIDI	DSM-IV	—	—	1.70 ^{c)}	
Cossrow et al. (2016)	Population sample (USA)	>18	22,397	—	DSM-IV	0.20 ^{b)}	0.20 ^{b)}	0.10 ^{b)}	
Lifetime Prev.						0.30 ^{c)}	0.30 ^{c)}	0.30 ^{c)}	
						—	0.92	2.07	

(continued)

Table 10.1 (continued)

Authors	Source	Persons	Method			Prevalence		
			Age (Y)	N	Screening ^{a)}	Criteria	Total	Men
Smink et al. (2014) Lifetime Prev.	Population sample (NL)		Adolescence	2149	–	DSM-5	–	0.7 2.3
d) Other Specified Feeding or Eating Disorder (DSM-5) Smink et al. (2014) Lifetime Prev.	Population sample (NL)		Adolescence	2149	–	DSM-5	–	0.3 0.6

EAT = Eating Attitudes Test; EDE-S = Eating Disorders Examination, Screening Version; ANIS = Anorexia Nervosa Inventory Scale; BCDS = Bulimic Cognitive Distortions Scale; DIS = Diagnostic Interview Schedule; CIDI = Composite International Diagnostic Interview

^{a)} Point prevalence, ^{b)} 12-month prevalence, ^{c)} Lifetime prevalence

on the American DSM-IV criteria. The numbers given in the tables vary considerably, as prevalence and incidence calculations are influenced by several factors: definition of a disease, type of detection (interview or questionnaire), composition of the total population and sample, and the time span to which a result refers. The point prevalence of AN for women at risk age between 15 and 35 years is approximately 0.5%.

With the publication of the American DSM-5 criteria (American Psychiatric Association 2013), there was a significant change: 1. AN, BN, and BED were defined somewhat more broadly, 2. BED became a main category alongside AN and BN, 3. the area of eating disorders was expanded by the area of “Feeding Disorders.” Feeding Disorders according to DSM-5 include (regardless of age) Pica, Rumination Disorder, and “Avoidant/Restrictive Food Intake Disorder (ARFID)” as well as the category “Other Specified Feeding or Eating Disorder (OSFED).” The latter includes atypical AN, BN, and BED (not meeting all criteria) and “Purging Disorder” (PD) and “Night Eating Syndrome” (NES). With the broader definition of AN, BN, and BED, the prevalence numbers increased (artificially). The “Lifetime” prevalence for women with AN was 1.2% according to the DSM-IV criteria and increased in the same Swiss sample to 1.9% (Mohler-Kuo et al. 2016).

For BN, the point prevalence is likely to be around 1% (with the lifetime prevalence correspondingly higher at around 1.5%). The BED is, according to the DSM-IV-TR criteria, broadly considered an eating disorder NOS and is defined in more detail as BED in the appendix of DSM-IV. The one-year prevalence of DSM-IV-BED, according to the few available results for women, is around 1.6%. It is less common in men (0.8%) than in women, but the proportion of men is higher than in AN or BN.

The largest eating disorder group is probably the residual group of **ED-NOS**. Since this is the least defined, prevalence rates vary considerably. In treated eating disorders, the proportion of patients who do not meet the criteria for , AN, BN, and BED accounts for more than 50%.

- **Important** The point prevalence of anorexia nervosa for women at risk age between 15 and 35 years is approximately 0.5%. For bulimia nervosa, the point prevalence is likely to be around 1% (with the lifetime prevalence correspondingly higher at around 1.5%).

10.2 Incidence

Selected results of incidence studies on AN and BN are presented in Table 10.2. The samples were obtained from hospital archives, case registries, and in the British study by Currin et al. (2005) from the patient registry of general practitioners. The incidence rates are consistently shown for cases per year and per 100,000 people in the population. The higher this number, the greater the incidence rate for AN, BN, and BED. The data from Theander (1970) for AN go back to 1931. For the period from 1931 to 1960, there is a clear increase in treated cases (women with AN in southern Sweden). A similar trend is also evident for the 1960s compared to the 1970s in the Monroe County case registry in the USA by Jones et al. (1980) (with information also for men) and the Zurich study (Milos et al. 2004). In the Danish case registry by Møller-Madsen and Nystrup (1992), the incidence rate was still low in 1970, but significantly higher in 1980 and 1989. The study by Lucas et al. (1999) in Rochester/USA also shows a gradual increase in the incidence rate for AN from 1950 to 1989. The implausible values for 1935 to 1949 may be due to methodological artifacts. The more recently published works from twin cohorts in Finland (Keski-Rahkonen et al. 2007, 2009), Australia (Wade et al. 2006) and Sweden (Bulik et al. 2006) show much higher values for incidence and prevalence. There are several reasons for this: 1) The samples consist of young women (no men, no elderly people, who have a lower prevalence of diseases). 2) The population is not the entire population, but consists exclusively of twins. 3) Case identification is different from, for example, the large American population studies. 4) Due to difficulties in individuation,

the risk of developing AN may be increased in identical twins.

- **Important** According to the results of recent studies, the incidence rates for AN were rather stable over the years or even slightly increasing, especially for girls aged 10–14 years. For BN, the incidence rates decreased somewhat over the years (2010–2016) (Reas and Rø 2018; Smink et al. 2016; Zerwas et al. 2015).

There is little data on the incidence of BN. Currin et al. (2005) reported an incidence rate for AN in women of 12.4 per 100,000 person-years. For the Netherlands, van Son et al. 2006 showed that for adolescent women aged 15 to 17 years, incidence rates were much higher than in other age groups, and that there was a very significant increase in the incidence of AN from 1985–1989 to 1995–1999. Micali et al. (2003) reported an annual incidence rate of 13.6 per 100,000 people in the British population. Incidence rates for BN are somewhat higher than for AN, with twin studies by Keski-Rahkonen et al. (2009) and Isomaa et al. (2009) distorting the picture upwards. Incidence rates for BED and ED-NOS are not yet available.

Eating Disorders in Developing Countries

Results from Japan, Hong Kong, and Singapore indicate that eating disorders are similarly common in eastern industrialized regions as in western industrialized nations. The situation is significantly different in developing and emerging countries such as Morocco, Iran, Malaysia, Fiji Islands, and Mexico, where the prevalence of eating disorders is considerably lower but on the rise.

Eating Disorders in Specific Risk Groups

According to several studies, black women living in the United States or the Caribbean, although seemingly exposed to similar media pressure for thinness as white women, have extremely rare cases of AN and less frequent cases of BN than white women. In contrast, BED and other forms

Table 10.2 Annual incidence (new case rate) for anorexia nervosa and bulimia nervosa per year per 100,000 people in the population (© M.M. Fichter)

Authors	Region	Source	Time period (Year)	Age group	Total	Men	Women
a) Anorexia Nervosa							
Theander (1970)	Southern Sweden	Hospital archive	1931–1940	All	—	—	0.10
			1941–1950	All	—	—	0.20
			1951–1960	All	—	—	0.45
Jones et al. (1980)	Monroe County (USA)	Case registry + hospital archive	1960–1969	All	0.35	0.20	0.49
			1970–1976	All	0.64	0.09	1.16
Møller-Madsen and Nystrup (1992)	Denmark	Case registry	1970	15–24	0.42	3.37	
			1980	15–24	1.36	11.96	
			1989	15–24	1.17	8.97	
Lucas et al. (1999)	Rochester, MN	Hospital archive	1935–1949	All	9.10	3.40	15.00
			1950–1959	All	4.30	0.80	7.60
			1960–1969	All	7.00	1.20	12.80
			1970–1979	All	7.90	1.40	14.50
			1980–1989	All	12.00	1.20	22.90
Martz (2001)	Zurich (CH)	Hospital archive	1963–1965	12–25	0.55		6.76
Milos et al. (2004)	Zurich (CH)	Hospital archive	1973–1975	12–25	1.12		16.75
	Zurich (CH)	Hospital archive	1983–1985	12–25	1.43		16.44
	Zurich (CH)	Hospital archive	1993–1995	12–25	1.17		19.72
Currin et al. (2005)	England, Wales	General practitioner (GP)	2000	All	4.70	0.70	8.60
Van Son et al. (2006)	Netherlands	General Practitioner (GP) Registry	1985–1989	All	—	—	13.40
			1995–1999	All	—	—	15.00
				15–19	—	—	109.20
Keski-Rahkonen et al. (2007)	Finland	Twin Registry	Born 1975–1979	15–19	—	Narrow diagnosis	270.00
					—	Broad diagnosis	490.00
Micali et al. (2003)	United Kingdom	General Practitioner Registry	2000–2009	10–49	7.9	1.3	13.60
Reas and Rø (2018)	Norway	National Patient Registry	2010–2016	10–49	18.8–20.4	—	36.3–42.3

(continued)

Table 10.2 (continued)

Authors	Region	Source	Time period (Year)	Age group	Total	Men	Women
b) Bulimia Nervosa							
Currin et al. (2005)	England, Wales	General Practitioner (GP)	2000	All	6.60	0.70	12.40
Van Son et al. (2006)	Netherlands	General Practitioner (GP) Registry	1985–1989	All	–	–	16.60
				15–19	–	–	29.80
			1995–1999	All	–	–	11.80
				15–19	–	–	41.00
Keski-Rahkonen et al. (2007)	Finland	Twin registry	Born 1975–1979	15–19	–	Dg. narrow	200.00
Isomaa et al. (2009)	Finland	Twin registry		21–27	–	Dg. broad	300.00
Micali et al. (2003)	United Kingdom	General practitioner registry	2000–2009	15–18	–	Dg. broad	438.00
				10–49	11.8	1.6	20.70

Dg. = Diagnosis

of binge eating are equally prevalent among black and white women. At-risk individuals are adolescent girls and young white women in western industrialized countries who were overly adapted in their childhood and could not develop a positive self-esteem. They are therefore susceptible to societal norms and are more likely to succumb to the pressure for thinness. They go on diets, try other ways to lose weight, and may eventually develop an eating disorder.

There are specific groups that have been shown to have an even higher risk of developing an eating disorder. People who engage in excessive sports or even competitive sports, and those who practice classical ballet, are likely to have an increased risk of developing AN due to the greater focus on their bodies. Sports and ballet dancing require a high level of physical fitness, slimness, and body control. Jockeys have an increased risk because they want to stay light and often fasted during adolescence to prevent further growth in size and weight. Wrestlers and boxers are divided into weight classes and often try to starve themselves down to a lower weight class before competitions, which leads to increased rates of eating disorders.

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Course and Prognosis of Anorexia Nervosa

11

Stephan Zipfel, Bernd Löwe and Wolfgang Herzog

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Anorexia nervosa (AN) has not lost its fascination since the early case studies by Richard Morton and the subsequent detailed initial descriptions in 1873/74 by the then famous British physician Sir William Gull and the no less well-known Frenchman Charles Lasègue. However, the two initial describers already disagreed in their assessment of the course of the disease. While the British Gull reached a rather optimistic assessment for the majority of

patients, Lasègue, on the other hand, already held the opinion that in the case of a clinical picture persisting for several weeks, the course often ended chronically.

Even today, a partly heterogeneous picture emerges in the evaluation and assessment of the course of AN. This is due, among other things, to the fact that previous studies on the long-term course of AN often show common methodological weaknesses. These points of criticism can be summarized as follows:

- Bias due to preselection of the sample
- Application of non-standardized diagnostic criteria
- Lack of explicit outcome criteria
- Lack of consensus on outcome criteria
- Insufficient research design or retrospective studies
- High refusal rate
- Indirect follow-up methods
- Lack of sufficient information between measurement points
- Lack of consideration of previous therapeutic interventions

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11.1 Results of the Research on the Course of AN

In the past 100 years, more than 300 studies have been conducted on the medium and long-term course of AN. These range from case-by-case descriptions to multicenter studies. A common characteristic of all studies in patients with AN is the wide range of disease spectrum in the long-term course. Steinhausen (2002) summarized 119 studies on the course of AN from the second half of the 20th century. These included as many as 5590 patients. Only one study exclusively covered the course of male patients with AN, otherwise the majority of patients—as expected—were female. In this review, the patients with AN were divided into two groups: One group was younger than 17 years at the onset of the disease, the second group included a mixed group of younger and older patients. The follow-up duration ranged from less than one year to a maximum of 29 years. In general, the author criticized the lack of control conditions and an insufficient description of therapeutic interventions. For the surviving patients, the course was mostly divided into the following three categories: a) global assessment, b) normalization of the core symptoms of the eating disorder, c) psychiatric comorbidity. With regard to the overall outcome, the distribution shown in Fig. 11.1 was obtained.

A comparatively large number of studies used the Morgan and Russell criteria, although other outcome parameters were also used in some cases. Due to the heterogeneous sample sizes for the individual parameters, the percentages do not add up to 100%. The following

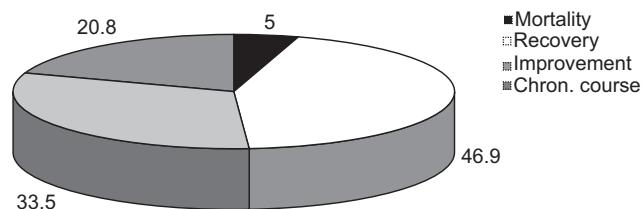
parameters had an influence on the overall result:

- Dropout rate
- Age at onset of illness
- Duration of the follow-up study
- Time period from which the study originated

For the core symptoms of AN, a slightly more favorable picture emerged, with weight normalization in 59.6% of patients with AN, on average 57% experienced a regular menstruation again, and 46.8% of patients with AN showed a normalization of eating behavior. In general, the group of patients who first fell ill before the age of 17 had a better course than the older comparison group on average. This group effect was detectable in all course categories. However, it should be noted that a prepubertal onset of AN is associated with a very poor course.

As Fig. 11.2 shows, about a quarter of AN patients suffered from affective disorders and anxiety disorders during the course of the disease. Obsessive-compulsive disorders and substance abuse also frequently occurred as additional comorbid mental disorders. If all forms of personality disorders, assessed according to DSM-III, are added up, more than 60% of the AN patients examined show a severe psychiatric comorbidity with accompanying personality disorders. Steinhausen (2002) also emphasizes that there is a large overlap between eating disorder pathology and psychiatric comorbidity during the course of the disease. However, this study does not provide any indication of the direction of the interaction between the two factors.

Fig. 11.1 Long-term course of anorexia nervosa—the percentages refer to different sample sizes; black mortality, white recovery, light gray improvement, dark gray chronic course. (Data from Steinhausen 2002)



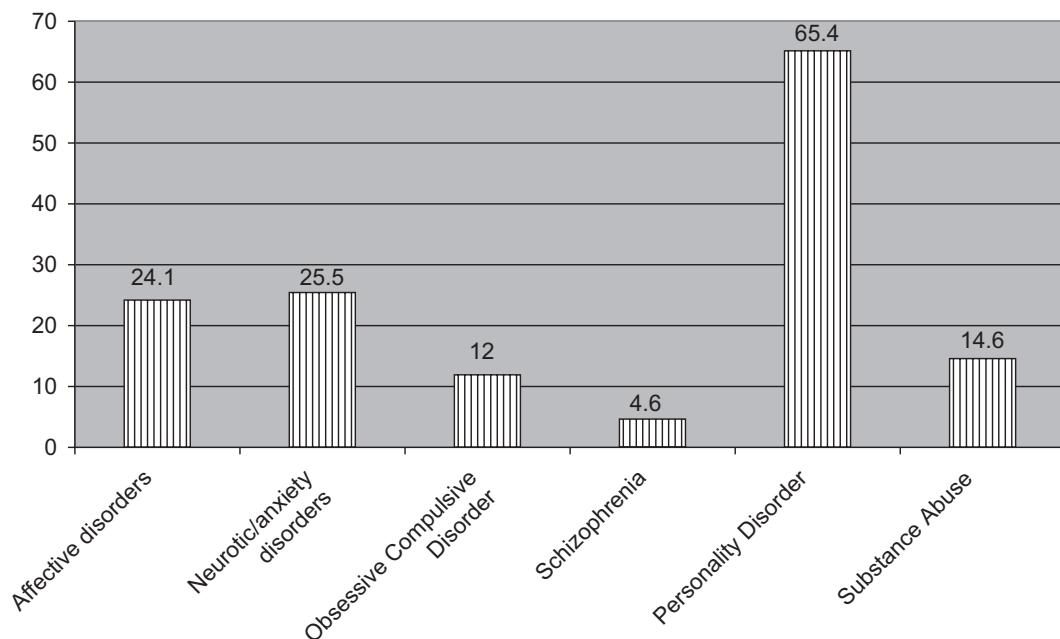


Fig. 11.2 Psychiatric comorbidity in the course of anorexia nervosa. The percentages refer to different sample sizes. (Data from Steinhausen 2002)

When examining the course and prognosis, the initial question is about compelling indicators that are relevant for the decision for inpatient treatment. In a review article (Zipfel et al. 2015), we identified three relevant areas: a) the current weight and weight course (e.g., weight < 14 kg/m²), b) the medical status (e.g., cardiac and electrolyte status), and c) other indicators (e.g., severity of eating-related symptoms and psychiatric comorbidity). Looking first at the inpatient area, Fichter and Quadflieg (1999) found in their 6-year follow-up study of women with AN that 55.4% of patients were completely recovered. The same working group examined the comparison of men and women with AN after an initial inpatient treatment. In the initial group of male AN patients, 40% showed a clinical underweight and 2% showed obesity almost 6 years after inpatient treatment. Compared to the matched female AN patients, the men gained more weight and scored lower in eating disorder-specific and general psychopathology. However, the

overall remission rates of male and female AN patients did not differ from each other (40 vs. 41%) (Strobel et al. 2019). Our own long-term study with a follow-up interval of 21 years showed a permanent recovery in just over 50%. Approximately another quarter of the total group had an intermediate or poor course (Zipfel et al. 2000). However, both the working groups of Herzog et al. (1997) and those of Strober et al. (1997) were able to independently demonstrate for German and US-American patient groups that it takes an average of 5–6 years until the first complete remission.

In the ANTOP study (Zipfel et al. 2014), the world's largest outpatient therapy study for adult patients with AN conducted in Germany, two of the currently recommended (Treasure et al. 2020) specific psychotherapy methods (focal psychodynamic psychotherapy [FPT] vs. enhanced cognitive-behavioral therapy [CBT-E]) were compared. Although no superiority was shown for either method, the good news from this study was that the majority of AN

patients continued to gain weight even in the year after the therapies that were limited to 40 sessions. The strongest predictor for a higher BMI and complete recovery one year after the end of therapy was primarily a higher starting weight. Negative predictors were an initial duration of the disease longer than six years as a sign of an already chronic course and the presence of a diagnosed depression before the start of treatment (Wild et al. 2016). A further analysis showed that, regardless of the therapy form applied, therapists should particularly push for the increased expression of negative emotions during the middle phase of therapy (Friederich et al. 2017). In the process analysis of so-called “sudden gains,” i.e., a first significant weight gain, we were able to show in the ANTOP study for both therapy directions that a total of 65.9% of AN patients showed such a sudden-gain weight gain and that the presence of such events was associated with a better short- and medium-term outcome. Moreover, we were able to demonstrate that those patients who showed these phases in earlier stages of therapy had a better overall course (Brockmeyer et al. 2019). We were also able to show that both innovative manualized therapy forms (CBT-E and FPT) were cost-efficient (Egger et al. 2016).

► **Important** The data on the long-term course of anorexia nervosa can thus be summarized as follows: The good news is that about half of the patients achieve complete recovery. The bad news, however, is that in the other half of cases, a chronic course with significant morbidity and mortality occurs.

11.2 Mortality

In the study by Steinhausen cited above (2002), a total of 5% of patients died as a result of AN. In the differentiated evaluation, however, it was shown that mortality in studies with a follow-up period of more than 10 years increased to 9.4%.

In our own 21-year follow-up, 16.7% of patients died between the ages of 20 and 40 as a direct result of AN. In international comparison, mortality rates for AN range between 0.5 and 1% per year of illness. Converted to the general population, this means a standardized mortality rate increased by a factor of 5–10. The most common causes of death are infections with lethal sepsis, electrolyte imbalances with subsequent cardiovascular failure, and suicide (Zipfel et al. 2015).

A recent study from Sweden showed a significantly reduced mortality rate for a Swedish cohort of adolescent patients with AN from the years 1987–1991 compared to a cohort from the years 1968–1977 (Lindblad et al. 2006). The authors concluded that the relative risk of dying in the older group was 3.7 times higher than in the more recent cohort. This is despite the fact that general mortality among people with mental illnesses in Sweden remained the same over both survey periods. The authors infer from this that the significant decrease in mortality is likely the result of specialized treatment implemented in the meantime.

The working group around Arcelus (2011) summarized data from 36 quantitative follow-up studies. For AN, these studies yielded the following outcome during a total of 166,642 person-years: The weighted mortality rate for AN (deaths per 1000 person-years) was 5.1, while the standardized mortality rate was 5.9. One in five deceased AN patients died as a result of suicide. Van Hoeken and Hoek (2020) pointed out that mortality rates in combined studies, which examined data from both primary and secondary medical care, showed a halving of mortality rates. However, these authors added that patients with AN, in particular, have a 9.4 times higher rate of “years lived with disability” (YLDs) compared to their healthy age group.

► **Important** Patients with AN, along with those with addiction disorders, have the highest mortality rate among mental illnesses.

11.3 Prognostic Indicators for a Poor Course

Although sufficient weight restoration can now be achieved in most patients undergoing intensified treatment, studies indicate relapse rates of up to 42%. Based on different definitions of relapse and varying lengths of observation intervals, previous studies have shown that the highest risk of relapse occurs during the first year after inpatient treatment. Across all previous studies, the average relapse rate was approximately 30%.

Herzog et al. (1997) report that a shorter duration of illness, younger age, and less pronounced purging behavior are associated with a lower relapse rate. Strober and colleagues (1997) identified AN patients with a compulsion for excessive sports and exercise behavior as a risk group for relapse. In the sample of patients with AN examined by Carter et al. (2004), patients with AN with a history of past suicide attempts, more frequent specialized treatments for eating disorders, and increased obsessive-compulsive symptoms were also at increased risk for relapse.

► **Important** Up to 30% of patients with AN experience a relapse in the first year after inpatient treatment.

A focus of follow-up studies revolves around the question of how individual risk groups or high-risk patients can be identified early on. Despite the problem of a multifactorial and complex genesis of AN, the following course predictors have been identified so far:

Predictors of a poor course were found to be low weight before therapy onset (especially a BMI < 13) and at the end of therapy (BMI < 15.5) (Hebebrand et al. 1997). Also predictive of a poor outcome were a long duration of illness before therapy initiation and the presence of an additional mental disorder. The bulimic subtype was associated with a 2.5-fold increased risk for a poor course. Conversely, an early onset of illness, a good parent-child relationship, and good

social integration were indicators of a good course. Franko et al. (2013) demonstrated in their large 20-year follow-up study with a mean standardized mortality rate (SMR) of 4.4 that the highest risk of early death occurred within the first ten years of illness (SMR 7.7). Prognostic indicators for increased mortality in this study were a long duration of illness, substance abuse, low weight, and a reduced psychosocial functioning level. The authors concluded that early identification and treatment of those suffering from AN is necessary.

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Course of Bulimia Nervosa and Binge-Eating Disorder

Norbert Quadflieg and Manfred Fichter

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12.1 Diagnosis

Bulimia nervosa (BN) has been described as a clinical picture since 1979, with more intensive research on its course beginning in the last 30 years. Accordingly, there is a larger number of findings on the short- to medium-term course, but few on the long-term course of BN. Most insights have been gained from samples that underwent outpatient, and more rarely, inpatient therapy. Only very few studies obtained data

from individuals who had not undergone therapy for their eating disorder.

Much less is known about the course of binge-eating disorder (BED). Patients with binge-eating episodes without inappropriate compensatory behaviors were classified in earlier versions of the criteria-based diagnostic systems in the category of unspecified or atypical eating disorders, along with a number of other atypical variants of eating disorders, and were mostly ignored by research. In the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders published in 2013 by the American Psychiatric Association (DSM-5), BED is classified as an independent diagnosis alongside anorexia nervosa and bulimia nervosa. The ICD-11 has also adopted this classification. In the DSM-5, the diagnostic criterion for the frequency of binge-eating episodes and—for BN—the compensatory behaviors was lowered to at least once per week. This means that more cases, which were previously considered as unspecified eating disorders, fall into these main diagnostic categories. Most

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research findings refer to the stricter definition of the 4th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; binge-eating episodes and compensatory behaviors at least twice per week).

Regarding BED, the study findings are still insufficient. There are a number of studies that have mostly recruited individuals with overweight for a weight loss program with psychotherapy and have followed up small samples for up to twelve months after therapy. For the longer-term course, there is one study on the 3-year and one study on the 6-year course in outpatients, as well as one study on the 5-year course in the general population and one study on the 12-year course in inpatients. Although BED is more frequently observed in men than other eating disorders, most published studies are based on samples of women. Almost nothing is known about prognostic factors in BED.

► **Important** Most studies on bulimic eating disorders focus on women.

12.2 Course of Eating Disorder Symptoms

12.2.1 Remission and Recovery

In the short-term course, which is usually associated with an initial measurement during a

therapeutic intervention, patients with BN show remission in about 30–50% of cases after 6–12 months (Fig. 12.1).

Remission rates of about 50% are also observed in the medium-term course over 2 to more than 5 years, with findings varying widely from 13–74%. The percentage of remitted cases correlates moderately ($r = 0.20\text{--}0.30$) with the time elapsed since the initial measurement. In the long term (9–12 years), about 70% of cases with BN were found to be in remission in several studies. A small study found that 16 out of 21 patients (76%) were in remission after 20 years. Improvements in symptoms are usually associated with long-lasting intensive therapy. Temporal stability of symptom improvement in BN is observed only after 5–6 years. A larger study on the course of BN in men 7.5 years after inpatient treatment found a remission rate of 44%.

For BED, higher remission rates are found in the first year after therapy (about 50%; values range from 30–93% in small sample sizes). Little is known about the medium- and long-term course. In outpatients, remission rates of 32% after 3 years and 59% after 6 years were observed (each in one study). In inpatients (one study), 80% were in remission 6 years after therapy and 70% 12 years after therapy. A small study from the general population confirms this trend, with 76% remission after 5 years. Despite the very optimistic results in the first year after BED therapy, long-term remission rates for

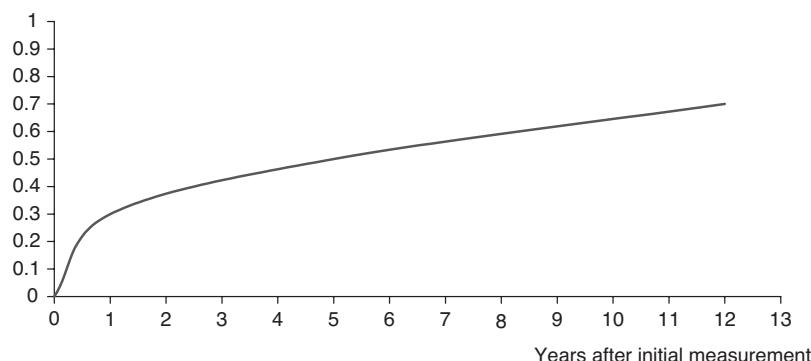


Fig. 12.1 Schematic representation of remission in bulimia nervosa in women. The curve represents a simplified, idealized course of remission rates in BN—often accompanied by intensive therapy—based on current knowledge

both bulimic eating disorders are comparable 12 years after inpatient treatment (70% for BN and 67% for BED). In outpatients, there is evidence that remission rates are higher for BED than for BN in the medium term.

Remission

In research on the course of bulimic eating disorders, remission is generally defined as the absence of binge eating and inappropriate compensatory behavior. Cognitive aspects such as constant thoughts about food, nutrition, and calories are given little consideration. A common definition for remission is the absence of an eating disorder diagnosis, including unspecified or atypical eating disorders. In the case of BED, remission does not include the restitution of normal weight, but the term usually refers to the absence of binge eating.

Even in remitted cases of bulimic eating disorders, elevated values regarding the thinness ideal and the relevance of weight for self-esteem and well-being are still found after many years compared to healthy controls who have never had an eating disorder.

12.2.2 Relapse and Chronicity

Many patients with BN end the index treatment with still existing serious eating disorder symptoms. Even in the long term, these patients maintain pathological eating patterns and cognitive thought patterns, which in about 15–20% of cases justify the diagnosis of an unspecified or atypical eating disorder even after more than 10 years. A relapse into a new phase of BN occurs in about 30% of patients within the time up to 6 years after the index treatment. The relapse rates decrease over time and are about 20% 6–9 years after treatment and about 10–15% after approximately 12 years. Since most studies only report

cross-sectional results, a meaningful distinction between a chronic course without longer-lasting remission and clearly defined relapse episodes cannot be made.

For BED, relapse or chronicity rates of 43%, 14%, and more than 11% after one year are reported by one study each. After 6–12 years, 6–12% still or again suffer from BED. An unspecified or atypical eating disorder was found in 27% after one year and in 5–13% in the long-term course (one study each).

12.2.3 Mortality

Despite the increasing number of studies on the course of BN, the number of observed deaths remains very limited, so that statements on mortality are only possible to a limited extent. The reported mortality rates vary greatly. Non-standardized mortality rates of 1.1–5.8% are reported, with longer-lasting studies after 10–12 years reporting non-standardized mortality rates of about 2.3%, but also of 0.6%. The standardized mortality rates are also very different across studies and range in meta-analyses between 0 and 20.8. This includes all known deaths within the respective follow-up period of the study. An increased mortality due to bulimic behavior has not yet been proven. There are indications of an accumulation of suicides and fatal traffic accidents, but the overall low number of reported deaths does not allow for a definitive statement. In a sample of male inpatients with BN, 11.1% had died after 9 years. The standardized mortality rate was not significant and was 1.88 (5% confidence interval 0.86–3.58).

No empirically based statement can be made about the mortality of BED; individual indications suggest a mortality comparable to BN.

Change of symptoms to another eating disorder

Up to 14% of patients with BN develop anorexia nervosa (AN) in the further course of observation, with a small proportion showing restrictive symptoms without bulimic behaviors. After

more than 10 years, about 1–2% of patients originally treated for BN have AN. The change of diagnosis from BN to BED also seems to range in this order of magnitude in the long term.

Evidence for the diagnostic change of BED is extremely scarce. The change from BED to AN is reported only in very few individual cases. One large study found no change of diagnosis from BED to AN over 12 years. About 3–10% of patients with BED show BN in the long term.

- **Important** A diagnostic change from BN and BED to AN occurs only in a few cases.

12.3 Comorbidity

Patients with BN and BED show a high degree of psychological comorbidity. This generally decreases with the eating disorder symptomatology, although the severity in general psychopathology scales remains higher than in healthy control subjects. A small proportion of patients fall into chronic alcoholism or remain in a lifestyle characterized by anxiety and avoidance of social contacts.

12.4 Social Factors

The evidence base for the aspect of social factors is generally weak. In general, an improvement in eating disorder symptoms is accompanied by an improvement in patients' social functioning. In the long term, patients with BN show significant improvements in social integration, work capacity, leisure activities, and relationships with more distant relatives and acquaintances, but less so with their—if present—partner, parents, and close family. Some findings suggest that a significant proportion of patients with BN continue to have significant limitations in leisure activities and friendships (52% had a good outcome after 6 years, 22% a moderate, and 26% a poor outcome). Regarding a satisfying sex life, the results were even worse

(40% good, 18% moderate, and 42% poor). Even after 12 years, even remitted patients with BN still show higher impairments in social integration and sexuality than healthy control persons. Nevertheless, about 75–80% of patients with BN marry during the observation period of the few studies, with almost half of these marriages ending in separation or divorce. The few available data suggest that there is no difference between remitted and non-remitting patients. About three-quarters of female patients with BN become pregnant at least once within 12 years of the initial measurement. 83–98% of women have their menstrual period after 11–12 years.

In the case of BED, social integration improves at the earliest 3 years after index treatment, while sexuality often remains impaired in the long term. However, this may also be related to body weight, as almost all patients with BED remain in the weight category (obese, overweight, or normal weight) they were in before treatment, despite weight loss programs.

12.5 Prognosis

A large number of prognostic factors have been studied for BN, with only the most important ones being mentioned here. For BED, prognostic factors for the course have hardly been studied at all, and in the following, only statements in the sections on severity of eating disorder and comorbidity are possible.

12.5.1 Age and Duration of Illness

The age at the beginning of the study (usually the beginning of a treatment episode) is a little-researched factor and seems to play no role in the course of BN. Although the age at the onset of BN is better studied, the evidence here is contradictory and unclear. There are some indications that an earlier onset of the eating disorder may lead to a better course. The results on prognosis by duration of illness also do not allow for a clear conclusion. However, it seems that a short duration of illness—and thus early

intervention in the disorder process—helps to improve the course of BN, with the narrow empirical basis being emphasized once again.

12.5.2 Severity of Eating Disorder and Treatment

BN patients with a high severity of eating disorder, expressed in a high frequency of binge eating and vomiting, have a poorer prognosis. However, there are also studies that do not confirm this. There are also no findings that an intensive, often long-lasting therapy would not be successful. A diagnosis of AN in the history of BN is not relevant for the prognosis, but a low body weight is a predictor for a poor outcome. Strongly pronounced eating rituals and compulsive preoccupation with food increase the likelihood of relapse in BN. Recently, the difference between the highest reported weight of the patient over their adult lifetime and the weight at the beginning of treatment (“weight suppression”) has been considered as a risk factor, with the assumption that a higher difference has a negative impact on the prognosis. The few findings for BN in this regard suggest that high “weight suppression” is associated with more binge eating and compensatory behaviors, as well as higher weight gain and longer time to remission. The weight difference does not seem to play a role in therapy adherence and ultimate therapy success (also in a study on BED).

In the case of BED, obesity is a predictor for a less favorable course.

12.5.3 Comorbidity

The empirical findings on the prognostic contribution of Axis-I comorbidity in BN are not clear, but some conclusions can be drawn. In a series of studies, individual disorder groups such as depression, substance use disorder (including alcohol), or anxiety disorders were investigated. The results are contradictory, but no study found evidence for Axis-I comorbidity as a predictor of a favorable course of BN. Either depression,

substance abuse or dependence, and suicidality were a negative or no predictor; the findings on anxiety disorders are based on a still insufficient empirical basis. If the various disorder groups are combined into a variable that only provides information on the presence of any Axis-I disorder, more meaningful prognosis models can be created. In one study—and thus representing a narrow empirical basis—comorbidity in this sense was identified as a strong predictor of an unfavorable course of BN after 2, 6 and 12 years.

There is also very little empirical evidence for the influence of personality disorders (Axis-II disorders) on the course of BN. There are indications that the presence of a borderline personality disorder or a Cluster-B personality disorder (which includes borderline personality disorder) is a negative predictor.

In BED, findings from one study show Cluster-B personality disorders as a predictor of an unfavorable course.

► **Important Psychiatric comorbidity worsens the prognosis of bulimic eating disorders.**

12.5.4 Personality Traits

Two personality traits that have been better studied in BN are self-esteem and impulsivity. Low self-esteem, especially when accompanied by perfectionism, is associated with an unfavorable prognosis. Impulsivity and impulsive behaviors, including self-harming behavior, are also predictors of a poor course of BN.

12.5.5 Family of Origin Characteristics

Although an association between the patient's illness and certain characteristics of their family of origin seems theoretically plausible, no such association can be demonstrated for BN. The presence of alcohol abuse in the family of origin has been identified as a positive, negative, or no predictor for the course of BN. The fact that a close relative was in psychiatric treatment has no prognostic value. The presence of depression in the family

of origin is either no predictor or a predictor of a poor course. Summing up the few findings, it can be stated that mental health problems in close relatives do not imply a poor prognosis. The limited research on the role of the environment in the family of origin has so far provided no tangible evidence of the relevance of this aspect for the prognosis of BN. The same applies to the socio-economic status of the family of origin.

Conclusion

- BN and BED show a very similar long-term course and outcome, even though the short-term course of BED is somewhat better.
- In the long term, about 70% of BN and BED patients remit.
- Approximately 15% of patients retain a treatment-requiring eating disorder even after more than 10 years.
- The presence of other mental disorders worsens the prognosis.
- As far as is known, the course of BN and BED in men does not differ much from that in women.

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Course and Prognosis of Binge Eating Disorder

13

Kathrin Schag

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13.1 Introduction

Binge eating disorder (BED) has only recently been recognized as an official diagnosis and included in the ICD-11 (Claudino et al. 2019) and DSM-5 2013 (Association 2013). Therefore, there are only a few studies on the course of BED, especially on the long-term course and prognosis. The reported statistics, e.g., for prevalence, vary widely across individual studies depending on the sample studied. Moreover, many of the research findings still refer to the research criteria for BED according to DSM-IV,

where at least two binge eating episodes per week over a period of six months were required for the diagnosis. The frequency of binge eating episodes required to meet the diagnosis was reduced to once weekly within three months in DSM-5 and ICD-11. In addition, many of the studies were conducted in samples of individuals with overweight or obesity, although body mass index (BMI) is not a diagnostic criterion for BED. Therefore, the previously collected data on the course and prognosis of BED may be biased towards more severely affected patients.

13.2 Onset

With a lifetime prevalence of 1–2%, BED is the most common eating disorder according to some large-scale studies (Keski-Rahkonen and

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Mustelin 2016; Kessler et al. 2013; Udo and Grilo 2018). BED typically begins in late adolescence and early adulthood with an average age of 23–24 years (Kessler et al. 2013; Udo and Grilo 2018). Thus, BED occurs on average later than anorexia nervosa (AN) and bulimia nervosa (BN).

However, BED also occurs in childhood and adolescence, with an assumed lifetime prevalence of 1–3% (Bohon 2019). The term “loss of control Eating” is often used in this context, as it is particularly about the experienced loss of control during eating in children and the amount of food consumed is less relevant or difficult to quantify (Bohon 2019; Hilbert et al. 2018). Therefore, a modification of the diagnostic criteria for BED in children and adolescents is currently being discussed (Bohon 2019; Hilbert et al. 2018). So far, there is very little research on the course and prognosis in children.

13.3 Distribution

Approximately three times as many women as men are affected by BED (Keski-Rahkonen and Mustelin 2016; Kessler et al. 2013; Udo and Grilo 2018). However, compared to other eating disorders, more men are affected by BED (Hilbert et al. 2018). Men show a less pronounced eating disorder pathology (Lydecker et al. 2020). However, gender does not seem to have a significant effect on the course of treatment, although male patients seem to lose more weight during therapy (Lydecker et al. 2020).

In addition, there may be cultural differences, but the data on this are still weak and heterogeneous (Agh et al. 2015). For example, there are inconsistent results regarding the question of whether ethnic minorities are more frequently, equally often, or less frequently affected (Agh et al. 2015; Udo and Grilo 2018). The prevalence rate for BED in the USA is slightly higher than in Germany (Kessler et al. 2013). The differences may be related to different eating cultures in the respective countries.

Furthermore, patients with obesity or diabetes type II show an increased risk for BED. A threefold increased risk for BED with prevalence rates of 20–30% is reported for individuals with obesity (Agh et al. 2015; Hilbert et al. 2018).

13.4 Comorbidity—Quality of Life—Level of Functioning

Although overweight and obesity are not a necessary criterion for a diagnosis of BED according to DSM-5 (Association 2013) and ICD-11 (Claudino et al. 2019), they occur significantly more frequently in comparison to the general population (Kessler et al. 2013). A large epidemiological study showed a mean BMI of 35 kg/m² in patients with BED (Udo and Grilo 2018). The prevalence rate for overweight in patients with BED is over 30% and for obesity even over 40% (Kessler et al. 2013). In accordance with this high prevalence of obesity, patients with BED have a twofold increased risk for chronic somatic diseases associated with obesity, such as diabetes, cardiovascular diseases, and pain disorders (Keski-Rahkonen and Mustelin 2016; Kessler et al. 2013).

Regarding mental health, patients with BED also show a significantly reduced quality of life (Agh et al. 2015) and impaired functioning (Kessler et al. 2013). This is evident to a similar extent as in other eating disorders and even more so than in individuals suffering from obesity but not from an eating disorder (Agh et al. 2015). Over 70% of patients with BED have at least one additional mental disorder (Keski-Rahkonen and Mustelin 2016; Kessler et al. 2013). These are mostly affective disorders or anxiety disorders (Keski-Rahkonen and Mustelin 2016; Welch et al. 2016). Disorders associated with increased impulsivity, such as attention-deficit/hyperactivity disorder, substance abuse, self-harm, and suicidality, are also more common in patients with BED (Keski-Rahkonen and Mustelin 2016; Welch et al. 2016).

13.5 Disorder Duration

Recent studies suggest that BED often has a chronic or long-lasting course: The average duration of the disorder is 14–16 years, which is longer than the duration of other eating disorders (Pope et al. 2006; Udo and Grilo 2018). Patients often retrospectively report a long-lasting phase beyond middle age, rather than several shorter episodes (Pope et al. 2006). Earlier studies may have underestimated the risk of chronicity, as they report shorter courses with stronger fluctuations in intensity and more spontaneous remissions (Hilbert et al. 2018).

13.6 Course of Treatment

Less than 50% of those affected seek treatment (Hilbert et al. 2018; Kessler et al. 2013), possibly due to a lack of awareness in society. However, with adequate treatment of BED, i.e., psychotherapy, as recommended by the current S3 guideline (Hilbert et al. 2018), significant and lasting improvements are seen regarding binge eating episodes, diagnostic assignment,

and eating disorder pathology (Brownley et al. 2016; Hilbert et al. 2019). Thus, 50% of those affected achieve abstinence after psychotherapy (Linardon 2018). Pharmacological interventions also lead to symptom improvements (Brownley et al. 2016), but these are usually inferior to treatment with psychotherapy (Hilbert et al. 2018).

The long-term course after psychotherapeutic treatment of BED has so far been little studied, and the recorded parameters vary. An overview of various relevant studies can be found in Table 13.1. A description of the different terminology used can be found in the infobox. For example, the remission rate of patients with BED after inpatient treatment increased to 67% twelve years after treatment (Fichter et al. 2008). Several years after outpatient psychotherapy, two-thirds of patients also showed remission (Castellini et al. 2011; Fischer et al. 2014; Hilbert et al. 2012). In addition to improvements in eating disorder pathology, these studies also showed a reduction in general psychopathology (Fichter et al. 2008; Hilbert et al. 2012). However, in almost a third of cases, only partial remission can be achieved, patients change to a

Table 13.1 Long-term course of BED after psychotherapy

	Setting	Remission	BED	Transmission/Partial remission	Relapse	Mortality
Fichter et al. (2008)	12 years after inpatient psychotherapy N = 68	67.2 %	7.8 % (relapse or chronic)	9.4 % BN, 12.5 % EDNOS		3.1 %
Hilbert et al. (2012)	4 years after outpatient psychotherapy (CBT vs. IPT) N = 90	Remission: CBT 72.0 % IPT 83.9 % Abstinence: CBT 52.0 % (27.3 % ongoing) IPT 76.7 % (22.2 % ongoing)	Chronic: CBT 12.0 % IPT 9.4 %	Further symptoms: CBT 24 % IPT 13.3 %	CBT 24 % IPT 10 %	
Fischer et al. (2014)	4 years after CBT N = 41	67 %	4.2 %			
Castellini et al. (2011)	6 years after CBT N = 262	63.8 %		7.1 % BN	11.4 %	

BN, Bulimia nervosa; BED, Binge Eating Disorder; EDNOS, Eating Disorder Not Otherwise Specified; IPT, Interpersonal Psychotherapy; CBT, Cognitive Behavioral Therapy

different diagnostic category, or the clinical picture becomes chronic (Fichter et al. 2008). The relapse rate is also considered high, at 10–24% in the long-term course (Castellini et al. 2011; Hilbert et al. 2012).

Infobox for distinguishing different terminologies

- *Abstinence*: No binge eating episodes occur within a certain period (usually four weeks).
- *Remission*: The criteria for BED are no longer met.
 - A distinction must be made between *partial remission* and *full remission* (Hilbert et al. 2018, p. 297): “If the number of binge eating episodes met the diagnostic criterion at an earlier time (at least one binge eating episode per week for three months), but there are fewer binge eating episodes at the current time, DSM-5 refers to a partially remitted BED. If all diagnostic criteria were met at an earlier time and are no longer present, a fully remitted BED is referred to.”
 - Furthermore, it should be considered that patients with partial remission often receive the diagnosis *EDNOS* (“*Eating Disorder Not Otherwise Specified*”), making it difficult to distinguish between partial remission and other EDNOS.
- *Transmission*: A transmission occurs when a patient’s diagnosis category changes from BED to another eating disorder category (AN, BN, EDNOS).
- *Relapse*: The diagnosis of BED has reoccurred after remission.

These studies show that psychotherapy is effective in addressing the core pathology of BED. However, half of those affected still suffer from (sub)clinical symptoms (Linardon 2018).

Therefore, treatment methods need to be further developed. For example, a therapy that more strongly targets the triggering and maintaining factors is useful. Moreover, weight is hardly improved immediately after psychotherapy (Hilbert et al. 2018), and in the long term, no more than a 5% reduction in BMI can be expected (Fichter et al. 2008).

13.7 Change of Eating Disorder Diagnosis

Little is known so far about the transmission from BED to other eating disorders (see Table 13.1). Overall, frequent changes between individual eating disorder categories are assumed. Williamson and colleagues (Wonderlich et al. 2007) postulate in their transdiagnostic model that eating disorders with binge eating episodes, in particular, can be assigned to one entity. A large-scale epidemiological study in the USA confirmed this by observing that most changes occur between BN and BED (Udo and Grilo 2018). Welch and colleagues (2016) also reported in a large-scale study in the Swedish disease registry of a significant number of changes in the diagnostic category from BED to other eating disorders (16%), mainly to BN and EDNOS. Changes from BED to AN are hardly known so far.

13.8 Mortality

Initial results indicate a significantly increased suicide rate among patients with BED (Welch et al. 2016). Fichter and colleagues (2008) report a mortality rate of 3% or a 1.5-fold increased risk. In addition, patients with BED show an increased prevalence of suicidal thoughts (27.5%) and suicide attempts (12.5%) (Carano et al. 2012). Furthermore, the increased mortality risk associated with obesity and its related diseases should also be considered due to the high proportion of patients with BED.

13.9 Prognosis: What Promotes and What Hinders a Positive Course?

There is little evidence to date on the prognosis and possible influencing factors, particularly on the natural course of BED. For example, according to a prospective study by Rohde and colleagues (2015), dissatisfaction with one's body during adolescence is associated with the development of an eating disorder four years later. Body dissatisfaction also appears to be an important predictor for the course of therapy (Fichter et al. 2008). In contrast, there are conflicting data on the age of onset: Kessler and colleagues (2013) report in their large epidemiological study that an early age of onset leads to a favorable prognosis in the natural course, while other studies see a worse prognosis for the course of therapy (e.g., Castellini et al. 2011).

Specifically, regarding predictors for the course of therapy in BED, it can be assumed that, as with other mental disorders, milder courses and faster remission are achieved the milder the severity of BED and the lower the general psychopathology (Fichter et al. 2008). With regard to general psychopathology, psychiatric comorbidities, especially depression, but also certain personality traits such as increased impulsivity and negative emotions, impede the prognosis (Castellini et al. 2011; Fichter et al. 2008; Peterson et al. 2005). Interpersonal problems (Hilbert et al. 2007) and sexual abuse (Fichter et al. 2008) also hinder a favorable outcome of therapy.

However, the extent of eating disorder pathology appears to be more important than general psychopathology for therapy success regarding BED (Hilbert et al. 2018). In various studies, the number of binge eating episodes, emotional eating, and weight and shape concerns, in particular, were predictors of an unfavorable course of therapy (Castellini et al. 2011; Fischer et al. 2014). A particularly important factor regarding the course of therapy is the so-called "rapid response." This means that patients who respond

quickly to therapy generally show the greatest and most sustainable therapy successes (Linardon et al. 2016; Nazar et al. 2017).

Overall, the prognosis of untreated BED is unfavorable: without treatment, a chronic or long-lasting course is often observed (see duration of illness). With adequate treatment and patient response to therapy, however, the course is somewhat more favorable than with AN and BN (Hilbert et al. 2018).

Conclusion

Binge eating disorder (BED) is the most common eating disorder, with far-reaching consequences for somatic and psychological quality of life. If left untreated, the disorder often follows a chronic or long-lasting course and is underdiagnosed. With adequate treatment in the form of psychotherapy, approximately half of those affected can achieve remission.

The prognosis is worse for patients in whom treatment does not quickly take effect, in cases of severe general psychopathology, and with strongly pronounced eating disorder symptoms.

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Anorexia Nervosa in Childhood and Adolescence

14

Beate Herpertz-Dahlmann

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14.1 Definition and Classification

Anorexia nervosa (AN) is the third most common chronic disease in female adolescents after asthma and obesity (Gonzalez et al. 2007). The classification of childhood and adolescent AN according to the ICD-11 (WHO 2018) and DSM-5 (American Psychiatric Association 2013) with their age-specific problems is presented here. The ICD-11 divides AN into two severity levels, with a BMI below the 5th percentile (significant underweight) and another threshold value below the 0.3rd percentile (dangerously low underweight). In addition to the “absolute value” for weight, rapid weight loss (more than 20% of the initial weight in six

months) is also taken into account, as long as the other criteria are met. Among the subcategories “AN in recovery with normal body weight” is a new diagnosis. In the DSM-5, the same weight threshold value (5th BMI percentile) is proposed for children and adolescents, with a deviation explicitly allowed without loss of diagnosis, if other physiological parameters are altered by starvation. A further subtyping is not carried out in DSM-5, even though a subdivision by severity is possible for adults (for an overview see Claudio et al. 2019; Gradl-Dietsch et al. 2021). In both classification systems, amenorrhea is no longer a diagnostic criterion; this is particularly important for childhood AN and the male sex.

► **Important** While the weight criterion for adults corresponds to the 10th BMI percentile, the threshold value for children and adolescents is the 5th percentile. This difference is neither clinically nor scientifically comprehensible, as the effects of chronic underweight on a growing organism can be more

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serious than in adult patients (for an overview see also Herpertz-Dahlmann and Dahmen 2019).

The BMI and BMI percentiles based on KiGGs data can be calculated online (<https://www.pedz.de/de/willkommen.html>; Option KIGGS data).

In the USA, the “% EBW” (percent expected body weight) is increasingly used to assess weight loss (Le Grange et al. 2012). The expected body weight corresponds to the 50th age- and gender-adapted BMI percentile. (Calculation: % EBW = current BMI/50th BMI percentile × 100).

Based on both classification systems, a distinction is made between the **restrictive type** and the **binge-eating/purging type** (bulimic type) of AN. In childhood and adolescence, the restrictive type is significantly predominant, but in the course of later adolescence, some patients develop the binge eating/purging type.

14.2 Epidemiology

The lifetime prevalence of AN in adolescent girls is 0.3–2% and in adolescent boys 0.1–0.3% (Keski-Rahkonen and Silen 2019). While an incidence of 20/100,000 person-years is found in 10-14-year-olds, it is 100–200/100,000 person-years in 15-19-year-olds (for an overview, see Keski-Rahkonen and Silen 2019). The first peak of AN occurs at around 14 years of age. The gender ratio in adolescence corresponds to that of adulthood and amounts to 1:10–20 (m:f).

► **Important** Recent studies have shown an increase in the incidence rate in the age group of 15-18-year-olds. 40% of all new cases of AN occur at this age.

In recent years, an increase in **childhood** AN has also been found. In Germany and the UK, a significant increase in inpatient treatments for childhood anorexia has been reported. The incidence of childhood anorexia is 1-3/100,000

same-aged peers (Nicholls et al. 2011; for an overview, see Herpertz-Dahlmann and Dahmen 2019). In childhood, the disorder rate is slightly shifted towards boys, at 1:5-6 (m:f).

14.3 Symptomatology

While in puberty, weight gain in males is primarily due to an increase in muscle mass, in girls the proportion of fat mass in total body weight increases from 17% to 24%. In addition, the fat distribution pattern changes due to the influence of sex hormones.

► **Important** Children have a significantly lower fat mass than adolescents and adults, so the physiological consequences of starvation in childhood AN are often severe.

While AN is “fulminant” (high weight loss in a very short time) in a small proportion of patients, it takes a more insidious course in the majority (see also classification according to ICD-11).

Primary Symptoms of Eating Disorders in Children and Adolescents

- Increasing interest in food composition and calorie content
- Avoidance or refusal of main meals
- Restriction to so-called “healthy” foods
- Frequent weight checks
- Dissatisfaction with one’s own appearance and figure
- Increasingly sad or depressive mood
- Excessive physical hyperactivity
- Increasing performance orientation and isolation
- Primary or secondary amenorrhea

Affected individuals first give up sweets/candy, cakes, and high-fat foods, preferring instead so-called “healthy” foods such as fruit, whole-grain bread, vegetables, and “diet” food. Many

become vegetarians, usually justifying this with sympathy for animals. Rituals during meals are typical. Some sufferers practically celebrate the consumption of a meal, decorating the table even for the smallest amounts of food, lighting a candle, etc.

In child patients, dehydration often leads to hospital admission, as they fear weight gain from fluid intake and stop drinking. Some refuse to swallow their own saliva, leading even more quickly to dehydration.

► **Important** Severe dehydration in young patients may require hospital admission.

Others fear food intake, e.g., from spreadable fats, through the skin and refuse to touch food. Many of the young patients are excessively physically active, i.e., they engage in sports to accelerate weight loss. With increasing cachexia, patients perceive restlessness as a “compulsion”; they must continue to be active despite physical exhaustion. Physical activity is not exclusively subject to cognitive control but is also influenced by hormonal regulatory mechanisms (e.g., changes in the gasteropeptide leptin).

► **Important** The younger the patients, the more difficult it is for them to access their own experiences and fears related to the illness.

The weight phobia typical for AN in later adolescence and adulthood is often not detectable in prepubertal adolescents (Becker et al. 2009). They often experience the disorder as a “foreign force” against which they cannot defend themselves. For instance, they may report that a voice commands them to reduce food intake and not to gain weight under any circumstances. However, this “inner voice” should not be confused with the symptom of “hearing voices” in a schizophrenic illness; rather, the patients perceive this voice as something of their own. The majority of adolescent patients with eating disorders become isolated during the course of the illness, neglect their hobbies, and many become more

ambitious and diligent in school. Some patients speak of a veritable work addiction.

14.4 Comorbidity and Differential Diagnosis

14.4.1 Psychological Comorbidity

Epidemiological studies show that subclinical eating disorders in adolescence are often accompanied by disturbances in self-esteem and depressive psychopathology. In the BELLA study conducted by the Robert Koch Institute, which examined 1,800 children and adolescents aged 11 to 17 years, it was observed that those with disturbed eating behavior reported significantly more frequent suicidal ideation and suicidal behavior than those without eating disorders (Herpertz-Dahlmann et al. 2008). The latest results of the study show, from a longitudinal perspective, that anxiety or depressive symptoms in childhood are significantly associated with an eating disorder in adolescence (Herpertz-Dahlmann et al. 2015).

Some adolescent patients with AN have been withdrawn and introverted since childhood and exhibit anxious-avoidant personality traits (Cardi et al. 2018). Some report that their sad mood improved at the beginning of anorexia. When assessing depressive mood, the starvation effect must be taken into account. Historically, separation anxiety can be detected in many adolescent patients with AN. Childhood anxiety disorders with “social hypersensitivity” often develop into a social phobia as a comorbid disorder of AN. Mothers of patients with AN reported significantly more pronounced sleep disorders in their daughters during early childhood, significant separation anxiety, and a significantly later age of the child at the “first sleepover away from home.” Comorbid obsessive-compulsive disorders, usually characterized by order and sorting compulsions, are also common in adolescent anorexia, with one-fifth having the onset of the obsessive-compulsive disorder in childhood before the onset of anorexia.

Conclusion

Since anorexia in child and adolescent patients appears threatening to many parents and therapists, comorbid psychological disorders—especially anxiety and obsessive-compulsive disorders—are often overlooked. Due to their importance for treatment, a diagnostic assessment of comorbid psychological disorders should be carried out at admission.

14.4.2 Somatic Comorbidity

At this point, only the complications typical for childhood and adolescent AN will be discussed.

► **Important** As a rule of thumb, the somatic changes in AN are more severe the younger the patients are and the more pronounced and rapid the weight loss is. Almost all affected individuals show a stagnation of pubertal development.

In child and adolescent patients with a chronic course, growth is impaired (Herpertz-Dahlmann et al. 2018). In some cases, growth is still completed very late after achieving normal weight; catch-up growth seems to be possible only if the disorder does not persist for too long. In addition to a restriction of growth, young patients have a high risk for the development of osteopenia or osteoporosis, which is based on reduced bone formation with increased bone resorption and is associated with an increased risk of fractures.

Particular risk factors for osteoporosis

- Onset of eating disorder in prepuberty or adolescence
- Persistent cachexia
- Long duration of amenorrhea
- Relative physical inactivity

If AN improves during the growth-active period of life, the bone structure normalizes. This process can be delayed by several years compared to age-typical girls (see Chap. 38).

The pseudoatrophia cerebri, which is also found in adults, depends, among other things, on the extent of brain volume loss and impairs concentration and memory, which puts a great strain on the patients at school. Compared to adults, adolescent patients in the acute state show stronger changes in gray matter and fluid volume (liquor); these findings may be due to the greater plasticity of the brain at this age (Seitz et al. 2018). In addition, it is still unclear which effects a long-term sexual hormone deficiency caused by AN has on brain growth. The development of certain brain structures, such as the hippocampus, shows a clear dependence to estrogen levels (Mainz et al. 2012). Further research is urgently needed to determine the extent to which chronic AN in childhood and adolescence is associated with long-term changes in brain structure and function. In chronically ill patients with AN, a volume reduction of the cerebellum is more frequently found (Seitz et al. 2018; Fonville et al. 2014).

14.5 Differential Diagnosis

The younger the girl at the onset of the disorder, the more difficult is the diagnosis. The most important psychiatric differential diagnosis is the “avoidant-restrictive food intake disorder,” known in professional circles as ARFID. In contrast to patients with AN, those with ARFID do not have body image disturbances; they are often younger, show little interest in food, or have sensory hypersensitivities during food intake, e.g., towards solid food, or in response to a mostly traumatic or unagreeable event (e.g., Bryant-Waugh 2019). In prepubertal children, we also see eating disorder syndromes in the context of anxiety and obsessive-compulsive disorders. The children fear, for example, choking, accidentally eating a dangerous or disgusting object (e.g., a fly), or becoming infected through contaminated food. This leads to the intake of only very specific foods, prepared by a known person in a familiar environment (e.g., at home). Others stop eating because they fear having to vomit in an embarrassing situation

(so-called emetophobia; Simons and Vloet 2018). Such behavior is usually observed in children who are triggered by previous experiences, e.g., in the presence of gastroesophageal reflux or another vomiting-related disease. Anorexia-like symptoms can occur in the context of conversion disorders when the affected individuals are confronted with patients with AN on the ward. In rare cases, the “pervasive refusal syndrome” must also be considered in 7- to 15-year-old girls, in which the children stop almost all actions and functions in addition to food intake, e.g., no longer speak, no longer get out of bed, and do not take care of their physical hygiene (e.g., Otasowie et al. 2020). The cause is unclear: the symptoms usually occur in girls with pre-existing other mental disorders; triggering factors can be infections or trauma. There is no evidence-based treatment. A multimodal treatment program, including intensive involvement of the parents, is usually recommended.

The differential diagnosis for somatic diseases is shown in the following overview.

Differential diagnosis of anorexia nervosa for somatic diseases in children and adolescents

- Crohn's disease
- Ulcerative colitis
- Celiac disease
- Hypothyroidism
- Diabetes mellitus
- Addison's disease
- Anterior pituitary insufficiency
- Hypothalamic tumors
- Malignant tumors
- Side effects of medications (e.g., amphetamines)

Recently, an association between the autoimmune diseases Crohn's disease, celiac disease, and diabetes mellitus and AN has been found, i.e., patients with AN have an increased risk for these diseases and vice versa (Hedman et al. 2019). As a consequence, the German

S3 guidelines for eating disorders recommend routine determination of calprotectin in stool (Crohn's disease) as well as of autoantibodies against tissue transglutaminase IgA and total IgA (celiac disease) (Herpertz et al. 2019).

14.6 Course

► **Important** The prognosis of adolescent AN is more favorable than that of adult AN.

In the majority of more recent 10-year follow-up studies of adolescent patients, no deaths were found. The mortality rate for mixed samples of adolescent and adult patients, based on a meta-analysis of 119 studies between 1953 and 1999, was 5.9%, whereas it was 1.8% in the same study for exclusively adolescent samples (Steinhausen 2002). In a recent Swedish long-term study of adolescent patients with a duration of follow-up of 30 years, almost two-thirds were without eating disorder symptoms at the follow-up time point, and there were no deaths. However, about 40% had another mental disorder at that time (Dobrescu et al. 2019).

The rehospitalization rate in adolescence is very high: A quarter to half of all adolescent patients with AN are treated as inpatients more than once. The adolescent patients of the study mentioned above suffered from an eating disorder for an average of about 10 years (Dobrescu et al. 2019).

Negative prognostic factors include

- mental illnesses of the parents,
- excessive physical hyperactivity,
- low weight gain during first hospitalization,
- longer duration of illness,
- a low BMI at admission or at discharge.

After overcoming the eating disorder, many patients suffer from other mental disorders in adulthood, particularly affective disorders, anxiety and obsessive-compulsive as well as personality disorders (see above).

There are no clear research findings regarding the success of treatment in children compared to adolescent patients. According to our own, more recent results, children show a worse outcome in terms of persistence of the eating disorder and other mental disorders. Patients with premenarchal AN have a worse outcome regarding the resumption of menstruation (Herpertz-Dahlmann et al. 2018).

► **Important** The majority of patients who suffered from AN in childhood or adolescence experience this retrospectively as a significant turning point in their lives and emphasize that the disorder deprived them of essential experiences during this period of life.

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Eating Disorders in Men

15

Barbara Mangweth-Matzek

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15.1 General Information on Anorexia Nervosa and Bulimia Nervosa in Men

Although anorexia nervosa (AN) and bulimia nervosa (BN) are considered typical female disorders, the first historical descriptions refer to male patients.

In 1689, the London physician Richard Morton described the drastic weight loss of a 16-year-old as “nervous consumption caused by sadness and anxious cares.” In 1764, Robert Whytt published a case report on a 14-year-old boy with AN, described as “nervous atrophy (...) that proceeded from an unnatural or morbid

state of the nerves, of the stomach, and intestines ...”. Robert Willan followed in 1790 with another publication titled “A Remarkable Case of Abstinence,” in which he portrayed the death of a young English man who fasted for 78 days.

Epidemiological studies confirm a gender ratio (female : male) of AN and BN of 10 : 1 and 4 : 1, respectively . The DSM-5 (Hudson et al. 2007; Jaworski et al. 2019) has opened up the diagnosis of eating disorders (especially AN) to men and women of all age groups. This has led to new research focuses and results that describe disturbed eating behavior also in middle and older age and present male-specific forms. The proportion of scientific papers on men is still very low compared to the available studies on women (Strother et al. 2012). However, clear content focuses are evident: 1) The existing data on eating disorders mainly refer to female-oriented survey instruments, which is why data on prevalence and symptom presentation in men only questionably reflect reality; 2) what is

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considered the core symptom of disturbed eating behavior in women, namely weight/fat phobia (drive for thinness), seems to often exist in combination with “drive for muscularity” in men. “Muscularity-oriented disordered eating” (Murray et al. 2019; Lavender et al. 2017) is described as a new form of eating disorder.

15.1.1 “Muscularity-Oriented Disordered Eating”

This form of disturbed eating behavior aims at a male body ideal featuring muscularity and leanness and is characterized by muscle-building sports and specific eating behavior. The dietary practice described as “bulk and cut” alternates between “bulking” as a phase of excessive protein replenishment to increase muscle mass in the body and “cutting,” the phase of restrictive eating behavior aimed at reducing body fat. In between, “cheat meals” can occur, i.e., planned or spontaneous eating phases that deviate significantly from the usual dietary regulations by consuming forbidden and unhealthy food in large quantities (1000–9000 calories). These phases resemble bulimic binge eating (Murray et al. 2019; Lavender et al. 2017; Gorrell 2019).

15.2 Onset of the Disorder

15.2.1 Risk Factor: Body Dissatisfaction

There are now clearly identified factors that, in their interaction, are discussed as putative risk factors for eating disorders. At the top of the list of psychological and behavior-specific factors is body dissatisfaction, which is associated with low self-esteem in both genders and often results in “dieting behavior,” “restrictive eating behavior,” and increased exercise. Specifically for men, dissatisfaction with one’s muscularity (= masculinity) is also described.

Risk Factor: Body dissatisfaction

- Body dissatisfaction as a trigger for the desire for body change
- Desire for weight loss (= body fat reduction), weight gain (= muscle mass increase)
- Means: (excessive) exercise and restrictive eating

AN and BN often begin in adolescence. Although young men show the first symptoms of these eating disorders a few years later than young women, puberty is often involved in the development process of the disorder in men as well.

Before the onset of puberty, girls and boys hardly differ in terms of their body structure. During puberty, the male body shows increased muscle growth, while the female body gains significantly more body fat (body fat in boys approx. 14%, in girls approx. 24%). This often leads to body dissatisfaction and, in combination with other factors (familial, biological, individual), often to initial dieting behavior. This essential gender-specific distinction in body development in boys is discussed as a possible protective factor for the development of eating disorders and serves as a possible explanatory factor for the lower rates of eating disorders in men.

Although beauty ideals and appearance have long been associated with the female gender, significant changes have emerged in recent decades. While girls continue to strive for thinness and weight loss, an increasing number of boys and male adolescents desire an athletic, muscular body. Results from the “Massachusetts Youth Risk Behavior Survey” show that more than half of male adolescents try to change their body weight and appearance: 36.4% tried to gain weight (muscle mass) and 22% tried to lose weight (fat mass), while girls were ten times more likely to want to lose weight than to gain weight. Boys engage in sports to gain weight or increase their muscle mass, while girls engage in sports to lose weight or reduce their body fat content. The method of dieting or restrictive

eating is predominantly used by girls, regardless of their weight. When boys start a diet or reduce their food intake, it is usually the result of real overweight, i.e., a BMI > 25 or extreme body dissatisfaction (perceiving one's body as not masculine enough).

Media of all kinds contribute to normal-weight children and adolescents of both genders feeling overweight, non-muscular, or "not fitting." At the same time, the prevalence of overweight is increasing, especially among children and adolescents. The result of this is that they want to change their bodies at a very early age and manipulate the sensitive area of the hunger-satiety mechanism through restrictive eating or neglect other important areas of life through extreme physical activity.

Men not only control their eating behavior differently than women, but often also for different reasons. Diets in men are not only usually aimed at a specific weight goal but also at a body consistency with a high muscle content and/or extreme athleticism.

Recent study findings have shown that eating disorders can also occur in middle-aged and older men (Mangweth-Matzek and Hoek 2017). Even if they are not diagnostically the typical forms of AN and BN, binge eating and unspecified eating disorders often appear in older populations. In addition, men (of all age groups) describe excessive exercise behavior as a compensatory method after previous binge eating episodes, alongside typical bulimic symptoms with vomiting. This form is often underestimated in its severity, as sports are still mostly positively connotated (Mangweth-Matezek et al. 2016).

Now that disturbed eating behavior is no longer exclusively associated with young age, other critical life events can be identified as potential risk factors, such as midlife crisis, children leaving home, separation of partnership, new relationship, professional or health reorientation, etc. Although eating disorder symptoms in middle or older age can often be a continuation of already existing symptoms from younger years, there is also the possibility of a late onset.

► **Important** Dissatisfaction with one's body and figure, which in men is often based on real overweight or a "not sufficiently masculine" body, leads to initial diet attempts and physical activity, with the goal of shaping a sporty, muscular body. "Muscularity-oriented disordered eating" has emerged as a new specific form of disturbed eating behavior in men. Eating disorders in men are no longer limited to adolescence but can occur throughout the entire lifespan.

15.2.2 Additional Risk Factors

Risk factor research combines many factors from different areas that contribute to the development of eating disorders in women and men (Jacobi et al. 2004):

- general and social factors,
- family factors,
- developmental factors,
- adverse life events,
- psychological and behavior-specific factors,
- biological factors.

The following risk factors have a particular significance:

- sexuality: homosexual or bisexual orientation,
- professions and sports entailing a focus on the body, weight, figure, and/or performance,
- childhood sexual abuse (not a specific risk factor for eating disorders in men, but shows significantly higher rates than in non-eating disordered men, yet lower rates than in eating disordered women).

All critical events throughout the lifespan (relationship changes, children leaving home, career changes, illnesses, aging, etc.) can cause vulnerability to eating disorders in men.

Sexuality Although the sexual orientation of men with eating disorders has long

been controversially discussed, study findings increasingly show a clear association between homosexuality or bisexuality and disturbed eating behavior (Feldman and Meyer 2007). Men with eating disorders show significantly higher prevalences of homosexuality or bisexuality (10–42%) compared to rates in the general population (5–10%). Conversely, higher prevalence rates of eating disorders were found in homosexual (“effeminate”) men (2.1%) than in heterosexual men (0.3%). Socioculturally, this phenomenon can be explained as follows: Homosexual and bisexual men place more emphasis on weight, figure, clothing, cosmetics, and eating behavior than heterosexual men. Even though sexual orientation is discussed as a specific risk factor for eating disorders in men, the clear backgrounds and relationships are not really known.

Profession Professions in which the body, figure, weight, appearance, and physical performance play a significant role are more frequently associated with disturbed eating behavior and eating disorders than other occupational groups. There are barely any gender-specific differences in this regard, as the profession of dancer or model requires a slim (to thin) body for both. In all these occupational areas, the body is defined and specified in a clear ideal form, which is usually not achievable without fasting, vomiting, diuretic or laxative abuse, or extreme sports.

Exercise Although exercise is fundamentally healthy, in the context of eating disorders there are often pathological forms of physical activity that are not based on health consciousness but on compusiveness and often unattainable performance goals. While the phenomenon of the “athletic triad” has been described in women, there is no comparable syndrome in men in competitive sports, but there is an increasing amount of literature on disturbed eating

behavior in the context of “sports addiction” (not a recognized disease concept).

Pope et al. (1993) described a new phenomenon of disturbed body image or eating behavior in 8% of the examined male bodybuilders, originally called “reverse anorexia nervosa” and then “muscle dysmorphia” (in the category: Body Dysmorphic Disorders). Although these men have oversized muscles according to their bodybuilder status, they perceive themselves as weak and non-muscular. The focus of their everyday life is regular and intensive training, excessive eating, and anabolic steroid consumption—with the goal of creating an ideal body consisting of the highest muscle and lowest fat content. This is comparable, only “in reverse,” to the phenomenon of classical AN (Pope et al. 2000).

Childhood traumatization Men with eating disorders show significantly higher rates of traumatization during childhood than men without eating disorders. Here, experiences of physical violence, sexual abuse, and psychological neglect are particularly evident. Similar to affected women, traumatization is not a specific risk factor for disturbed eating behavior but rather a risk factor for mental illness in general.

Conclusion

Eating disorders have a multicausal pathogenesis. Critical events throughout the lifespan can increase vulnerability to eating disorder symptoms. The risk factors mentioned here act in the context of other (biological, cultural, individual, situational) factors. Factors such as “occupation” or “sports” are not only potential triggers, but often also stabilizers for already existing symptoms of disturbed eating behavior or existing eating disorders.

15.3 Disease Course

Disease Course

- Clinical symptoms of AN and BN show no gender-specific differences, with the exception of excessive exercise as a compensatory measure in BN, which is more common in men.
- High prevalence rates of comorbidity, especially affective disorders and substance abuse or dependence in men.

For a long time, the clinical picture of men with AN was misunderstood, as AN was exclusively associated with women, and the diagnostic criteria (especially DSM) required the existence of a 3-month amenorrhea. Today, the criterion of amenorrhea is seen as an epiphénoménon for extreme underweight; accordingly, both the ICD-10 and DSM-5 have eliminated the gender specificity of the criterion, making men and women of all age groups (i.e., also postmenopausal) diagnosable.

Once the anorexic or bulimic (especially binge eating plus vomiting) symptoms have manifested, there are no gender-specific differences in clinical presentation. Men who engage in extreme sports after binge eating to compensate for excessive food intake often do not have the awareness of the disorder of those who vomit, and are therefore not the typical patients seeking treatment in the clinic. Weight phobia, body perfectionism, fear of eating, and psychological narrowing are in the foreground. In line with the physical regression in AN, sexual fantasies and activity usually disappear. Affected individuals often live without relationships and asexually. Medically, patients present with the same findings as in female patients: e.g., cachexia, dry skin, lanugo hair, petechiae, acrocyanosis, hypothermia, bradycardia, hypotension, osteopenia or osteoporosis, brain atrophy in AN; e.g., arrhythmia, sialadenosis, dental damage, constipation in BN.

Men with eating disorders (Raevuori et al. 2014) show not only severe medical symptoms

during the course of their illness, but also high rates (60–80%) of psychiatric comorbidity: mainly affective disorders (unipolar depression), anxiety disorders, substance abuse or dependence. It is still unclear whether these additional psychiatric disorders occur before, during, or after the eating disorder. In addition, men with eating disorders often have personality disorders (avoidant-self-conscious, dependent, borderline, paranoid, and schizoid).

15.4 Treatment and Outcome

Treatment and Outcome

- Treatment:
 - Since men with an eating disorder experience double stigmatization, few seek treatment. Those who do are often severely symptomatic.
 - The treatment of eating disorders is gender-neutral: weight rehabilitation, structuring and stabilization of eating behavior in combination with psychotherapy
 - Pharmacological and psychotherapeutic co-treatment of comorbidities
- Course:
 - Men with AN show no differences in long-term survival compared to women, but do show more frequent deaths immediately after inpatient stays.

The gender-specific attribution of eating disorders is considered a major reason for the low treatment willingness of men with eating disorders. The disease “eating disorder” per se is a stigma for many affected individuals, and male gender in combination is often a second stigma. Like women with AN and BN, affected men also show a significant delay in treatment, i.e., months or years usually elapse between the onset of the first symptoms and the time when professional help is sought (Cottrell and Williams 2016)

Outpatient or inpatient treatment is based on the same principles for both genders. The most important aspect of therapy for men with anorexia nervosa is weight gain with the aim of body stabilization, including the return of libido or sexual function (= normalization of testosterone levels), comparable to the menstruation weight in affected women. Data on the outcome for men with eating disorders are insufficient due to the few studies available.

► **Important** Long-term studies of the originally very small samples have proven extremely difficult and put the selection of the examined subjects in the foreground. Results should therefore be considered in light of these limitations.

On the one hand, studies describe the course of eating disorders in men similarly to that of affected women, but on the other hand, the increased mortality after discharge points to the need for immediate outpatient follow-up care. Essential for remission are a short disease course, early effective treatment, little comorbidity, and a supportive social system.

15.5 Atypical Eating Disorders and Binge Eating Disorder (BED)

This category of atypical eating disorders (Chap. 5) has gained significant importance after it was shown that a large proportion (50–70%) of patients seeking treatment at eating disorder clinics do not exhibit the full picture of AN or BN, but rather show atypical eating disorders. The proportion of men in this eating disorder category is significantly higher than in the two “typical” eating disorder categories. However, large studies are still lacking to describe precise epidemiological factors in men.

BED, which is an independent eating disorder in the DSM-5, is the best-described category

of atypical eating disorders. The gender ratio of female to male is approximately 3:2. Men with BED do not differ from women with BED in terms of symptomatology. Clinically dominant is the frequent association with overweight or obesity (over one third).

A number of studies on eating disorders in women have shown that eating disorders can occur well into old age. While AN and BN are typical for adolescent girls and young women, BED and atypical eating disorders are more common in middle and old age (from 40 years). Prevalence studies in middle-aged and older men are still scarce.

Conclusion

Eating disorders are rare in men but can occur across all age groups. While they are often AN- and BN-typical in younger years, BED and eating disorders not otherwise specified (= atypical) are more common in middle and older age. Recent research findings suggest the establishment of male-specific assessment tools to capture possible gender-specific differences. “Muscularity-oriented disordered eating” is considered a new form of male eating disorder. However, when AN or typical BN do occur, they show clinically the same symptomatology and a similar long-term course as in affected women. Notable are a premorbid overweight or extreme body dissatisfaction and a high proportion of homosexual or bisexual orientation. The strong female association with disordered eating often leads to male sufferers denying their symptomatology and consequently not seeking treatment. On the side of professionals, there is often a misinterpretation of the symptomatology or misdiagnoses, especially when sports activity is reported in context. BED, as the third main eating disorder, has a significantly higher proportion of men than AN and BN and is often associated with overweight and obesity.

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Eating Disorders and Competitive Sports

16

Petra Platen

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Given the huge importance of physical activity for health, all people should regularly engage in physical activity and/or sports. Sometimes, however, athletic activity can be associated with an increased health risk. This includes a non-demand-adjusted, hypocaloric diet, which can affect the entire range of eating disorders up to classical eating disorders. A hypocaloric diet can in turn be associated with disorders of the reproductive system and bone demineralization. In female athletes, this symptom triad is also referred to as the “female athlete triad”. Eating disorders and reproductive system disorders

have also been described in male athletes. In recent years, a so-called “Relative Energy Deficiency Syndrome (RED-S)” has been applied to both genders. Due to the higher prevalence, the focus is on female athletes.

Female Athlete Triad

The “female athlete triad” refers to a symptom triad consisting of

- chronically insufficient energy intake with or without eating disorders,
- menstrual cycle disorders, and
- low bone density up to osteoporosis.

Although there is little literature on male athletes due to the lower prevalence, the corresponding publications show that a chronic calorie deficit can also lead to

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disorders of the reproductive system and bone demineralization in male athletes.

Competitive sports represent a specific social sphere. The pressure on athletes to increase performance, conform to an aesthetic norm, or achieve a lower weight class is very high. Failure to reach a certain weight class can lead to exclusion from the team or a ban on competing. This, in turn, can lead to changes in eating behavior that take on pathological traits and can develop into classical eating disorders.

16.1 Body Weight and Body Composition in Competitive Sports

Body weight and body composition are two of the many factors that can influence performance. The body weight has an impact on maximum running speed, endurance, and strength, while the body composition affects aesthetics and agility. An optimal power-to-weight ratio determines performance in many sports. Since the body fat percentage has a negative effect on the power-to-weight ratio, many athletes strive for the lowest possible body fat percentage. However, a too low body fat percentage has negative health effects and can also lead to a deterioration in performance. Moreover, it is not the only performance-relevant parameter, and a high performance does not automatically result from low body fat alone.

In some sports, the pressure to achieve a certain body weight and/or the lowest possible body fat percentage, and thus potentially negative health consequences, is particularly high. Some athletes have a genetically determined almost ideal body anthropometry for their sport-specific requirements, but many athletes undergo partially extreme diets when trying to achieve optimal conditions for high performance in their sport, for which they may not be constitutionally optimally suited.

Weight-sensitive sports

1. Sports in which **gravity** plays a role, where the body has to be moved against gravity and a high body weight therefore reduces performance; these include
 - long-distance running,
 - cross-country skiing,
 - road cycling and mountain bike racing,
 - ski jumping and
 - the jumping disciplines in athletics;
2. Sports in which **weight classes** exist, such as
 - combat sports like judo, boxing, taekwondo, as well as
 - weightlifting and lightweight rowing;
3. **aesthetic sports** such as
 - rhythmic gymnastics and floor and apparatus gymnastics,
 - figure skating and ice dancing,
 - platform high diving and synchronized swimming.

Gravity-sensitive sports In gravity-sensitive sports, the body weight has to be carried, so only slim-built athletes can be successful. Here, diets are often used to try to lose excess body mass. However, both body fat and muscle mass are lost under pronounced dieting behavior, so performance can actually deteriorate.

Weight class sports In weight class sports, athletes are forced to either gain or lose weight if they want to compete in the supposedly optimal weight class for them.

Aesthetic sports In aesthetic sports, athletes must have a slim stature to be successful and often develop dieting behavior, even if their current body height-weight ratio seems to be optimal from a health and performance perspective.

► **Important** An optimal competition weight and optimal body composition should be

determined individually. It is important to ensure that the athlete is or stays healthy and can achieve his or her individual maximum performance.

Strategies for body weight control in sports

- Realistic goals for weight and body composition should be pursued. The following questions arise:
 - What maximum weight would be acceptable?
 - What was the last weight without dieting?
 - How was the target weight achieved?
 - At what weight was the highest performance capacity?
- Is great importance placed on healthy behavior, including good stress management and healthy eating habits?
- Are progressions, e.g., regarding performance increase, energy balance, injury prevention, normalization of the menstrual cycle, and general well-being documented?

Athletes need support in their efforts to make lifestyle changes for themselves and not for their sport, their coaches, their sports environment, or for proving anything.

16.2 Energy Balance in Competitive Sports

In recent years, the term relative energy deficiency in sports (RED-S) has been increasingly used in dealing with the issue of eating disorders or disturbed eating behavior in competitive sports. In contrast to the female athlete triad, this term includes the male gender and does not only cover clinical eating disorders. Rather, the spectrum between optimal energy intake for the performance of competitive sports activities and insufficient energy intake with or without

clinical eating disorders is wide. The issue of a positive energy balance is addressed elsewhere (Chap. 65, “Obesity and Sports”).

In this context, energy availability is defined as the difference between energy intake and energy expenditure through physical training and represents the amount of energy available to the organism for other body functions. If energy availability becomes too low—specifically, if it falls below 40–45 kcal/kg of fat-free body mass—the organism implements energy-saving measures, e.g., in cell metabolism, thermoregulation, and reproduction. This partially and temporarily compensates for the energy deficit and ensures survival, but impairs health if it persists for an extended period. This applies equally to men and women.

Some athletes with conspicuous energy balances reduce their energy availability by increasing energy expenditure through physical training more than energy intake from food. Other athletes reduce their energy availability by decreasing energy intake more than energy expenditure through sports. Others still use specific forms of eating behavior, such as fasting or purging methods such as the use of laxatives, diuretics, or emetics.

Another group exhibits clinical forms of eating disorders, which are often accompanied by other mental illnesses. In cases of proven sports addiction, there is a disproportionately high frequency of a combination with disturbed eating behavior.

Insufficient energy availability (with or without eating disorders), functional hypothalamic amenorrhea or a hypothalamically induced reduction in testosterone production, and bone demineralization, either alone or in combination, have significant health consequences for the affected athletes. Therefore, effective prevention, early diagnosis, and consistent therapy should be pursued.

Each of these three fully developed clinical conditions is to be understood as the end of a spectrum of interrelated conditions between complete health and illness. For each individual, any of the three conditions can move at different

speeds along the various spectra, depending on the current nutritional situation and training behavior.

A moderate or only recently established calorie deficit can trigger subclinical forms of menstrual cycle disorders, such as anovulatory cycles or luteal insufficiencies, or only minor changes in metabolic hormones. Energy balance can vary from day to day, but changes in the menstrual cycle with chronic decreases in estrogen levels may only become apparent after one or more months. Effects on bone density may not be detectable until after a year or later, and metabolic effects may not be apparent for many years.

16.3 Epidemiology

The prevalence of individual components of the triad of the female athlete varies considerably in existing studies. Information on the frequency of a possibly latent chronic negative calorie balance is completely lacking.

Overall, subclinical and clinical eating disorders are more common in adult female and male athletes than in non-elite sports participants, with the prevalence being higher in female athletes, especially in endurance and aesthetic sports, than in male athletes, while the issue is particularly relevant for male athletes in weight-class sports. How this issue presents itself in elite para sports is still completely unknown.

Large, well-designed epidemiological studies report the prevalence of clinical eating disorders (anorexia nervosa, bulimia nervosa and other eating disorders) in female athletes in so-called risk sports at almost 50%. One study, using structured interviews among other methods, diagnosed eating disorders in 46.5% of female athletes with the need for a lean physique, in 19.8% of female athletes without weight pressure, and in 21.4% of a non-training control group. Another study found eating disorders in 31% of women in sports where a lean physique is desired, such as endurance sports, aesthetic sports, weight-class sports, and so-called

“anti-gravity sports” like high jump and climbing, compared to 6% in a non-training comparison group of women. Another large study found clinically relevant eating disorders in 25% of female athletes in endurance and aesthetic sports as well as weight-class sports, compared to 9% in non-training women. The differences in prevalence between the studies can be explained, among other things, by differences in the survey instruments employed. Larger studies in male athletes found eating disorders in 2–4% of athletes from sports with high pressure for a lean physique, compared to 0% in non-training controls.

It is important to note that neither male nor female athletes from “non-risk sports”, such as ball sports, technical disciplines, and strength sports, showed an increased risk for eating disorders compared to non-training controls.

The prevalence of eating disorders is reported in the literature to be up to almost 45% in female athletes and up to 13% in male athletes. Estimates for an increased risk of developing an eating disorder are even as high as 90% for female athletes. Sport-specific differences in the prevalence of eating disorders are not yet found in young athletes, possibly because the duration of high performance pressure has not prevailed for very long and therefore sport-specific patterns have not yet been able to develop.

► **Important** In those sports where there is high pressure for a lean physique, there is an increased risk for the occurrence of eating disorders, ranging from subclinical to clinically manifest eating disorders. In other sports, there is no increased risk.

Risk Sports Regarding Eating Disorders

- Sports with a high aesthetic character; this group can be divided into three further areas:
 - Sports in which performance and aesthetics are partly subjectively judged (examples: figure skating, dancing, rhythmic gymnastics, artistic

- gymnastics, synchronized swimming)
- Sports in which a childlike habitus offers biomechanical advantages (examples: artistic gymnastics, rhythmic gymnastics)
 - Sports in which body-conscious clothing is worn (examples: artistic gymnastics, diving)
 - Endurance sports in which body weight must be carried (examples: triathlon, long-distance running, cross-country skiing, road cycling, and mountain biking)
 - Weight class sports (examples: wrestling, judo, rowing, boxing, horse racing [jockeys])
 - Other sports in which weight affects performance (“anti-gravity sports”) (examples: ski jumping, climbing, high jump)

General risk factors

1. Predisposing factors
 - Genetics
 - Age
 - Pubertal developmental status
 - Psychosocial factors (dissatisfaction with one's body, low self-esteem, personality factors such as perfectionism)
 - Sociocultural factors (eating disorders in the family, pressure from sports peers, influence of the media, bullying)
2. Trigger factors
 - Negative comments regarding body weight and/or body proportions
 - Traumatic experiences etc.
3. Maintaining factors
 - Lack of recognition by the coach or other important persons
 - Physiological effects of starvation
 - Initial success no longer occurs etc.

16.4 Risk Factors

The risk factors that can contribute to the development of eating disorders in female athletes are multifactorial in nature. General risk factors can essentially be divided into three categories:

- predisposing factors,
- “trigger” factors,
- maintaining factors.

Furthermore, experiences of abuse as well as sports- and gender-specific aspects are among the risk factors.

Dietary behavior appears to be an important entry point towards the development of a manifest eating disorder. Noticeable disturbances in eating behavior lead disproportionately often to clinically manifest eating disorders, so their presence should be closely monitored in a preventive sense.

Sport-specific risk factors

- Sports with high pressure for a lean physique (risk sports, Sect. 16.3)
- Aspired high performance level
- Beginning of training before menarche
- Significant fluctuations in body weight
- External pressure to follow a diet
- Lack of support in losing weight
- Calorie deficit and/or loss of appetite due to increased training volume
- Personality profile
- Early start of sport-specific training
- Traumatic events such as illnesses, change or loss of the coach, injuries, problems at school or in the social surroundings
- Behavior of the coach
- Poor educational level of the coach
- Rules and regulations in sports

Gender-specific risk factors, especially in male athletes

- Need for a muscular physique
- Abuse of anabolic steroid hormones
- Homosexuality

16.5 Pathophysiological Mechanisms

16.5.1 Eating Disorders

There is no known specific cause for the development of eating disorders in competitive sports. Rather, an interaction of several risk factors is assumed (Sect. 16.4). From a pathophysiological perspective, it seems significant that a negative energy balance, which is achieved by food restriction alone (dieting behavior), triggers a feeling of hunger, while this does not occur with increased physical activity. There seems to be no internal “sensor” for adjusting food energy intake to a training-related increased energy expenditure. Moreover, the energy deficits to be achieved through food restriction appear to be greater when there is a high carbohydrate content in the diet, as is typical for athletes.

16.5.2 Menstrual Cycle Disorders and Reduction of Testosterone Levels

Disorders of the menstrual cycle or reduction of testosterone production in connection with insufficient calorie intake are triggered by alterations of the gonadotropin-releasing hormone pulse generator (GnRH pulse generator) at the hypothalamic level and are among the so-called functional disorders of the gonadal axis. There seems to be a “threshold” of energetic

availability below which significant alterations of the GnRH or downstream pituitary pulses of luteinizing hormone (LH) occur. This threshold is at about 30 kcal/kg fat-free mass energy per day, which is still available to the organism after deducting the training-related energy expenditure. This corresponds to the resting metabolic rate of a healthy person.

Insufficient energetic availability, whether in connection with a disturbance of eating behavior, a manifest eating disorder, or high energy expenditure due to performance training with inadequate nutrition, can lead to changes in metabolic hormones and substrates. These, in turn, serve as metabolic signals to the GnRH-secreting neurons. It is unclear whether there are specific mechanisms at work in female or male competitive athletes.

16.5.3 Low Bone Density

Female athletes with functional amenorrhea and male athletes with reduced testosterone blood levels show pathological bone remodeling. Bone formation is suppressed and bone resorption is increased. So far, antiresorptive drug therapy has not been able to normalize bone density in affected female athletes. This is probably due to other relevant factors, such as an overall more or less pronounced calorie deficit. In a prospective study with female athletes, a 5-day calorie restriction led to an energy availability of less than 30 kcal/kg fat-free body mass per day, an increase in bone resorption, and a decrease in formation. The increase in resorption is likely an effect of reduced estradiol concentrations, while the decrease in formation is likely an effect of changes in insulin, T₃, and IGF-1 or other hormones such as cortisol and leptin. Low bone density values have also been described in male athletes with reduced testosterone concentrations related to calorie deficiency.

16.6 Health Consequences

16.6.1 Medical Consequences

Eating disorders in sports, as well as all aspects involved in sports, lead to various health consequences. Depending on the severity and duration of the eating disorder, significant somatic health consequences can occur (Chap. 3, “Clinical Aspects of Anorexia and Bulimia Nervosa”).

16.6.2 Psychological and Social Consequences

Eating disorders have profound psychological and social consequences, significantly deteriorating the quality of life of those affected. People with eating disorders increasingly lose their zest for life, their self-confidence decreases, and their interest in their environment diminishes. Over 5% of female athletes with eating disorders report suicidal intent. The constant stress experienced by those affected and the fear that others will discover the disordered eating behavior (especially in bulimia) lead to increased irritability and withdrawal. At the same time, concentration, overall performance, and interest in sexuality decrease. The transmission between nerve cells in the brain (e.g., due to serotonin deficiency) can change and thus negatively affect mood. Severe depression and anxiety disorders can result.

In competitive sports, eating disorders lead to a further increase in the already high emotional pressure faced by athletes, not only during competitions. From the perspective of bulimic athletes, courses, training camps, and competitions are particularly stressful, as they have little opportunity for solitude and thus secret vomiting. Athletes with anorexic tendencies can hardly hide their very low food intake. The result is depressive processing disorders, lack of motivation, sleep disorders, and consequently further loss of performance and worsening of the eating disorder.

16.7 Screening and Diagnosis

16.7.1 Screening

The screening for disturbed eating behavior and clinically manifest eating disorders in competitive sports athletes requires both an awareness of the continuity of the disease spectrum between only slightly noticeable behavior and severe clinical manifestations, as well as an understanding of the pathophysiological relationships between the three components of the female athlete triad.

Ideally, screening for disturbed eating behavior or manifest eating disorders should be performed both during the initial sports medicine examination before starting competitive sports training (sports entry examination) and during the annual squad examination. Furthermore, a specific investigation for disturbed eating behavior or eating disorders should also be conducted when athletes present with health problems that might be related to eating disorders, such as amenorrhea, stress fractures, or repeated injuries or illnesses.

A standardized instrument should be used for screening, e.g., the Eating Disorder Inventory (EDI). In the case of conspicuous values on the individual subscales, targeted questions about eating behavior and abnormalities related to the other components of the triad should be asked in a personal conversation. Even though eating disorders are more common in the aforementioned risk sports (Sect. 16.4), they can still be present in any other sport. Therefore, appropriate screening should be initiated at the first slight suspicion.

16.7.2 Diagnostic Procedure

16.7.2.1 Anamnesis

The anamnesis should include information on food intake, diet behavior, weight fluctuations, and training-related calorie consumption. The BMI should be above 17.5 kg/m^2 or, in the

case of adolescents, above 85% of the expected value. Furthermore, the menstrual history should be taken, and if abnormalities are found, a (sports) gynecological examination should be initiated. It is important to specifically ask about factors that may indicate low bone density, such as the occurrence of stress fractures. If eating disorders are suspected, further psychosomatic or psychological clarification should be carried out to rule out or diagnose a clinically manifest eating disorder. The examination follows the usual standards for non-athletes. During the physical examination of the athlete, signs indicating an eating disorder should be looked for. These include: bradycardia (a typical finding in healthy endurance athletes), orthostatic dysregulation, cold, bluish hands and feet, lanugo hair, and enlarged salivary glands.

16.7.2.2 Bone Density Measurement

The bone density should be measured

- in the presence of disturbed eating behavior or a clinically manifest eating disorder,
- with a BMI $\leq 17.5 \text{ kg/m}^2$ or $<85\%$ of the expected weight or with a recent weight loss of $>10\%$ in one month,
- with reduced testosterone blood levels in male athletes,
- with menarche at the age of over 16 years or with menstrual cycle disorders lasting longer than six months, and
- if a stress fracture has already occurred.

Furthermore, a bone density measurement should be performed if several of the mentioned factors are present to a less pronounced extent.

The measurement method of choice is still a DXA measurement, which is widely available in Germany. The diagnosis of low bone density is based on the lowest Z-score of the vertebral bodies (pa-view) or the hip region (femoral neck or total hip). It should be noted that the range of bone density values in amenorrheic athletes is considerable and can vary greatly from sport to sport and between different skeletal sections. In athletes, bone density may be normal at the radius but pathologically reduced at the spine or

hip region. In the case of abnormal values, further methods such as high-resolution computed tomography can be used.

16.8 Prevention and Therapy

Due to the interaction of the three components of the female athlete triad or the athlete with reduced energy availability, effective prevention and therapy require a functioning team from the fields of sports medicine/sports gynecology/sports andrology, nutrition counseling, and sports psychology. This team should also include coaches, parents, and other individuals from the athletes' personal environment.

The mortality rate due to the consequences of severe anorexia is also increased for (former) elite athletes. In addition, disturbances in eating behavior or manifest eating disorders and associated disturbances in the menstrual cycle also lead to predominantly irreversible decreases in bone density in female athletes, with the corresponding long-term health consequences for the affected athletes. For these reasons, consistent preventive and effective therapeutic measures should be used, particularly in high-risk sports.

16.8.1 Prevention

In modern performance sports, victories are particularly important. Athletes develop the feeling that they are only as valuable as the performance they deliver. All too often, athletes are told, or they themselves feel, that they are not interesting as individuals.

Regarding the prevention of eating disorders, the primary concern must be to help athletes develop a **mature, autonomous, and self-confident** personality or to offer them support in developing in this direction. They must be protected from defining themselves solely by their performance and achievements, and they must not allow others to do so either.

Athletes should have the opportunity to develop into self-confident women and men. To do this, they should be able to optimally develop

their own abilities, realistically assess them, and recognize and accept their limits. They should also develop and implement their own goals and needs and be able to accept criticism. With such a developed personality, they are equipped to adequately defend themselves against “inappropriate” criticism, such as overly critical comments about their figure.

Athletes should attach an appropriate level of importance to performance and success and understand it as one part of the qualities that distinguish them as individuals. They should learn to openly show and articulate their feelings. They should also be able to work cooperatively in a community, as performance sports always take place within a community.

► **Important** Stabilizing the personality is an important component of prevention against the development of eating disorders. In the case of uncertainties and problems, athletes, parents, and people from their environment should consult experts in the field of sports psychology.

16.8.2 Therapy

The overarching goals for athletes with disturbed eating behavior or manifest eating disorders are the normalization of nutritional status, normalization of eating behavior, and changing the thought patterns that lead to or maintain the eating disorder. The younger the athlete, the more the family should be involved in therapy.

In amenorrheic female athletes, an increase in body weight leads to increases in bone density of about 5% per year. In women with anorexia nervosa, some studies have shown an increase in bone density of 2–3% per year with an increase in body weight.

For affected athletes, the most important measure to normalize the menstrual cycle or testosterone blood levels and increase bone density, depending on compliance, should be a modification of the diet with an increase in calorie intake and/or a reduction in training-related calorie

expenditure. The latter will probably be difficult to achieve in high-performance sports.

► **Important** The most important therapeutic measure is the normalization of the energy balance or energy availability, respectively.

The specific recommendations for interventions in athletes with insufficient energy intake depend on how the insufficient energy intake has developed. If the energy deficit has developed unintentionally, intensive sports counseling or nutritional counseling is sufficient. If the energy deficiency is based on disturbed eating behavior, medical consultation in combination with nutritional counseling should be provided. If the energy deficit was deliberately induced without disturbed eating behavior, intensive nutritional counseling is also sufficient. In cases where a clinical eating disorder is the cause, treatment should include medical care, nutritional counseling, and medical or psychological or psychotherapeutic treatment.

A nutritional counseling should aim for an adequate intake of calcium (1000–1500 mg/day), vitamin D (800 IU/day), and vitamin K (60–90 µg/day) in addition to optimizing the energy balance. Supplementation may be necessary.

► **Important** Clinically manifest eating disorders in athletes should be treated according to the same medical and psychotherapeutic standards as in non-athletes.

A female athlete affected by a manifest eating disorder should only continue her training and participate in competitions if she meets minimal requirements. This includes good compliance, combined with close monitoring. She must prioritize treatment over training and competing, and she must be willing to modify her training in terms of type, duration, and intensity if necessary. If this is not successful, the athlete must be excluded from training and competing but should remain under therapeutic supervision.

The pharmacological therapy of female athletes with clinically manifest eating disorders includes the spectrum of medications used for non-athletes, particularly the group of antidepressants. Current doping regulations may need to be considered when using medications.

Normalization of eating behavior without pharmacological measures can only achieve complete normalization of bone density in athletes with hypothalamic amenorrhea or in women with anorexia nervosa if the eating disorder does not last too long and normalization of eating behavior is achieved at a young age. Pharmacological measures without simultaneous normalization of eating behavior do not lead to an increase in bone mass. This also applies to hormone replacement therapy or oral contraceptives. In athletes older than 16 years with reduced bone density and in whom amenorrhea persists despite general treatment attempts, oral contraception can be used in the hope of preventing further decrease in bone density. Biphosphonates should not be used in young athletes with hypothalamic amenorrhea or should only be considered after intensive review of the individual risk constellation.

16.9 Performance-Optimized Weight Management for Athletes

In competitive sports, it is common for an athlete to want to lose or gain body weight in order to meet the demands of the sport and achieve the best possible performance (Sects. 16.1 and 16.2). In both cases, weight changes should occur over the long term during competition breaks or in the season preparation, before competitions take place.

16.9.1 Guidelines for Appropriate Weight Loss

Weight loss occurs whenever more calories are consumed than are added through food. Both

the level of calorie deficit and the composition of the diet, particularly the amount and quality of protein intake, determine whether (almost) exclusively carbohydrate and fat stores or body proteins (muscle mass) are targeted.

In order to maintain the highest possible performance, it is of great importance in competitive sports that, during a reduction of body weight, muscle mass is preserved as much as possible when body fat percentage is reduced. However, any calorie deficit in sports leads to a decrease in glycogen stores in the liver and muscles. This means that only a very small amount of carbohydrates is available for physical training. Intensive exertion, in which mainly carbohydrates are metabolized, can therefore only be sustained for a limited time, and performance in many sports is restricted. Consequently, no diet should be undertaken immediately before a competition.

Rapid weight loss or excessive restriction of energy from food over several days and weeks is always accompanied by a significant loss of muscle mass. Therefore, ideally, weight loss should not exceed 500 g per week.

It is of great importance to maintain a high fluid/water intake during a diet. Enough should be drunk such that the urine is pale yellow and clear. Dark yellow or even brownish urine color is a clear sign of insufficient fluid intake. The total amount of fluid intake depends on the training volume and environmental conditions. Restricting water intake leads to a short-term decrease in body weight, which can cause serious health problems in sports, including overheating, fainting, and death, and should therefore not be carried out.

Furthermore, it should be noted that the increased need for vitamins, minerals, and trace elements in sports must be adequately covered during a diet to avoid health problems. This is often only achievable through additional supplementation, e.g., with a good multivitamin/multi-mineral preparation.

Recommendations for Sensible Weight Loss

- Avoid significant weight fluctuations; lose weight during the pre-season, not during the competition phase; expect reduced performance during the diet phase;
- Do not lose more than half a kg/week, so do not choose too large a calorie deficit;
- Reduce total calorie intake, mainly by reducing fat intake, but do not go below 15% of total energy intake from fats; choose high-quality fats (mono- and polyunsaturated fatty acids, found in marine fish, olive oil, linseed oil);
- Do not fall below a protein intake of 1.2 g/kg body weight; choose high-quality protein (fish, lean meat, poultry, whole grain cereal, low-fat milk and dairy products, eggs, soy products, legumes, etc.);
- Eat at least five portions of vegetables and fruits per day;
- Drink plenty of fluids, especially magnesium-rich water ($>150 \text{ mg/l}$), and consume calcium-enriched fruit juices; restricting fluid intake is not a suitable method for weight loss;
- Take a multivitamin/multimineral supplement during a longer diet phase (longer than 1 week).

16.9.2 Guidelines for Performance-Enhancing Weight Gain

An increase in body weight can be achieved by the additional intake of energy sources in the diet (about 500–1000 kcal/day). Protein should amount to approx. 1.5–1.8 g/kg body weight. The intake of protein supplements is not necessary with a balanced and varied diet. The composition of the diet should otherwise meet the general recommendations for a healthy diet in

sports, containing about 25% of energy from fat and 60% from carbohydrates.

The increased food intake must be combined with additional strength training or strength-focused training to actually build more muscle tissue and not store the energy sources in fat tissue. The speed at which an increase in body weight can be achieved depends on many different factors, such as genetic predisposition, surplus of supplied energy, number of rest and recovery days, and the type, duration, and intensity of training.

Conclusion

An insufficient energy intake from food and/or too high energy consumption through competitive sports training with or without clinically manifest eating disorders, hypothalamic amenorrhea or hypothalamically induced reduction of testosterone production, and pathologically low bone density values, either alone or in combination, have significant health consequences for the affected athletes. Therefore, both preventive and therapeutic measures should be consistently applied, especially in high-risk sports, in addition to raising awareness of the problem. Only in this way can athletes derive the optimal health benefits from their sporting activities.

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Cognitive Behavioral Therapy Models

17

Gaby Resmark

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There are a variety of theoretical models that attempt to explain the development of eating disorders. However, there is no uniform, empirically proven model for the pathogenesis and maintenance of anorexia nervosa (AN) and bulimia nervosa (BN). In the sense of a heuristic concept, etiological ideas of cognitive behavioral therapy are based on a multifactorial model in which 3 main classes of “causes” play a role: predisposing, triggering and maintaining factors (Laessle 2018).

Multifactorial Model in Eating Disorders

- Predisposing factors
- Triggering factors
- Maintaining factors

17.1 Predisposing Factors

Predisposing or vulnerability factors are enduring personal characteristics or environmental conditions that form the basis for the development of an eating disorder. They are characterized by having existed for a long time before the onset of the disorder and may continue to be effective even after the onset of the disease. Their presence can increase the risk of developing an eating disorder in the course of life, but they do not allow for a specific causality assumption or even prediction of an exact onset of the disease. In longitudinal and cross-sectional studies, according to Jacobi et al. (2004), the following risk factors for eating disorders were found.

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Risk factors for eating disorders (Jacobi et al. 2004)

- Female gender
- Ethnicity (non-Asian)

- Early childhood nutritional and gastrointestinal disorders
- Increased weight and shape concern
- Negative self-evaluation
- Sexual abuse and other psychologically stressful experiences
- General psychiatric disorders

Predisposing factors can be divided into four subcategories:

1. biological,
2. sociocultural,
3. familial,
4. individual factors.

17.1.1 Biological Factors

Biological factors that can promote the development of an eating disorder include

- genetic factors,
- neurobiological changes (e.g., hypothalamic dysfunctions),
- changes in serotonin metabolism,
- physical factors (e.g., higher set-point weight, early menarche),
- nutritional factors (e.g., disturbances in hunger and satiety regulation).

17.1.2 Sociocultural Factors

The growing discrepancy between the prevailing, increasingly unrealistic thinness ideal in industrialized countries and the actual body sizes of average women forms another basis for the development of eating disorders. Women who are particularly at risk are those who, due to low self-esteem, tend to internalize this ideal more strongly and try to compensate for personally experienced deficits through weight loss. Another sociocultural factor concerns the high, sometimes irreconcilable expectations that modern society places on women, which can lead to pronounced role conflicts (e.g., professional success vs. satisfaction

as a housewife and mother) (Jacobi et al. 2016). Not least due to the rapidly increased influence of social media and modern television shows (Götz et al. 2015), sociocultural factors have gained even more importance (Wilksch et al. 2020).

17.1.3 Family Factors

In many families of patients with eating disorders, pathological relationship patterns can be found, although it is often difficult to determine whether these may have arisen secondarily, i.e., as a result of the eating disorder. Significant factors are the regulation of boundaries, social deficits, and the dependence of adolescents on the primary family. Specific interaction patterns such as enmeshment, rigidity, overprotection, conflict avoidance, and changing coalitions lead to difficulties in the development of a stable identity, autonomy, and the formation of a positive self-esteem in children and adolescents.

17.1.4 Individual Factors

Among the individual factors that can predispose a person to an eating disorder are, among others, low self-esteem, perfectionism, impulsivity and cognitive deficits. The latter play a particularly important role in behavioral therapy models. Eating disorder-specific dysfunctional core beliefs favor certain situation-related “automatic” thoughts that contain “thinking errors” in the sense of typical anorexic cognitions (Table 17.1). Distortions such as secondary consequences of cachexia, unconscious psychological defense, conscious denial, or a combination of these mechanisms are discussed as possible causes for such cognitive impairments (Meermann and Borgart 2006).

In the two-factor model of Connors (1996), the interaction of two components represents a prerequisite for the development of an eating disorder:

- negative body image, excessive preoccupation with weight and dieting,
- disturbance of self-regulation including affective dysregulation, low self-esteem, and attachment insecurity.

Table 17.1 Thinking errors. (Modified according to Garner and Bemis 1982)

Category	Automatic Thought
Selective Abstraction Tendency to isolate single facts from the context and overestimate them, while ignoring other, more significant features	“Only when I am thin am I something special.”
Oversimplification Derivation of rules based on a single event	“I used to have a normal weight, and I was not happy. Therefore, I know that I will not feel better if I gain weight.”
Dichotomous/all-or-nothing thinking Assignment of experiences to two mutually exclusive categories, without perceiving any gradations (“black and white”)	“If I don’t plan my daily routine down to the minute, everything becomes chaotic, and I achieve nothing.”
Personalization Overestimating the extent to which events have to do with oneself and/or excessive assumption of responsibility	“Someone laughed as I walked past him. Surely he was making fun of my ridiculous shape.”
Catastrophizing Designation of an event as a catastrophe without reason	“If I don’t constantly control my weight, I will keep going up.”

Both factors separately are not specific to eating disorders and can individually lead to “normal” dieting behavior and “normal” dissatisfaction with one’s own figure without mental illness (component 1) or other mental disorders (component 2).

17.2 Triggering Factors

Triggering factors include the totality of circumstances that provoke the first occurrence of an eating disorder and determine the timing of the onset of the disorder. These include, similarly to other mental disorders, so-called critical life events such as separations and losses, new demands, fear of failure, or physical illnesses. The affected individuals are not able to meet the necessary adjustment requirements in these situations. Further triggering factors can be a strict diet or physical activity.

17.3 Maintaining Factors

Maintaining factors are conditions that contribute to the continuation of an eating disorder. They are often a consequence of the underlying

problems that led to the development of the eating disorder and are thus closely related to the predisposing factors. On the other hand, the disturbed eating behavior leads to a variety of biological and psychological changes that can contribute to the maintenance of the eating disorder, even if other factors originally involved in the development are no longer relevant. Via positive reinforcement, they lead to a vicious cycle from which the affected individuals often cannot escape without help. According to Legenbauer and Vocks (2014), maintaining factors include restrained eating, deficient coping behavior, and dysfunctional information processing. Restrained eating corresponds to self-imposed food deprivation aimed at achieving or maintaining a weight below one’s own set-point (optimal, presumably biologically determined body weight). Deficits in coping with stress and challenging situations represent another maintaining factor. Finally, dysfunctional cognitions play an important role not only in the development of an eating disorder but also in its maintenance, as they impair a person’s ability to act. Fig. 17.1 shows the vicious cycle of bulimia as a model for maintaining pathological eating behavior involving binge eating.

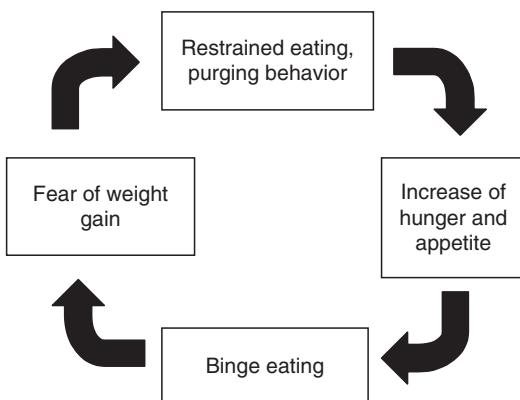


Fig. 17.1 The vicious cycle of bulimia. (Modified according to Jacobi et al. 2008; with kind permission of Beltz-Verlag)

by common “transdiagnostic” mechanisms and combines all three disorder pictures in his model (Fig. 17.2). In some cases (e.g., in some patients with binge-eating disorder), only a few of the maintaining processes of the model are active, while in other cases, most processes are active (e.g., in patients with AN of the purging type). The transdiagnostic perspective simultaneously highlights the aspects that should be considered in the behavioral therapeutic treatment of eating disorders and supports therapists in designing an adequate therapy plan tailored to the individual psychopathology of each patient.

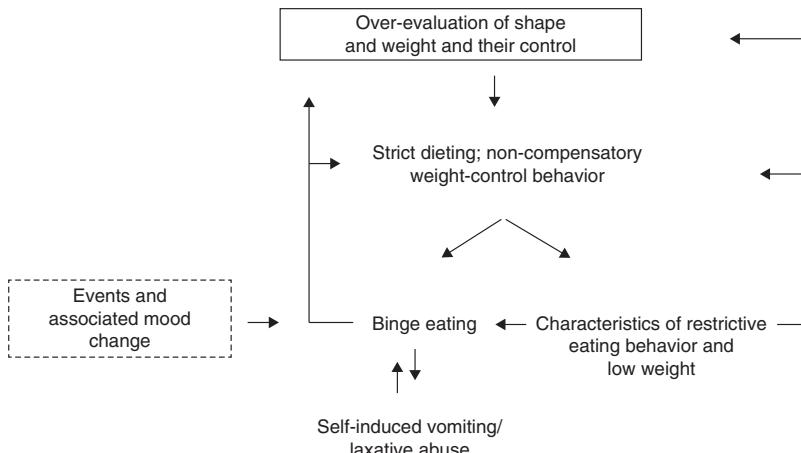


Fig. 17.2 The Transdiagnostic Model. (Adapted from Fairburn 2012; with kind permission of Guilford Press)

17.4 The Transdiagnostic Model

In his so-called “transdiagnostic” model, which primarily represents a model of maintenance, Fairburn summarizes the most important aspects of the cognitive behavioral perspective (Fairburn et al. 2003; Fairburn 2012). The core pathology of AN, BN, and eating disorder NOS (not otherwise specified) show great similarities, and patients often migrate between the different diagnoses. Therefore, Fairburn assumes that the various eating disorders are maintained

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Psychodynamic Model Concepts

18

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Psychodynamic psychotherapy has its roots in psychoanalysis, which can be described in a clinical context as a personality, illness, and treatment theory. In this context, the unconscious is of central importance both in the functioning of a healthy personality and in mental disorders. The basic assumption of psychoanalysis is that the main structures of a personality develop from “an interplay of individual predisposition and interpersonal relationships in the first years of a person’s life through internalization processes” (Hau and Leuzinger-Bohleber 2004), whereby the processes of structure formation are not accessible to consciousness.

The focus of the psychoanalytic theory of illness is the structural and/or conflictual genesis of mental disorders. An important characteristic of mental disorders is specific, biographically

derived perspectives and interpretations of one’s own person, other people, or interpersonal events. Psychoanalytic treatment is primarily not aimed at treating a symptom, but at resolving the underlying structural disorder or unconscious conflict.

The proportion of psychoanalytic therapies among treated patients in outpatient psychotherapeutic care in Germany is low, at around 2.4% compared to almost 45% psychodynamic psychology and 50% cognitive behavior therapy (Multmeier and Tenckhoff 2014). Despite many similarities with psychoanalysis (basic theoretical concepts, treatment techniques), psychodynamic psychotherapy differs in terms of the therapeutic stance, treatment frequency and duration, and setting. Compared to psychoanalysis, less space is given to regression, as well as to free association, in order to give preference to an active therapeutic approach. The subject of therapy is not so much the analysis of transference, but rather current life events and conflict-related transference patterns in the external relationships of the patient, the here

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and now of real relationships. Psychodynamic psychotherapy-oriented treatment is a time-limited treatment, which makes focusing on a specific issue in therapy absolutely essential. In order to determine the focus, a psychodynamic diagnosis of the conflict situation underlying the patient's current disorder, such as self-esteem problems, is required. The focus should refer to an unconscious pathogenic conflict that, according to psychoanalytic theory of neurosis, arises in childhood and adolescence and is reactivated in adulthood by certain triggering events. At the same time, the focus should include an interpretation or an interpretive explanation of this conflict, which contains a clinical hypothesis about the unconscious meaning of the patient's symptomatology. In this context, the patient's statements are specifically addressed with regard to this focus, and psychodynamic aspects of the disorder and expressions of the patient that are not related to the focal theme are selectively neglected. The focus is on conflicts that occur in the present and in the patient's everyday life environment, especially in her interpersonal relationships.

With the introduction of the descriptive classification systems DSM-III-R, DSM-IV, and DSM-V as well as the ICD-10 and ICD-11 (Claudino et al. 2019), the neurosis concept important for psychodynamic psychotherapy-oriented psychotherapies was abandoned in favor of phenomenological and biologically oriented etiology concepts. Undoubtedly, these classification systems contribute to greater diagnostic reliability, albeit at the expense of lower validity.

18.1 Operationalized Psychodynamic Diagnosis (OPD)

Within psychodynamic psychotherapy, the OPD was developed in the early 1990s, and the first diagnostic manual was published in 1996. The aim of the OPD is to expand the symptomatically descriptive classification of mental disorders, as provided by the DSM or ICD, to include the fundamental psychodynamic

dimensions (OPD Working Group 2006). The multiaxial psychodynamic diagnosis is based on five axes: "Experience of illness and treatment prerequisites", "Relationship", "Conflict", "Structure", and "Mental and psychosomatic disorders according to Chapter V (F) of the ICD-10". Thus, eating disorders such as anorexia nervosa (AN), bulimia nervosa (BN), or binge-eating disorder (BED) are represented in the categorical classification systems DSM and ICD on the descriptive axis 5 of the OPD. The description of the patient and her psyche or psychopathology according to the important psychoanalytic concepts of personality structure, intrapsychic conflict, and transference is carried out on the four psychodynamic axes, underlining the continuous, dimensional approach of this concept, which borrows more from the social sciences.

In recent decades, important psychodynamic hypotheses regarding the development of BN and AN, such as separation disorders in the mother-child relationship, early traumatic experiences, loss of support, and conflictual oedipal bonds, had to be abandoned due to a lack of specificity. The same applied to an affect psychology inherent in eating disorders, which interpreted eating behavior as a regulatory mechanism of an unstable self and as a projective disposal of negative self-parts.

A cardinal symptom of all eating disorders is undoubtedly the lack of self-confidence and negative self-image, which Hilde Bruch, a pioneer in the field of eating disorders, highlighted in her published book "The Golden Cage" (Bruch 1973). The "all-pervasive feeling of one's own inadequacy" describes the self-esteem problems that are pathognomonic for both eating disorders AN and BN, which usually have their origin in interpersonal problems and possess mutual reinforcement functions. The result is a considerable vulnerability. Instead of clarifying the interpersonal situation, there is a break in the relationship and social withdrawal. Lack of self-confidence and a negative self-image result in a high dependency on external evaluations, such as the ideal of slimness, which is conveyed through media, family, and peers.

► **Important** Modern psychodynamic psychotherapy concepts understand mental disorders such as eating disorders in an interpersonal context, based on the assumption that the psychosocial and interpersonal experiences of the patient have a decisive influence on the treatment. In this context, psychodynamic psychotherapy focuses on the underlying conflict of the symptomatology, with particular consideration of the object relationship level.

According to object relations theory, (infantile) conflicts arise in interaction with developmentally early significant caregivers and can be re-enacted in current relationship situations. Symptom formation is thus an expression of a suboptimal solution to the conflict. The conflict is associated with considerable anxiety and tension, so a means of tension discharge must be found, which can lead to the development of symptoms. Psychodynamic psychotherapy methods pursue, among other things, the goal of at least tentatively enabling conflict repetitions in the therapeutic relationship. The basis for this is the establishment of a basal relationship. The therapist empathizes with the role unconsciously assigned to him/her by the patient and intervenes from this role understanding.

► **Important** The treatment of AN or BN is usually a treatment of young people, especially adolescent girls or young women, which has significant treatment implications, particularly for the psychodynamically important transference processes between therapist and patient.

Adolescence or young adulthood poses significant psychosexual and social challenges. The constitution of self-image (self-worth) is a continuous process that originates from early childhood, but certainly entails the most demanding developmental steps for the individual in the life phase of puberty, adolescence, and early adulthood. In terms of shaping one's own "private" as well as professional life, significant decisions are required, and the "adult" life experience

that every decision in favor of something also means, or at least can mean, a decision against something, becomes noticeable in various areas of life. Therefore, a therapeutic stance can be recommended that sees no insurmountable differences between a reflected, committed partiality and the necessary abstinence and can allow a dynamic interplay of psychoeducational and genuinely psychotherapeutic treatment strategies. This includes empathic solidarity as well as "putting one's foot down" in the sense of a structuring measure. The auxiliary ego function of the therapist can also be just as significant in important decision-making processes in the here and now as the interpretation and working through of repetitive neurotic, especially interpersonal, behavioral patterns.

► **Important** The autonomy-dependency conflict characteristic of this life phase and the ambivalently experienced father or mother relationship are usually found in the therapeutic relationship and can be used productively.

In particular, the unspecific predictor variables of the psychotherapy process, such as interest, curiosity, commitment, authenticity, and reliability, are subjected to a very critical examination against the background of parent transference ("Is the interest really directed at me, is it genuine, can I rely on him or her?").

► **Important** Significant conflicts of self-worth, as are pathognomonic for patients with eating disorders, also require a resource-oriented psychotherapy. It is not so much the deficits in previous development that need to be addressed, but rather the abilities and achievements already accomplished.

At the same time, it is necessary to work out the genesis of the self-worth problem, which is usually to be found in interpersonal conflicts, especially with parents (high performance expectations, "I can only get recognition and affection through performance"), in order to ultimately be able to make corrective experiences. A benevolent, resource-promoting (e.g., paternal

or maternal) transference relationship offers the opportunity to make positive corrections to self-worth, which can then be transferred from therapy to other relationships.

18.2 Effectiveness of Psychodynamic Psychotherapy Methods

Anorexia nervosa According to the guidelines “Diagnosis and Therapy of Eating Disorders” of the Working Group of Scientific Medical Societies (AWMF; <https://www.awmf.org/leitlinien/detail/ll/051-026.html>), there is no empirical evidence for the effectiveness of a classical psychoanalytic treatment of AN.

Older depth psychological studies suggest that there is effectiveness in terms of weight gain as the primary goal of treatment for AN. However, the meta-analysis by Zeeck et al., published in 2018, which also included naturalistic studies, could not demonstrate the superiority of one psychotherapy method over another (outcome criterion: weight gain). In the absence of studies with untreated control groups, an evaluation of the effectiveness of a specific method for AN was only possible to a limited extent. The results of the studies could only be evaluated based on weight (BMI), as other parameters (eating disorder pathology, depression, quality of life, etc.) were either not collected or collected using different instruments.

A newer, manualized psychodynamic therapy approach (Focal Psychodynamic Therapy, FPT) designed for AN patients with moderate underweight ($BMI > 15 \text{ kg/m}^2$) (Friederich et al. 2014) proved effective in a multicenter, randomized controlled trial compared to cognitive behavioral therapy (CBT) and a treatment-as-usual control group (TAU control group) (guideline psychotherapy in outpatient psychotherapeutic practices) with regard to weight gain and a combined outcome measure (weight and eating disorder-specific psychopathology) at 1-year follow-up (Zipfel et al. 2014). Although there was no significant difference in weight course between the three therapy

arms studied, the FPT arm was superior to the TAU arm in terms of remission rates after one year. The methodological quality of the study and the comparatively high number of cases ($n = 80$) supports the assumption that FPT is effective.

Bulimia nervosa Neither for classical psychoanalytic nor for psychodynamically based psychotherapies are there data with a passive/placebo-controlled control group. A randomized psychoanalytic study (Poulsen et al. 2014) and a psychodynamic study (Stefini et al. 2017) allow both a pre-post and a pre-follow-up comparison (Svaldi et al. 2019). Poulsen et al. (2014) report a cessation of binge eating in 6% of cases after therapy, while Stefini et al. report it in 31% of cases. Both studies describe a weak to moderate reduction in binge eating, a comparable reduction in compensatory behavior, and a moderate reduction in self-reported eating pathology, results that could also be replicated at follow-up.

When compared to CBT, no differences were observed in a psychodynamic treatment (Stefini et al. 2017) with a mean therapy duration of 36 hours. Both methods were equally effective, with large effect sizes ($d = 1.2$) and a remission rate at the end of therapy of 32%. In the study by Poulsen and colleagues (2014; psychoanalytic psychotherapy compared to cognitive behavioral therapy), however, there were significant differences in the two therapy methods. After five months (end of CBT), 42% of patients treated with CBT were completely abstinent regarding eating disorder symptoms, while this was the case for only 6% of patients who received psychoanalytic treatment. Even two years after the start of treatment, 44% of patients in the CBT arm and only 15% in the psychoanalytic arm were completely remitted regarding eating disorder symptoms—despite a significantly higher therapy dose of the psychoanalytic method (weekly psychoanalytic treatment over two years compared to 20 sessions of CBT over a total of five months). Both in terms of eating disorder symptoms and general psychopathology, CBT was clearly superior to psychoanalytic treatment after five months and also after two

years, whereas psychodynamically based psychotherapy appeared to be comparable in effectiveness to CBT.

Binge eating disorder There is not sufficient research on psychoanalytic or psychodynamic therapy of BED to perform an adequate assessment.

► **Important** With regard to the treatment of AN, no psychotherapy method seems to be superior to another. There is no strong evidence for either the psychodynamic or the psychoanalytic treatment of BN—not least due to the small number of studies. In a randomized study, psychoanalytic treatment was found to be significantly inferior to CBT. No difference was found between CBT and psychodynamic treatment in adolescents with BN.

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Epidemiology, Etiology, and Course of Eating Disorders

Silke Naab

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19.1 Systemic and Family Perspective

19.1.1 Historical Development

In the second half of the 19th century, William Gull, Ernest-Charles Lasègue, and Pierre Janet described anorexia and advised, due to the lack of therapy options, removing patients from their social environment for a certain period. This approach was called “parentectomy,” and the family was attributed responsibility for the development of the eating disorder (Fichter 2008). In later works, mothers were described as dominant, intrusive, and ambivalent, fathers as passive and weak-willed (Vandereycken et al. 1988). In the 1970s, a family therapy movement

emerged that understood the family as a holistic system and, based on systemic theoretical considerations, assumed specific family interaction patterns and conflicts as the genesis of eating disorders in adolescents (“systemic family therapy,” cf. Minuchin et al. 1975 and Selvini-Palazoli 1978). The eating disorder of the so-called “index patients” was seen as an indicator of a dysfunctional family and at the same time as a desperate attempt to maintain the status quo. Specific patterns (especially in anorexic families) were described and interpreted as the basis of the pathology:

- “Enmeshment” of family members with extreme closeness and intensity, weak boundaries of family members
- Overprotectiveness,
- Rigidity (rigid norm and performance orientation and maintaining the status quo),
- Conflict avoidance and deficient conflict management,
- Involvement of the symptom bearer in the (hidden) couple or family conflict.

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Family relationship patterns of adolescent patients with bulimia nervosa were described through conflict-laden family interactions, lack of parental affection and recognition, and impulsive, uncontrolled behavior of family members (Minuchin et al. 1978; Root et al. 1986).

Although the descriptions of typical family systems helped to sharpen clinical observation and incorporate corresponding findings into therapy, the narrowing of therapeutic observation to the “typical eating disorder family” was criticized.

The described family interaction patterns have only been empirically proven in a few families to date, and general statements regarding the families of patients with eating disorders cannot be drawn (Kog et al. 1987; Kog and Vandereycken 1988; Vandereycken 1995). Over the following years, a more differentiated picture of the influence of the family on the development and maintenance of eating disorders emerged, facilitated by numerous scientific studies. According to current research, the etiological significance of observed abnormalities in families is entirely unclear, and there are very different interaction patterns and styles in families with family members with eating disorders, without clear and consistently observable differences between families with bulimic, anorexic, or other disturbed eating behavior and those without clinical problems (Herzog 2002).

The relationship between familial influences and eating disorders was described in 1996 in the “Dual-Process Family Model” (Leung et al. 1996): The family’s preoccupation with weight and appearance has direct effects on body dissatisfaction and eating disorder symptoms, and body dissatisfaction, in turn, has a direct effect on self-esteem deficits and eating disorder symptoms. General family dysfunction had a direct influence on negative self-esteem and an indirect influence on eating disorder and other psychiatric symptoms. The dual-process phase model describes how dysfunctional family relationships and family preoccupation with weight and appearance predispose girls (and boys) to the development of eating disorder pathology.

► **Important** Empirical studies in the following years showed that attitudes in the family, eating and dieting behavior, weight, appearance, and family relationships have a potential influence on the development and course of eating disorders and can reinforce or weaken genetic, sociocultural, and personality influences (Tetzlaff and Hilbert 2014; Reich 2003).

19.1.2 The Family as a “Risk Factor”

► **Important** Family relationships as risk factors in the development and maintenance of eating disorders have been widely demonstrated (reviews by Fairburn and Harrison 2003; Reich 2003; Jacobi et al. 2004; Stice 2002). A higher socioeconomic status, increased occurrence of physical illnesses and mental disorders (especially eating disorders and affective disorders) in the family, as well as mutually controlling family relationships—combined with parental disagreement—were found to be characteristic features of families of patients with AN and BN in cross-sectional and longitudinal studies (Jacobi and Neubert 2005; Kog and Vandereycken 1988).

Compared to healthy adults, individuals with AN and BN retrospectively report a higher degree of parental conflicts, criticism, high expectations, lower parental affection, and less care (Fairburn et al. 1997, 1999). An insecure attachment style has also been described in individuals with eating disorders (Ward et al. 2000). High parental education and high parental expectations are also associated with a higher risk of eating disorders in children (Bould et al. 2015a).

19.1.3 The Family as a Resilience-Promoting Institution

Numerous studies have shown that family functioning, along with positive parental behavior, is

associated with the well-being of growing children (Haines et al. 2016). In particular, positive emotional relationships between family members represent a central aspect for the emotional well-being of children, especially during adolescence (Henry et al. 2006).

► **Important** Adolescents who report emotional support from their parents seem less likely to develop weight preoccupation, body dissatisfaction, and high thinness ideals, and to adopt bulimic behavior (Hasenboehler et al. 2009). A strong family bond appears to protect adolescents from emotional stress and is associated with healthy behavior (Croll et al. 2002). The relationship between positive family life and healthy eating behavior and the positive perception of family relationships as an important and protective factor for the risk of developing disordered eating behavior is well documented (Neumark-Sztainer et al. 2009; Wisotsky et al. 2003).

In the following Table 19.1, empirical findings on specific areas concerning the family of patients with eating disorders are summarized (adapted from Herzog 2002).

19.2 Does the Family Influence the Eating Disorder or Vice Versa?

It is often difficult to determine whether the described family factors were present before the manifestation of the eating disorder or whether they only developed secondarily, i.e., as a reaction to the disorder, within the family (Jacobi et al. 2008). For example, patients with BN were found to perceive lower emotional connectedness within their families even before the onset of the eating disorder, whereas for patients with AN, the low perceived autonomy seemed to be a consequence of the disease (Huemer et al. 2012).

The majority of previous longitudinal studies also do not allow it to be differentiated whether certain family structures and interactions pose a risk for the development of AN or BN or are a consequence of the disease (Cierpka and Reich 2001; Calam and Waller 1998; Button et al. 1996; Attie and Brooks-Gunn 1989). Cross-sectional surveys suggest that pathological family structures and functions are more likely to be associated with the severity and chronicity of anorexia nervosa and are less etiologically significant (Jacobi et al. 2004).

► **Important** The strong mental and psychological strain on relatives due to the illness of their daughter or son can be reflected in emotional reactions and corresponding changes in family interactions, which do not necessarily cause the eating disorder but are a consequence of it (Treasure et al. 2008).

19.3 Conclusions for Practice

The importance of family and familial relationships in the development and maintenance of eating disorders is confirmed. However, the results of scientific studies are so diverse that no definitive statements can be made about causal relationships. Some, but not all, results of studies in families of individuals with eating disorders support the psychosomatic family constellation described by Minuchin (enmeshed, overprotective, rigid, conflict-avoidant, poor problem-solving capacity). However, there are no substantial data today that confirm the empirical model of the psychosomatic family, as conceived by the pioneers of family therapy. A multifactorial genesis of eating disorders is nowadays assumed, in which, in addition to genetic and other factors, the family also plays a role (Erriu et al. 2020). More recent empirical studies have identified factors that view the role of the family in a more differentiated manner and also support the inclusion of the family in therapy.

Table 19.1 Label: empirical findings on specific areas concerning the family of patients with eating disorders

Stressful life events	<p>Loss of parents through death or separation are probably not more frequent than in control groups (possibly in BN)</p> <p>Sexual abuse is as common as in other mental disorders, not specific to eating disorders (Esman 1994; Vize and Cooper 1995), often associated with further problems such as alcohol abuse, theft, and suicide attempts</p> <p>Traumatic childhood experiences in patients with BN are as common as in severe depression, patients with AN rather comparable to general population (Webster and Palmer 2000)</p> <p>Childhood maltreatment, e.g. harsh physical punishment, physical abuse, sexual abuse, emotional abuse, physical neglect, and threat by intimate partner are associated with increased occurrence of AN, BN, and BED in adulthood (Afifi et al. 2017)</p> <p>Parental intrusiveness and/or withdrawal from contacts with children in the first five years of life may promote the development of eating disorders in puberty, especially if parents have experienced traumatic events and physical or psychological abuse in their own lives (Le Grange et al. 2010)</p>
Personality and attitude of parents	<p>Stereotypes: Mother dominating, over-involved, emotionally less available, fathers emotionally distant, weak and passive, not empirically confirmed</p> <p>Parents of patients with BN, who may more frequently have weight problems or show preoccupation with nutrition</p> <p>Promotion of negative attitudes towards one's own body through critical comments on figure, weight, and eating behavior (Stice and Agras 1998; Van den Berg et al. 2002; Laghi et al. 2016)</p>
Eating disorders and other mental disorders in the family	<p>In siblings, anorexic eating disorders and weight problems are more common than expected, especially</p> <p>Affective, substance-induced (in BN) and obsessive-compulsive disorders (in AN) are more common than expected, probably independent of predisposition to eating disorders, compusiveness as a risk factor for AN (Lilenfeld et al. 1998)</p> <p>Parental mental illness, especially bipolar disorder, personality disorder, anxiety, and depression increase the risk of developing an eating disorder in the child (Bould et al. 2015b)</p> <p>Depression and anxiety disorders in mothers predispose to the development of an eating disorder (Crandall et al. 2015; Cimino et al. 2015)</p> <p>Burden of mental disorders, especially depression and addiction in parents, is increased in patients with BN (Fairburn et al. 1997)</p> <p>Prevalence of eating disorders and obesity increased in the family of origin (Strober et al. 2000)</p> <p>Maternal eating disorders combined with comorbid psychopathology increase the risk of psychiatric disorders in childhood and early adolescence, especially for emotional disorders (Micali et al. 2014)</p>
Prenatal and perinatal influences	<p>High prenatal stress in the mother as a possible risk factor</p> <p>Death of an older child or partner six months before pregnancy associated with a higher risk of eating disorders in children (Su et al. 2015, 2016)</p> <p>Anxiety disorder of the mother during pregnancy associated with an increased risk of eating disorder (Goodman et al. 2014)</p> <p>Prenatal and perinatal factors influence the development of eating disorders such as AN and BED (Watson et al. 2019)</p>

(continued)

Table 19.1 (continued)

Parent-child relationship, family structure and interaction	<p>Families with weak cohesion, low emotional expression, and excessive interpersonal dependency have a high risk of developing pathological eating behavior (Lyke and Matsen 2013; Goossens et al. 2012; Hoste et al. 2007; Steinhausen et al. 2005)</p> <p>Adolescents with eating disorders experience unsatisfactory family relationships, low parental acceptance (family warmth, empathy, emotional support) and limited independence among family members (Laghi et al. 2012).</p> <p>Rigid family rules with restrictions on discussion, addressing problematic topics, problem-solving (Pauls and Daniels 2000; Kog and Vandereycken 1989)</p> <p>Critical attitude and family pressure regarding body and shape with negative influence on eating behavior and disorder development—physical shape is an indicator of involvement and family rigidity, which strongly affects the development of the disorder, and the adoption of inadequate eating habits (Stice and Agras 1998; Van den Berg et al. 2002; Laghi et al. 2016).</p> <p>Increased family conflicts and feelings of stress and depression in parents (especially of patients with AN) (Sim et al. 2009)</p> <p>Symbiotic relationship patterns, fixed role patterns, oriented towards traditional value systems (Pauls and Daniels 2000; Kog and Vandereycken 1989)</p> <p>Studies with the Expressed-Emotion construct showed overall relatively low parental hostility and criticism (Hodes and Le Grange 1993)</p>
Eating disordered partners	Couples with an eating disordered partner are less relaxed in their interactions than non-affected couples, but more competent at communication than couples with explicitly disturbed couple relationships
Eating behavior of mothers	Mothers of patients with BN have a history of repeated dieting phases, serving as a model for so-called “restrained eating behavior” (Pike and Rodin 1991)
Influence on therapy course	Evidence in family therapeutic intervention studies that pathological family interactions are associated with negative therapy outcomes (Herzog et al. 2000; Russel et al. 1987; Robin et al. 1999; Eisler et al. 2000)

► **Important** The lack of empirical evidence for the etiological role of systemic and familial factors in the etiology of eating disorders does not contradict the important significance and empirical evidence for the effectiveness of family therapeutic approaches. However, it is likely that the influencing factors of family therapeutic interventions are based more on resource activation and support of the family in therapy (family as co-therapists) than on the remediation (or resolution) of questionable causal systemic factors.

Due to their importance, familial factors have also been included in therapeutic interventions in childhood and adolescence. Thus, in the

current S3 guidelines “Diagnosis and Therapy of Eating Disorders” for the treatment of AN and BN, family therapeutic interventions or the inclusion of parents or family in therapy were recommended (Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften 2020). In the treatment of binge eating disorder (BED) in children and adolescents, these recommendations have not been described so far.

In family therapeutic interventions for patients with eating disorders, knowledge about certain familial influencing factors can be helpful. A lack of meal structure within the family can lead to problems in developing healthy eating behavior in children and adolescents and to

the maintenance of these problems, critical comments within the family regarding weight and figure have a direct influence on the evaluation of patients and can make it difficult to develop a positive body image, family relationships, attachment experiences, and autonomy conflicts play an essential role in the development of self-esteem and identity.

Research findings on familial influencing factors are essential, not only for therapy but also for possible preventive measures.

For the therapy of patients with eating disorders, it is necessary to comprehensively analyze familial interaction patterns and use them for therapeutic intervention, as familial relationship patterns decisively influence self-esteem, autonomy striving, identity formation, and thinking and behavioral patterns of patients.

Regular and accompanying involvement of family members in the therapeutic process is therefore indispensable. Family members should be motivated to support the therapeutic process, especially for younger children, and to be involved as a resource in coping with the illness for adolescents or even adult "children."

It is also essential to recognize the uncertainty and distress of family members and their desire for information and support in dealing with their daughter's or son's illness and to support them accordingly. This can be done through direct involvement in the therapeutic process, with concrete support for family members (see Treasure et al. 2008), and/or by arranging further family therapeutic support.

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Genetic Aspects of Eating Disorders

20

Helge Frieling, Stefan Bleich and Vanessa Buchholz

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20.1 Anorexia Nervosa

Although the etiology of eating disorders and specifically anorexia nervosa (AN) was long considered to be predominantly psychosocially determined, in recent years, formal and molecular genetic studies have shown that hereditary influences also play a significant role. The investigation of the genetics of complex phenotypes such as AN, which can be broken down into numerous subtypes, endo- and subphenotypes, each showing their own genetic characteristics, is fraught with immense difficulties. AN is not a monogenic disease; rather, it is likely

that numerous genetic variants contribute to the pathology to varying degrees.

► **Definition** Molecular genetic research approaches

In molecular genetics, various approaches are used to investigate genetic influences on disorders/diseases:

Candidate gene studies. Genes whose protein products are suspected to have an influence on the investigated phenotypes are analyzed using the candidate gene approach. Candidates are derived from animal models, pharmacological studies, biochemical or physiological considerations. Initially, a mutation screen can help clarify the genetic variability at the gene. Associations of the found variants (alleles, genotypes) with investigated phenotypes can then be determined using association studies.

Association studies. In association studies, genetic variants (polymorphisms) in candidate genes are specifically investigated. Usually, a patient cohort is compared with a healthy control cohort. Positive association results must be independently replicated before an ‘actual’

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association with the investigated disorder can be assumed.

Genome-wide association studies. In this special case of association studies, no candidate genes are initially pursued. Genome-wide searches are conducted for genetic factors relevant to the investigated phenotypes. All genes located in the identified chromosomal regions are then examined more closely; a positional candidate gene analysis follows. Modern, chip-based analysis methods can simultaneously analyze millions of individual polymorphisms. Furthermore, it is possible to detect changes in larger chromosome segments (so-called copy number variations—CNV). Meanwhile, sequencing of complete expressed portions of the genome (“exome”) up to complete genome sequencing is also possible.

There is no “anorexia gene”!

20.1.1 Family and Twin Studies

The important role of a hereditary component in the etiology of AN was determined through family and twin studies. First-degree relatives of patients with AN have an approximately 10-fold increased risk of developing AN themselves compared to individuals without a family history. Furthermore, the risk for other eating disorders is also significantly increased. Twin studies quantified the hereditary proportion of AN at 30–80%, with the most recent and extensive analyses reporting around 50%. Here too, the captured phenotype plays an important role. If sub-syndromal characteristics of AN are also recorded in addition to the DSM IV criteria, the genetic proportion increases to about 75%.

20.1.2 Rare Variants

In recent years, thanks to advances in sequencing technology, initial genetic variants with high penetrance segregating in families have been discovered, some of which followed a Mendelian inheritance pattern. One of the

discovered genes is neuronatin (NNAT), which appears to play a role in AN mainly in men. NNAT encodes a proteolipid that is important for brain development. In other cases, rare variants have been described in genes involved in dopaminergic metabolism, the reward system, neurotrophins, and epigenetically relevant genes such as histone deacetylase 4.

20.1.3 Genome-wide Association Studies (GWAS)

In recent years, several genome-wide association studies (GWAS) on AN have been published. The largest GWAS to date included samples from the Anorexia Nervosa Genetic Initiative (ANGI) (Bulik et al. 2020), the Genetic Consortium for Anorexia Nervosa (GCAN), the Wellcome Trust Case Control Consortium-3 (WTCCC-3), and the UK Biobank, comparing 16,992 cases with 55,525 controls from 17 European countries. In this study, 8 significant loci were found in single genes, with the best results for the genes CADM1 (cell adhesion molecule 1), MGMT (Methylated o6-methylguanine-DNA-methyltransferase), FOXP1 (Forkhead box protein 1), and PTBP2 (Polypyrimidine tract-binding protein 2) (Watson et al. 2019). As expected, strong genetic correlations were found with other mental disorders such as compulsion, depression, anxiety disorders, and schizophrenia, while a negative correlation was observed with metabolic and anthropometric traits. These relationships, as well as a suspected genetic predisposition for increased physical activity, are currently leading to a re-conceptualization of our understanding of eating disorders.

Conclusion

So far, there are only a few confirmed genes (gene variants) for anorexia nervosa. However, a genetic predisposition to the disease mediated by numerous genes is confirmed, as is a genetic relationship of AN

with other mental disorders. The risk variants of genes identified so far can help to better understand the pathophysiological basis of AN (Stern and Bulik 2020).

20.2 Bulimia Nervosa and Binge Eating Disorder

20.2.1 Family and Twin Studies

As with AN, the estimates for the hereditary component of bulimia nervosa (BN) and binge eating disorder (BED) vary considerably. For BN, values between 28% and 83% are reported, while a study in BED estimates the hereditary contribution to the phenotype at 41%.

20.2.2 Association Studies

To date, several association studies have been conducted for BN and BED, but none have included sufficiently large cohorts. Only in a few cases were initially positive findings replicated. Among the most frequently studied genes are those encoding the serotonin transporter (5-HTTLPR), serotonin receptors (mainly 5-HT_{2A}, 5-HT_{2C}) and dopamine receptors (DRD2). An association with the Val66Met polymorphism in the BDNF gene with bulimic behaviors has also been reported, but an independent replication of this association also failed. There may be an association between binge-eating and variants in the melanocortin-4 receptor gene (MC4R). Mutations in MC4R, which lead to a functional restriction, are associated with obesity (Chap. 43).

The data situation appears somewhat more favorable when considering subphenotypes or disease-specific phenotypes: For example, increased affective instability, impulsivity, borderline personality traits, and *harm avoidance* were found in patients with BN with the short allele (S-allele) of the 5-HTTLPR. Other studies revealed an association between increased impulsivity and the 5-HT_{2A} gene in BN.

20.2.3 Genome-wide Association Studies

There are no published GWAS for BN so far. However, bulimic behaviors have already been investigated in various GWAS. To date, no risk variants with genome-wide significance have been identified.

20.3 Outlook—Gene-Environment Interactions and Epigenetics

In recent years, studies on various mental disorders have demonstrated the immense importance of so-called gene-environment interactions. In many cases, risk genes only turn out to be such under very specific environmental conditions, while under other circumstances they are either harmless or even possess protective properties. For example, it has been shown that carriers of the less active s-allele of 5-HTTLPR have an increased risk of becoming depressed after stress exposure. People who experienced early childhood trauma had a significantly increased risk of developing depression if they were homozygous for the same variant (5-HTTLPRs). A recent study showed that patients with BN who both carried the s-variant of 5-HTTLPR and had experienced severe childhood abuse reported stronger *sensation seeking* and developed a more insecure attachment style. In patients with AN, an interaction between psychosocial stress factors such as high parental control and disease risk was also found primarily in carriers of the s-allele of 5-HTTLPR. However, few studies have specifically investigated the role of gene-environment interactions in the context of eating disorders, although malnutrition and/or under-nutrition would lend themselves particularly well to such an association. It seems essential for future studies to also standardize the recording of various environmental conditions during development. Even if the first results raise hopes of better understanding the etiology of eating disorders, caution is warranted and hasty

conclusions must be avoided. The studies mentioned here also include small case numbers and have not been replicated. Only when these disadvantages of the studies are remedied will it be possible to assess the relevance of gene-environment interactions in a well-founded manner.

Molecular genetic analyses based on sequence information can only provide a static picture. However, genetic regulation is a highly dynamic process that can respond plastically to changes and thus also compensate for certain less favorable genotypes. Essential for this dynamic are the so-called epigenetic mechanisms, which control the activity of individual genes over a longer period. Essentially, this involves DNA methylation in promoter regions of genes and modifications of histone proteins that influence chromatin structure and micro-RNA species that can regulate gene activity even after transcription. DNA methylation, in particular, is strongly influenced by nutritional factors, so it is not surprising that changes in global DNA methylation have been found in patients with AN. However, specific changes in the form of increased methylation of individual gene promoters have also been described for AN and BN. So far, however, these are individual, rarely replicated findings that are often only available in cross-sectional studies. There are at least initial indications that methylation changes could be used as prognostic markers (Neyazi et al. 2019). The first methylome-wide studies have already been completed. However, the studies published so far are all highly heterogeneous and case numbers were too small to make definitive statements. Epigenetic mechanisms could well play a decisive role in mediating and integrating vulnerability, triggering factors, and maintaining factors of eating disorders (Steiger et al. 2019).

Conclusion

The investigation of genetic aspects of eating disorders has made significant progress

in recent years, but as expected, it has not led to the discovery of the “anorexia gene.” The current study data underline that eating disorders are complex diseases in which genetics *also* play a role.

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Psychosocial Risk Factors

21

Eike Fittig and Corinna Jacobi

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In the last 20 years, the number of studies on risk factors has increased rapidly. In this process, the term “risk factor” has been used excessively and inconsistently, which can be attributed to the lack of clear definitions. Proposals for clearer definitions were created by Kraemer et al. (1997) and are nowadays widely accepted. Since the corresponding definition for the term risk factor also underlies this chapter, the term will be introduced first.

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Definition of Risk Factors

A risk factor is the measurable characteristic of a person in a specific population that

- precedes an event (e.g., onset of illness) and
- increases the risk of the event occurring.

Risk factors that are not changeable, such as gender or ethnic affiliation, are referred to as “fixed markers.” If the temporal sequence of a factor cannot be demonstrated by longitudinal studies or by definition (ethnic affiliation, age), it is referred to as a correlate or a retrospective correlate if the relevant factor was recorded retrospectively in studies with a cross-sectional design.

In the following, the results of empirical studies on psychosocial risk factors and retrospective

correlates for anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED) are presented.

21.1 Anorexia nervosa

21.1.1 Gender

Numerous studies show that AN and BN occur significantly more frequently in women in both clinical and non-clinical samples. The prevalence of eating disorders differs only marginally in girls and boys aged 10–12 years. In adulthood, the prevalence of eating disorders in women is then increased by a factor of 10. Since female gender is also considered a risk factor for numerous other mental disorders, it is classified as a non-specific marker.

21.1.2 Ethnicity and Age

Although eating disorders have traditionally been seen primarily as a problem in Caucasian ethnicities, a review shows that increased or equally high rates of eating disorders were also found among “native Americans” and persons of Hispanic ethnicity. Lower prevalences were found among persons of African American or Asian ethnicity. Non-Asian ethnicity can therefore be classified as a marker for both AN and BN. Numerous studies report the highest incidence of eating disorders from adolescence to early adulthood, so this time period can be referred to as a variable risk factor.

21.1.3 Factors Related to Pregnancy and Birth

Based on several studies that retrospectively examined the frequency of complications during pregnancy and birth using hospital registers, an increased occurrence of preterm births, low birth weight, birth trauma, cephalohematomas, preeclampsia, and heart problems in newborns

was observed. In a study by Larsen et al. (2020), a complete survey of births in Denmark between 1989 and 2010 was conducted. This study also confirmed that preterm births were associated with the development of AN and BN. Furthermore, the authors report that higher parental age and maternal nicotine consumption could be classified as risk factors. These factors can be considered as specific fixed markers for AN and BN.

The results regarding the timing of birth as a marker are highly contradictory. While several studies classified births in the spring as a marker, other studies found no difference, and one study found that participants born between October and November had an increased risk of underweight and restrictive eating behavior at the age of 25–43 years.

21.1.4 Eating and Feeding Problems

In four longitudinal studies, the role of early eating and feeding problems was investigated. Based on these studies, picky eating, underweight in childhood, difficulties in feeding, and conflicts and struggles around food can be classified as risk factors for AN that are already relevant in early childhood.

21.1.5 Mother's Educational Level

In a Swedish cohort study (birth year 1953) with over 14,000 participants (22 participants with AN who were treated in hospital), the authors classified a higher educational level of the mother and “frequent comparisons of one’s own future perspective with others” as a risk factor for the development of AN.

21.1.6 Preoccupation with Shape and Weight/Dieting/Body Weight, Body Dissatisfaction

The relationship of dieting, a negative body image, and a preoccupation with shape and

weight with the likelihood of developing an eating disorder is one of the most frequently discussed associations in the context of etiological theories of eating disorders. Although numerous studies have found evidence for this association in AN using a cross-sectional design (sometimes also retrospectively assessed), most patients in longitudinal studies meet the diagnosis of BN. At the time of the new edition of this book, there are now six longitudinal studies that confirm the relationship of dieting and preoccupation with shape and weight with the development of AN. Stice and Desjardins (2018) reported that a low BMI was the most important risk factor for the development of AN and was further exacerbated by a high degree of body dissatisfaction.

21.1.7 Acculturation

In addition, the role of cultural adaptation (acculturation) in the development of an eating disorder is increasingly being discussed. The influence of this factor on the development of AN was confirmed in a cross-sectional study in which acculturation was retrospectively assessed.

21.1.8 Sexual Abuse

In the context of the etiology of eating disorders, great attention is also given to the role of sexual abuse in childhood and adolescence. In several cross-sectional studies, sexual abuse has been identified as a retrospective correlate. However, there are also studies that do not report this relationship. In a more recent retrospective study (Monteleone et al. 2019), the association with all dimensions of abuse was mediated by “emotional abuse.” To date, only one longitudinal study has addressed this question, in which only one patient with AN was identified.

21.1.9 Attachment Style and Family Climate

Attachment style, family climate, and the interaction between family members are attributed great importance in etiological models of eating disorders, especially from a historical perspective. In the majority of studies, patients with AN and BN evaluate various aspects of their family structure (interaction, cohesion, communication, emotionality, attachment, etc.) as more disturbed, conflict-ridden, pathological, or dysfunctional compared to healthy controls. Since the diagnosis of AN was not recorded as an outcome in any of the longitudinal studies in which these variables were assessed, there is currently no evidence that these variables represent risk factors for the development of AN. A highly overprotective parenting style was reported in a cross-sectional study in patients with AN prior to the onset of the disorder, so this factor can at least be described as a retrospective correlate. It is also postulated that adopted or foster children have an increased risk of developing an eating disorder. A study examining the role of this factor in a Swedish hospital registry confirmed that adoption or foster care placement is a risk factor for the development of AN.

21.1.10 Family Psychopathology

A significant number of studies have also dealt with the role of family psychopathology in the development of AN. Clear evidence is primarily available for the role of eating disorders (AN and BN), affective disorders, anxiety disorders (panic disorder, generalized anxiety disorder, obsessive-compulsive disorder), and an obsessive-compulsive personality disorder. However, none of the studies provided evidence for a clear temporal sequence of these factors. Based on these studies, family psychopathology can only be described as a (retrospective) correlate. However, in three cohort studies with several million participants, maternal depressive

symptoms, parental eating disorders, and paternal panic disorder were classified as risk factors for the development of AN. In one of the studies, a higher weight of the mother was also a **protective factor** with regard to the development of AN.

21.1.11 Own Psychopathology

The psychopathology or the presence of other mental disorders in the subjects themselves is also attributed a significant role in both etiological theories and scientific studies. To date, there are several longitudinal studies in which general psychiatric morbidity, psychopathology, or negative emotionality were investigated as potential risk factors. In a retrospective twin study, the authors reported that patients with restrictive AN often had internalizing psychopathology (e.g., social withdrawal, depression) before their illness, whereas patients with BN were more likely to have externalizing problems (e.g., emotional instability, conflicts).

In the few available longitudinal studies, depressive symptoms as well as anxiety and obsessive-compulsive disorders were classified as risk factors for AN.

21.1.12 Self-esteem

Low self-esteem, a negative self-concept, or “ineffectiveness” are likewise seen as influencing the development of AN. These assumptions have been consistently confirmed in cross-sectional studies. So far, however, only one longitudinal cohort study has provided evidence for this risk factor.

21.1.13 Perfectionism and Neuroticism

Perfectionism is particularly associated with AN from a clinical perspective. Patients with AN often show rigid, stereotyped, ritualized, or

perfectionistic behaviors. From a biopsychological perspective, perfectionistic personality characteristics have been primarily associated with changes in serotonin levels. A series of cross-sectional studies confirm that perfectionism is increased in remitted AN patients and can thus be described as a retrospective correlate. In a longitudinal Swedish cohort study ($N = 1.8$ million) by Sundquist et al. (2016), the authors reported an association between good school achievement and the development of AN. In a longitudinal study, increased neuroticism values were also classified as a risk factor for the development of AN.

21.1.14 Occupational Groups and Risk Sports

The question of whether occupational groups (models, actors) and various athletes (e.g., ballet dancers, gymnasts, jockeys, ski jumpers), in which the importance of figure and low weight is emphasized, can be considered high-risk groups for the development of an eating disorder, has been discussed for over 20 years. Although eating disorder-related symptoms and behaviors can often be observed in elite athletes, the prevalence of full-syndrome eating disorders (AN and BN) usually does not exceed that of control groups. Numerous cross-sectional studies also deal with the role of excessive exercise in the development and maintenance of an eating disorder. Only one study retrospectively assessed the extent of exercise before the onset of the eating disorder. In this study, anorexic and bulimic patients reported higher exercise than healthy control subjects.

Psychosocial risk factors and retrospective correlates (*in italics*) for AN

- Birth
 - Female gender
 - Non-Asian ethnicity

- Complications during pregnancy and birth (esp. preterm births)
- Higher educational level of the mother

• Childhood

- Age (adolescence to early adulthood)
- Health problems
- Picky eating, anorexic symptoms in childhood
- Feeding difficulties, conflicts and struggles over food
- Adoption or foster care
- Sleep problems
- Maternal depression, parental eating disorder, paternal panic disorder
- Low weight of the mother
- *Overprotective parenting style*
- *Childhood sleep disorder*
- *Childhood anxiety disorder*
- *Obsessive-compulsive personality disorder*
- *Sexual abuse*
- *High levels of loneliness and shyness*
- *Internalizing psychopathology*

• Adolescence

- Preoccupation with shape and weight/dieting, low BMI
- Psychopathology (anxiety and obsessive-compulsive disorders, depressive symptoms)
- Neuroticism
- Negative self-esteem
- Frequent comparisons of one's own future prospects with others
- Good academic achievement
- *Acculturation*
- *Excessive exercise*
- *Psychopathology beyond the above-mentioned risk factors*
- *A higher level of risk-laden personal, diet-related, and environmental factors (e.g., sports and professional groups; perfectionism)*

21.2 Bulimia nervosa

21.2.1 Gender, Ethnicity, Time of Birth, and Age

The roles of gender, ethnicity, and age have already been discussed in Sect. 21.1 as risk factors for AN. Thus, **female gender** and **non-Asian ethnicity** can be considered as fixed markers and **age** between adolescence and early adulthood as variable risk factors for BN. The time of birth seems to play little or no role in the development of BN. The findings in this regard are even more inconsistent than in the context of AN, and the majority of studies found no association between month of birth and the occurrence of BN. In three cross-sectional, retrospective studies, early onset of puberty was also classified as a fixed marker for BN.

21.2.2 Eating and Feeding Problems

The role of early eating and feeding problems has also been investigated in the context of the development of BN. Three longitudinal studies provided empirical evidence that Pica, insufficient food intake, and health problems in toddlers—as with AN—can be considered risk factors for the development of BN.

21.2.3 Preoccupation with Shape and Weight/Dieting/Body Weight

As in the context of the development of AN, dieting, a negative body image, and preoccupation with shape and weight are also attributed great importance in the development of BN. While this relationship was mainly confirmed empirically in cross-sectional studies for AN, there are about 20 longitudinal studies for BN. The results of these studies clearly underline the role of this factor, such that preoccupation with weight and shape can also be considered a risk

factor. In our own longitudinal study, we found a strong association between weight and shape concerns and the subsequent occurrence of (predominantly) bulimic eating disorders, as well as a potent relationship between initial compensatory behaviors and the subsequent occurrence of an eating disorder (Jacobi et al. 2011). With regard to weight, the results of longitudinal studies suggest that a higher body weight is associated with the development of BN. In the aforementioned study by Stice and Desjardins (2018), this is further reinforced by the presence of increased weight and shape concerns and the desire to be thin.

21.2.4 Acculturation

Cross-sectional studies have also demonstrated a relationship between retrospectively assessed acculturation and the development of BN.

21.2.5 Own Psychopathology

As already mentioned in Sect. 21.1, there are numerous studies investigating the role of psychopathology or negative affect in the development of eating disorders. Although the majority of these studies only have a cross-sectional design, there are also some longitudinal studies. These studies documented an influence of general psychopathology, social problems, negative affect (e.g., suicidal thoughts), emotional instability, and depression, such that preceding psychopathology can be classified as a risk factor for the development of BN based on these studies. Increased alcohol consumption within the last 30 days was also associated with the subsequent occurrence of an eating disorder in our own longitudinal study. Further retrospective correlates include an overanxious disorder and overweight during childhood, social phobia prior to BN, and externalizing psychopathology (e.g., emotional instability, conflicts).

21.2.6 Family Psychopathology

In the majority of cross-sectional studies, family psychopathology is likewise increased in BN compared to the parental psychopathology of healthy control subjects. Parents of patients with BN show a higher prevalence of eating disorders, affective disorders, substance disorders, and cluster-B personality disorders (e.g., borderline disorders) compared to the parents of healthy control persons. Unfortunately, the temporal sequence is not sufficiently proven in any of these studies. There are several cross-sectional studies in which family problems such as alcoholism, depression, drug abuse, and obesity were retrospectively assessed and can therefore be classified as retrospective correlates. In two longitudinal studies, a relationship between parental eating disorders and anxiety disorders was reported.

21.2.7 Sexual Abuse

Sexual abuse, especially during childhood, has been discussed in many studies and review articles as a risk factor for the development of BN. In cross-sectional, retrospective studies, consistently higher rates of sexual abuse are reported for patients with BN compared to healthy control persons. As already described in the context of AN, the association with all types of abuse seems to be mediated by the dimension of “emotional abuse.” In the only longitudinal study on this topic, an influence of negative life events (including sexual abuse) and physical neglect was demonstrated in a large representative population sample. Based on this study, sexual abuse can be classified as a risk factor for the development of BN.

21.2.8 Attachment Style and Family Climate, Negative Comments about Food, Weight, and Body Shape

Consistent with findings from AN risk factor studies on attachment style, family climate, and family member interaction, in cross-sectional studies, patients with BN describe various aspects of their family structure as more disturbed than do healthy control participants. Noteworthy in this regard are negative comments about weight, body shape, and food. In a longitudinal study, for example, the authors reported that being perceived as overweight by a parent was more strongly associated with the occurrence of an eating disorder than actual overweight. In our own longitudinal study, we found that negative comments about diet, weight, and body shape from siblings, teachers, or coaches were the most potent risk factors. Overall, the importance of teasing and negative comments about food, weight, and body shape is well documented in longitudinal studies. One longitudinal study demonstrated an influence of various family variables (such as unsatisfactory family interaction or insufficient parental affection); therefore, disturbed family interaction can be considered a risk factor based on this work. Another longitudinal study identified stress within the family as a non-specific risk factor for eating disorders (predominantly BN and partial eating disorders). High maternal care was a protective factor for the development of BN in the longitudinal study by Micali et al. (2017).

21.2.9 Problems with Self-Esteem

In contrast to risk factor studies for AN, there are several longitudinal studies investigating the influence of low self-esteem, negative self-concept, or “ineffectiveness” or low self-efficacy expectation on the development of BN investigate. Since a large part of these studies report that these factors increase the likelihood of BN, they can be considered risk factors.

21.2.10 Perfectionism and Neuroticism

The role of perfectionism in the development of BN has been analyzed in several longitudinal studies. However, only one of these studies was able to demonstrate an influence of perfectionism over time. This study also found that the development of BN or a subclinical eating disorder showed a significant positive association with the EDI subscale “Fear of Growing Up” and, surprisingly, a negative association with the subscale “Mistrust”. Higher academic achievement (Sect. 21.1.13) was also associated with the development of BN. In another longitudinal study, subjects who showed higher neuroticism scores also had a higher likelihood of developing BN.

21.2.11 Professional Groups and Risk Sports

There is currently no longitudinal study investigating the influence of various professional groups or sports on the development of BN. In terms of cross-sectional studies, the results are similar to those described in the previous section for AN.

Psychosocial Risk Factors and Retrospective Correlates (*in italics*) for BN

- Birth
 - Female gender
 - Non-Asian ethnicity
 - Complications during pregnancy and birth (premature births, birth traumas, cephalohematomas, preeclampsia, and heart problems in newborns)
- Childhood
 - Higher weight, perceived as overweight by parents
 - Health problems
 - Anxiety—Depression
 - Sexual abuse, physical neglect
 - Pica, difficulties in feeding

- *Disorder with overanxiousness*
- *Childhood sleep disorder*
- *Obesity, higher weight*
- *Externalizing psychopathology*
- **Adolescence**
 - Early onset of puberty
 - Worries/dissatisfaction regarding weight and shape, dieting
 - Negative comments about food, weight, and shape, teasing
 - Prodromal symptoms (compensatory behavior)
 - Negative emotionality, emotional instability, general psychopathology, social problems, major depression
 - Low self-esteem, ineffectiveness, low self-efficacy expectation
 - Unfavorable interaction patterns in the family, stress in the family, negative comments about weight and shape from siblings, teachers, or coaches
 - Maternal care protective
 - Alcohol consumption within the last 30 days
 - Youth-Self-Report “aggressive”, “unpopular”
 - High neuroticism scores
 - Good academic achievement
 - EDI scales: increased “fear of growing up” and low “mistrust”
 - Low interoceptive perception
 - Negative life events
 - Avoidant coping, distraction as coping
 - Low social support
 - *Acculturation*
 - *Sexual abuse, unfavorable life events*
 - *A higher level of risk-laden personal, diet-related, and environmental factors (higher athletic activity, unfavorable family experiences, parental alcohol dependence, depression, drug addiction; parental obesity; negative comments about weight and shape)*
 - *Social phobia*

21.2.12 Additional factors

A number of other factors have been classified as risk factors for the development of BN in various longitudinal studies. This concerned the two **Youth Self-Report subscales** “**aggressive**” and “**unpopular**” as well as **alcohol consumption** within the last 30 days, **delinquency** or **substance abuse**, **avoidant** and externalizing **coping** as well as **low social support**. The results of two longitudinal studies also suggest that in addition to unfavorable coping strategies, the increased occurrence of critical life events should be considered as a risk factor for the development of BN.

21.3 Binge Eating Disorder (BED)

Before the introduction of BED as a separate diagnosis in the DSM-5, there were only a few studies that explicitly investigated risk factors for the development of BED, and they predominantly only considered “unspecified eating disorders”. However, this category is likely to have included a substantial proportion of patients with BED.

The outcome of longitudinal risk factor studies is often a mixture of bulimic and binge-eating syndromes, so it can be assumed that a number of factors presented in Sect. 21.2 as risk factors for the development of BN may also be relevant in the development of BED. Therefore, only the results of longitudinal and cross-sectional studies will be presented in the following, where it can be ensured that the research criteria for BED were explicitly used as the outcome.

21.3.1 Findings from Longitudinal Studies

In contrast to low birth weight as a risk factor for AN, the results of a recent longitudinal study suggest an association between high birth weight and the development of BED (Watson et al. 2019).

In a longitudinal study, sexual **abuse or physical neglect** (assessed through a central register or interviews with mothers) was identified as a risk factor for the development of an eating disorder (BED and BN).

The influence of **low self-esteem**, high **body-related concerns**, as well as **avoidant coping and external control beliefs** on the development of BED has also been documented in several longitudinal studies. In the aforementioned study by Stice and Desjardins (2018), body dissatisfaction, exacerbated by overeating, was the most significant risk factor for the development of BED. Overeating in childhood was also associated with the development of BED in the longitudinal study by Herle et al. (2020).

A factor that includes concerns about weight, shape, and eating, as well as societal pressure to be thin, significantly predicted the development of an eating disorder in another longitudinal study. Furthermore, this study also found an increase in **negative life events** prior to the onset of the disease. Since both BN and BED patients were identified in this study, these mentioned factors can also be considered risk factors for the development of BED. In the study already presented in the context of risk factors for BN, 21 out of 96 participants with an eating disorder met the criteria for BED.

In this study, the following factors were associated with the onset of an eating disorder:

- drug use by the mother during pregnancy,
- high weight or being perceived as overweight by parents,
- stress in the family,
- dieting,
- social problems, and
- low self-efficacy.

In further longitudinal studies, external control beliefs, low self-esteem, teasing, body dissatisfaction, and high socioeconomic status were confirmed as risk factors.

21.3.2 Findings from Cross-sectional Studies

In addition to the listed longitudinal studies, there are three studies in which potential risk factors for the development of BED were retrospectively assessed.

In the first study, increased scores or frequencies were found for patients with BES compared to healthy control subjects for

- a negative self-concept,
- a major depression,
- difficult social behavior,
- self-harm behavior,
- parental criticism,
- high expectations,
- low affection,
- low parental involvement,
- low maternal care, and
- high overprotection.

In addition, patients with BED reported higher prevalences of sexual abuse, repeated physical abuse, intimidation within the family (bullying), negative comments and teasing about body shape, weight, and eating. Low parental involvement, negative comments about body shape, weight, and eating, as well as childhood obesity appear to be specific retrospective correlates for the development of BED.

In this second study, women with BED were compared to women without eating disorders with and without obesity in terms of their perception of their parents. Women who met the diagnosis of BED reported more paternal neglect and rejection than did women without obesity. Paternal neglect and rejection can therefore be described as retrospective correlates.

The frequencies of retrospectively recorded sexual and physical abuse, as well as intimidation and discrimination based on ethnic affiliation, were compared in the third study among women with BED with healthy controls and controls with mental disorders. Although women

with BED reported higher prevalences of sexual and physical abuse, bullying by peers, and discrimination than did the healthy control subjects, they only differed from controls with other mental disorders with respect to discrimination.

Psychosocial risk factors and retrospective correlates (*in italics*) for BED

- **Birth**
 - Maternal drug use during pregnancy
 - Higher birth weight
- **Childhood**
 - Higher weight, being perceived as overweight by parents
 - Sexual abuse, physical neglect
 - *Perceived neglect and rejection by parents*
 - *Obesity during childhood*
- **Adolescence**
 - Dieting
 - Overeating
 - Body dissatisfaction
 - Low self-esteem, low self-efficacy expectation
 - Worries about weight, shape, and eating, societal pressure to be thin
 - Negative life events
 - Coping (avoidant coping; eating to regulate emotions), external control beliefs
 - Low social support, social problems
 - Stress in the family
 - *Sexual abuse, repeated physical abuse*
 - *A higher level of risk-laden personal, diet-related, and environmental factors (e.g., negative self-esteem; major depression; difficult social behavior; self-harm behavior; parental criticism, high expectations, minimal affection, low parental engagement, as well as low maternal care and high overprotection)*
 - *Bullying within the family and by peers, discrimination, negative comments and teasing about shape, weight, and eating*

21.4 Interaction of Risk Factors in the Development of Eating Disorders

At the time of the first publication of this book, a substantial criticism of the existing state of knowledge about psychosocial risk factors in the context of the development of eating disorders was that individual studies hardly made any statements about the interaction of the various risk factors. In recent years, an increasing number of studies have been devoted to this issue, some of which will be summarized in this section. Some interactions of risk factors have already been reported above. In the study by Stice and Desjardins (2018), for example, an interaction of dieting (AN) or overeating (BN and BES) with the risk factor body dissatisfaction was shown in the development of both AN and BN and BED. The authors also consider these results as an indication of the relevance of the “dual pathway model”.

This model states that the internalization of a slim body ideal and the societal pressure to be thin lead to dissatisfaction with one’s body.

This dissatisfaction can lead to the development of an eating disorder through two pathways:

- by the affected person increasingly dieting, which subsequently leads to binge eating and compensatory measures;
- by dissatisfaction with one’s own body leading to increasing negative affect (up to depression) and binge eating as well as compensatory behaviors being used as emotion regulation strategies.

In our own work, we also found indications for the validity of the model: In a longitudinal study, a history of depression prior to the eating disorder on the one hand and weight and shape concerns on the other hand represented independent risk factors (Jacobi et al. 2011).

In the unpublished dissertation of the first author of this chapter, there were also indications that weight and shape concerns act as mediators between negative comments about weight and shape and the development of an eating disorder. This finding underlines the central, possibly causal role of the risk factor weight and shape concerns.

► **Important** The risk factor weight and shape concerns/dieting plays a central role in the development of an eating disorder.

21.5 Conclusion and Outlook

Although numerous studies on risk factors for eating disorders are now available, some limitations must be mentioned: As with the 3rd edition of this book, the majority of so-called risk studies come from studies with cross-sectional designs, so the results from these investigations can only be interpreted as correlates. Although most of the longitudinal studies were conducted with large sample sizes, the number of identified subjects with eating disorders is still too low to make general statements about the significance of the identified factors. Therefore, replication of many results is absolutely necessary. The evidence from longitudinal studies is significantly better for BN and BED than for AN, which is not least due to the low prevalence of AN. Finally, in the longitudinal studies, the various diagnoses as well as full-syndromal and partial disorders are mostly mixed. In the majority of the works, only eating disorders are recorded as outcomes, so the specificity of many of the risk factors described in this chapter is questionable. For example, there are a number of longitudinal studies that demonstrate that a preceding psychopathology is also relevant as a risk factor for the development of affective disorders.

In summary, it can be stated that female gender, concerns about shape and weight, dieting and overeating, as well as a negative self-esteem

represent both the most potent and the best-confirmed psychosocial risk factors for the development of an eating disorder. Since some of the risk factors presented here were classified only on the basis of one study, they are in need of replication. Likewise, the retrospective correlates require further examination within the framework of future longitudinal studies. In addition, it seems appropriate to examine the causal influence of the presented risk factors on the development of eating disorders in randomized and controlled prevention and intervention studies.

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Sociocultural Aspects of Eating Disorders

22

Burkard Jäger

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The occurrence of eating disorders varies considerably between different sociocultural groups and over time in a changing cultural environment. There are differences between various ethnic groups as well as differences between different cultures and between social subgroups in the otherwise same cultural-spatial environment, clearly independent of purely genetic influences. The most important aspect of these cultural factors seems to be the Western-influenced societal pressure to be slim, which is mainly conveyed

by the media and the social environment (peers and family). Sociocultural factors are thus to be assigned to the risk factors for the development of eating disorders and are in competition and interaction with other factors (see Chap. 21). However, the importance of the various socio-cultural characteristics is differently pronounced for the different diagnoses.

While eating disorders have long been considered predominantly as diseases of Western industrialized nations, today—with the exception of natural societies, as far as they still exist—a worldwide distribution can be assumed. In particular, countries that have adapted more or less rapidly to Western values seem to have a particular vulnerability to eating disorders and now show very similar prevalence rates.

- **Important** Recent studies are increasingly demonstrating a worldwide distribution of eating disorders.

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22.1 Anorexia nervosa

22.1.1 Cultural-historical perspective

Individual cases of obvious anorexic illnesses, albeit not yet called as such, have been reported since medieval historiography at least. The circumstance of getting by with almost no food was usually explained as the implementation of the Christian-clerical ideal of pious asceticism. The case of Catarina of Siena (around 1347–1380), a patroness of the Dominican Order and temporary advisor to Pope Gregory XI, is considered prototypical. She owed her popularity and her later political influence to an alleged prophetic gift and her strict fasting, which began in adolescence and continued until her death, which was partly caused by it. The recognition offered by such an “achievement” was able to establish a career as a nun or even as a “saint” and thus support a detachment from the family—a role offer that no longer exists in this form today.

The cases of anorexics from the Middle Ages and the beginning of modern times already include the characteristic of role model function or “social contagion,” as we know it in today’s manifestations of eating disorders. However, the clinical pictures—or their representation—regularly lack the characteristic of an overvalued desire for thinness, which was only described around the beginning of the last century.

22.1.2 Prevalence in Different Cultures

Hilde Bruch (1980) initially assumed that anorexia was practically absent in People of Color, as opposed to White people. This position is no longer tenable today, at least for People of Color in Western-oriented countries, even if critical attitudes towards one’s body seem to be less pronounced compared to other ethnicities (see below). Cases of anorexic disorders are reported from all cultures and all religious groups, but

the few valid studies on sociocultural changes show an increase, particularly in emerging countries. A difference between “Western” and other countries is also found for anorexia, with a lifetime prevalence (women, DSM-IV criteria) for Anorexia nervosa (AN) between 0.3% and 2.2% in Western countries compared to a rate of 0.002–0.9% in non-Western or non-developed countries (Makino et al. 2004). Hoek (2016) cites a prevalence rate of 1.05% for women in China, 0.43% for Japan, 0.1% for South America, and a very low value of <0.01% for Africa; the low prevalence for African-American women is also confirmed for anorexia diagnoses according to the DSM-5 (Cheng et al. 2019).

22.1.3 Influences of the Thin Body Ideal

The desire to conform to the prevailing beauty ideal is not the main focus of anorexic illness; the pathological aspect lies on an intrapsychic or interpersonal level and is not associated with a desire for conformity. Due to the absence of this characteristic in historical reports and in Asian countries, it has also been discussed whether the fear of body fat represents an additional feature alongside the common criteria of AN. Nevertheless, the mentioned increases in the prevalence of the disease often run parallel to industrialization and the adoption of Western beauty ideals.

► **Important** Anorexia is not tied to the desire for thinness but is supported and legitimized by it. It can also be triggered by fashion-conscious diet attempts, but in the further progression of the disorder, it clearly separates from an orientation towards societal ideals.

22.1.4 Other Sociocultural Influencing Factors

The long-reported observation that anorexia predominantly occurs in higher socioeconomic

classes (see Gard and Freeman 1996) is repeatedly confirmed in more recent works, with even the generation of grandparents showing an influence (Ahren-Moonga et al. 2009).

As “Anorexia athletica”, anorexic disorders are referred to in the context of sports where a low weight promises a competitive advantage, such as gymnastics, ballet, and endurance sports, and for men additionally ski jumping. Only recently has the generation of middle-aged adults received attention regarding the prevalence of eating disorders, which were previously considered firmly tied to adolescence and young adulthood.

22.2 Bulimia nervosa

22.2.1 Cultural-Historical Perspective

The origin of the term from Greek and the translation as “ox hunger” already suggests a historical root. Hedonistic, bulimic rituals with feasting and subsequent, deliberately induced vomiting are known, for example, from pre-Christian Egypt, Greece, and the Roman Empire; however, these lack the characteristic of using these practices as a means of weight control. From about the middle of the 19th century, rare case reports of insatiable hunger are described, which often had a psychiatric or neurological background and were not followed by deliberate vomiting or another measure of regulating energy intake (Habermas 1990). Despite initial contrary speculations, it is now assumed that the syndrome of bulimia, in contrast to anorexia, has actually only developed with significant frequency since the 1950s. The first comprehensive description is known to be from 1979, and the first recognition as a disease entity occurred in 1980. The question arises whether the recognition as a disease has contributed as an iatrogenic factor to the epidemic spread.

22.2.2 Prevalence in Cultures with and without Connection to Western Media Content

Much more clearly than in anorexia, there is a clustering of the disease in countries and cultures under the influence of a Western-shaped beauty ideal with the outstanding importance of the ideal of thinness (Makino et al. 2004). Just a few decades ago, bulimic eating disorders were unknown in countries other than those culturally influenced by the West, whereas prevalence rates of up to 20% were estimated for the risk population in the USA. As far as natural societies without significant Western influence can still be found at all, there is or was a widespread abstinence from the ideal of slimness: Peruvian Indians, who were shown female silhouettes of model proportions, judged their health status as “almost dead” (Yu and Shepard 1998). In Western cultures, occurrence rates of 0.3%–7.3% are reported, in non-Western countries 0.46–3.2% (Makino et al. 2004). Hoek (2016) cites a prevalence of 2.98% for China, 2.32% for Japan, 1.16% for Latin America, and 0.87% for Africa (women).

A wealth of studies have examined attitudes towards slimness and the frequency of bulimia nervosa (BN) among Americans or Britons of different ethnic origins. While a different ethnic-cultural background was once considered a protective factor, Latin American, Asian, or African women now show a similarly high degree of body dissatisfaction and bulimic attitudes as Caucasian women (Cheng et al. 2019). Again, people with Black skin color show the lowest frequency, which is explained by the fact that the African subculture may provide protection against negative, body-related cognitions. When assessing these relationships, it should be noted that the risks for a pathogenic desire for thinness increase with an elevated BMI, which can be genetically, socio-culturally, or behaviorally based.

22.2.3 Influences of the Thin Body Ideal

In the case of AN, there is a stable and difficult-to-treat internalization of the ideal of a (too-) thin body, which is also recognized as an important risk factor for the disease even with critical reception (Culbert et al. 2015). There is hardly a patient with a bulimic disorder who does not have a career of years of more or less frustrated attempts at weight control and weight loss.

Role of the Media The ubiquitous desire for thinness in Western societies is inconceivable without the widespread and aggressive marketing of a thin ideal. Here, the classic print and film media, but especially the internet media with the prevailing promotion of aesthetically optimistic life plans and templates for individual identification figures, are of great importance. Media consumption is considered an acknowledged risk factor for eating disorders in women (Culbert et al. 2015) (see Chap. 23).

- ▶ **Important** The causal link between the reception of overly thin models and the development of bulimic symptoms can be considered well-established.

Barbie's Big Sister

There is a wealth of research on the question of when the thin body was idealized and accepted as an undisputed model. Although the extremely thin model "Twiggy" (approx. 1966–1971) was still admired as an exception to the norm, various authors have shown that not only the bodies depicted in fashion magazines and men's magazines became increasingly thinner, especially towards the end of the 1970s and the beginning of the 1980s, but also—in association with the increasing prevalence of obesity—increasingly deviated from the realistic body image of the age-matched female population. On the other hand, Mattel®'s Barbie doll, with its clearly anorectic body proportions, was

already launched in 1962, and its older, German-born sister (and patent model) "Lilli" (Fig. 22.1) even as early as 1955, i.e., at the time of the beginning of a prosperous post-war economy and a then welcomed, again macronutrient-rich cooking culture.

Role of Peers A similarly significant role to mass media is played by peers, i.e., same-sex and approximately same-age adolescents, as well as the model of parents. In Western-oriented countries, the ideal of slimness and



Fig. 22.1 "Lilli", big sister and patent model of the Barbie doll. (© Thomas Goldschmidt, Badisches Landesmuseum Karlsruhe, with kind permission)

symptomatic behavior are conveyed through pronounced social comparison within peers (Keski-Rahkonen and Mustelin 2016). This problematic behavior has been further promoted by social networking sites, which are particularly popular among young people. Here, the limiting function of interpersonal ethics (consideration, politeness, etc.) seems to be particularly suspended in the face of open defamation of non-ideal physicality. The parental influence on the development of an eating disorder should not be underestimated either. Parents' dissatisfaction with their own weight and rigid weight control measures predispose to incorrect model learning, especially when this is associated with criticism of the child's body weight is.

Fig. 22.2 shows body self-evaluation and desire for thinness in 14 national and ethnic groups of female student populations ($n = 2468$) in the empirical relative of a silhouette scale.

The Role of Men The role of men is controversial. On the one hand, in a still male-dominated society, most decisions about employing

models or casting film roles can be considered male-influenced, but studies on body image consistently show that the female ideal figure from a male perspective is less thin than from a female perspective! One explanation is that the thin body, in addition to the component of social advantages, seems to have its own inherent attractiveness and an inherent "promise of salvation."

22.2.4 Further sociocultural influencing factors

For bulimia nervosa, the correlation with a higher socioeconomic status—unlike anorexia—is not found, and there is evidence that increased prevalence rates are more likely to be found with low family income and educational level (see Gard and Freeman 1996). Lower socioeconomic status is relatively well-established as being linked to an increased risk of overweight, which in turn has a pathogenic effect towards bulimia. Finally, in Western European

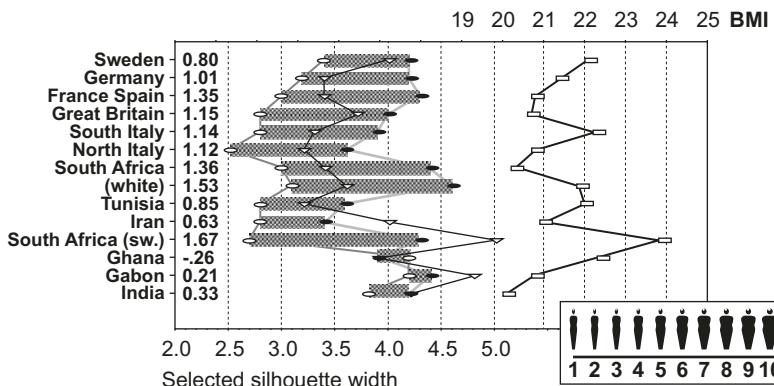


Fig. 22.2 Body self-evaluation and desire for thinness in 14 national and ethnic groups of female student populations ($n = 2,468$) in the empirical relative of a silhouette scale. Shown are the averaged results for participants' current self-evaluation (black ovals) and how she would like to look in the body silhouette (white ovals). In addition, the evaluation of an "attractive" female silhouette by men of the same culture ($N = 1,757$) is shown (white triangles) as well as the average BMI of the sample (white rectangles). The difference between "current" and "ideal" self-evaluation is calculated as "desire for thinness" (gray hatched fields). There are striking differences [$F(df = 13) = 15.1$; $p < 0.001$] in the desire for thinness, corresponding to the degree of orientation towards Western culture, with particularly extreme expressions in the European Mediterranean countries. Only in South Africa can the extreme desire for thinness be explained by an increased BMI in both White and Black subjects. As expected, hardly any desire for thinness, or even a "negative" desire for thinness, is formed in Central Africa and India, while the societies in transition in Tunisia and Iran take a middle position (see Jäger et al. 2002).

countries, both dancers and practitioners of weight-class sports (e.g., martial arts) or sports with a clear advantage at low weight form subcultures with an increased likelihood of bulimia. Systematic studies have also relativized the influence of adolescent age as a high-risk factor: a similar proportion of illnesses is found in middle adulthood as in younger people (Slevec and Tiggemann 2011). Body dissatisfaction even increases with age, with the effect almost entirely explained by the increasing BMI.

22.3 Cultural Factors in Weight Gain, Obesity, and Binge Eating Disorder

22.3.1 The Role of Norms and Ideals in Media and Public Morality

The risk of adopting an increased body weight is significantly higher in Western countries and, in addition to being a prerequisite for developing obesity, also poses a risk for bulimia and binge eating disorder (BED). In addition to the significant influence of genetic predisposition, the culture-specific abundance of calorie-dense food combined with a lack of exercise is primarily responsible for the epidemic weight gain. The average daily TV consumption is significantly positively associated with increased body weight. For BED, the distribution pattern across ethnic groups does not follow the pattern seen in anorexia or bulimia. BED is much more dependent on body weight and thus possibly on biological-genetic factors. Hoek (2016) found the highest prevalence of 4.45% among Africans, similarly found among African Americans in the USA (Cheng et al. 2019; DSM-5 diagnoses).

Unlike the thin ideal, a voluminous body ideal has not been actively promoted and has not been associated with positive values for at least 60 years—on the contrary, the role of the media is mostly limited to unrealistically propagating the feasibility of substantial weight loss and repeating the popular, negative associations with obesity.

► **Important** The extent of societal stigmatization of overweight is comprehensive and hardly limited by conventions or taboos.

The characteristic of being overweight is associated with traits such as sluggish, lazy, uncontrolled, undisciplined, and stupid. Social psychological experiments show that overweight individuals in our Western-influenced cultures, for example, earn less, are less likely to get a job, are less likely to be accepted as tenants, and receive longer prison sentences. Even kindergarten children prefer a ragged doll to a fat one and attribute great importance to body weight for social position—and among children, these assimilated attitudes are particularly unmitigated by primary or social secondary virtues. Teachers rate school essays by overweight children—within the framework of a controlled experiment—worse than those by normal-weight children, and representatives of health disciplines unfortunately often contribute to the perpetuation of the corresponding prejudices. While the negative physical long-term consequences of obesity often only occur after a disease duration of 10–20 years, the psychological exclusion and stigmatization begin immediately with the onset! At best, in selected social niches—top male politicians, male business leaders—a residue of the association “weighty = powerful = successful” handed down from the Middle Ages still remains.

22.4 Common Factors: Upheaval and Migration, Religious Orientation, and Role Expectations for Women

Regardless of ethnic origin or cultural environment, it regularly becomes apparent that migration—more precisely, acculturative stress—represents an independent risk factor (Warren and Akoury 2020). There is increasing data from Eastern European countries (especially Poland, Hungary, Czech Republic, and the territory of the former GDR) indicating a further convergence of eating disorder-specific attitudes

since the time of political upheaval. Studies from the United Arab Emirates point in a similar direction. Several studies from Iran show an increasing convergence with the data of Western countries over time, which seems particularly interesting for this culturally “ambivalent” country regarding eating disorders. Regarding the influence of religious values orientation—Christian and Jewish—the following seems to apply: A firm and secure attachment to faith is associated with less eating disorder pathology and greater satisfaction with one’s body, thus providing protection against eating disorders, but this protection does not exist in an insecure or superficial relationship (Akrawi et al. 2015). Similar results are found for the comparison of veiled vs. non-veiled Muslim women (Wilhelm et al. 2018).

Sociological and feminist explanations focus on the still high gender specificity of eating disorders. Popular theses from the 1970s and 1980s, stating that those with eating disorders were particularly feminine in the sense of a passive-dependent attitude, have been empirically refined to show that those affected orient themselves particularly strongly towards prevailing ideal conceptions and have a more pronounced need for social recognition. Migration movements, in turn, are often associated with changes in women’s roles, which primarily involve an unfavorable expansion of role expectations (the “pressure to conform” plus the “pressure to compete”).

22.5 Conclusion and Limitations

On the one hand, a worldwide prevalence of eating disorders can be observed in the sociocultural comparison, while on the other hand, meaningful interpretable differences can be found, which can essentially be explained by the degree of Western vs. traditional orientation as well as the factor of forced acculturation. The originally Western ideal of thinness plays a prominent role in this, which can be interpreted as causal based on a multitude of findings from longitudinal and experimental studies. The most

significant effect of these ideals, which are also disseminated through mass media, can be observed for bulimia, whereas the occurrence of anorexia is not tied to a widespread desire for thinness but is apparently legitimized and reinforced by it.

For other sociocultural influences, such as socioeconomic status, the available findings are less clear.

The relationships referred to here are presented with a strong focus on women. This is partly because the cultural body ideal of men, encompassing leanness and muscularity, has two partly contradictory and partly difficult-to-distinguish characteristics, and the results are less clear. On the other hand, the still significantly higher prevalence rates suggest focusing on women.

When comparing epidemiological data across cultures and continents, it should also be noted that this is fraught with particular methodological uncertainties, which affect case definitions and sample selection, as well as difficult-to-control influences such as semantic uncertainties and translation effects in questionnaires (Chap. 10).

Dealing with cultural norms also points to an ethical dimension of this issue. If one accepts—with the above-mentioned limitations—the disease-promoting influence of a uniform thinness ideal, a political response similar to national initiatives banning the depiction of anorexic models should be considered. Beliefs and norms can be changed, as the example of the popularization of basic ecological beliefs shows. In principle, this should also be possible with regard to the esteem for thinness of one’s own and other people’s bodies.

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The Influence of Media on Body Image

23

Maya Götz

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Media is a part of everyday life for children and adolescents and can play an important role in the development of internalized body ideals, a healthy lifestyle, etc. The basic problem: For the most part, only young and very slim women are shown in the media. This starts with children's television and continues with shows like the international "Next Top Model" franchise and on social media platforms like Instagram. The almost consistent hidden message is: Only women who are stereotypically beautiful, young, and exceptionally thin have a happy and successful life. If girls and women internalize this image, the likelihood of them being dissatisfied with their own bodies is high. If the need for constant self-optimization is propagated and any deviation from this body image is pathologized,

as happens in "Fitspiration" and "Pro-Ana" communities, people can be led into an eating disorder and unhealthy eating behavior can be promoted.

23.1 The Media Image of the Female Body

Women are significantly underrepresented in almost all media. On television, for example, they play only half as many leading roles as men and are then almost exclusively young, stereotypically beautiful, and slim (Prommer and Linke 2019). The normal diversity of body and appearance is hardly ever seen on television and in film. This tendency runs through various media and is also clearly evident in magazines, advertising, and the fashion industry (for a summary, see for example, Kiehl 2010). Over the decades, there has been an increasing "slimming down" in the media: While thirty years ago, photo models were only about 8% thinner

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than an average woman, they are now about 23% slimmer (Derenne and Beresin 2006). As a result, only an estimated 4% of all women would be physically able to meet the beauty ideal, and only one in 40,000 women would meet the requirements of a professional model in terms of size, shape, and weight (Hawkins et al. 2004).

The dominance of ultra-thin girl and women figures already begins in children's media. On children's television, half of all cartoon characters are drawn with a waist so slim that it is not naturally possible (Linke et al. 2017). For internationally marketed cartoon characters representing a teenage girl or woman, it is even three-quarters (Götz and Herche 2013). This means that girls grow up with a body image that they can never achieve. In some girls, seeing such images leads, as experimental studies have shown, to a spontaneous decline in satisfaction with their own bodies (e.g., Bell and Dittmar 2011). The crucial factor is the extent to which girls and women have internalized the ideal of a very thin body (Harrison 2013).

► **Important** The body image of women shown in the media is unattainable for most. If girls and women internalize this image, the likelihood of them being dissatisfied with their own bodies is high.

23.2 Television Shows and Eating Disorders

The importance of media for people's internal images does not follow a simple stimulus-response logic, but is a form of appropriation and subjective attribution of meaning in everyday life (Mikos 2015). Media can be part of the development, course, and coping with disordered eating. In the development phase, in a number of patients, it is shown that girls and women feel inferior to the thin beauty ideal of the media, feel helpless and trapped by the images. During the course of the illness, they then take guidance from various shows on how to manipulate their weight (Baumann 2009; IZI/

BFE 2016). Television also creates spaces where the topic of "eating" does not have to be thought about, at least temporarily (Märschel 2007). In the phase of active coping with the eating disorder, the unmasking of media stereotypes and the demarcation from the underweight beauty ideals, the "diet terror" and the contradictory advertising messages can play a significant role (Baumann 2009).

In the last decade, the show *Germany's Next Topmodel* (*GNTM*) has played a prominent role in this context. Almost a third of 9-year-old girls have watched the show at least sometimes, rising to two thirds of 10-year-olds, and nine in ten 16-year-olds (Götz et al. 2015). There is a high, significant correlation between thoughts of being too fat and watching *GNTM*. In particular, underweight girls who watch *GNTM* are almost five times more likely to have thoughts of being too fat compared to underweight girls who never watch *GNTM* (Götz et al. 2015). In a survey of people (mostly women) undergoing treatment for an eating disorder, just under one third attributed a "very strong" influence of *GNTM* on the development of their illness, and another just under one third attributed at least "some" influence. The impact of the show is predicated, among other factors, by conveying the impression that the contestants are "ordinary girls." In fact, the cast participants are physical exceptions, all with a minimum height of 1.76 m and a maximum clothing size of 36. The girls watching them in front of their television or laptop take this appearance as a role model and compare their bodies in detail with the staged bodies of the contestants. If they then follow the central narrative patterns of the show, that only unconditional self-optimization and adaptation to market demands bring success and recognition, this can reinforce disordered eating behavior (Götz and Mendel 2016a; Götz et al. 2015).

► **Important** Shows like *Germany's Next Topmodel* can influence the development of an eating disorder because they promote an unattainable body image for most women as normal, and encourage constant self-optimization.

23.3 Social Media and Body Dissatisfaction

Stereotypical role models of women and a very limited image of the female body also dominate in social media. Influencers stage themselves in the same poses over and over again (Götz and Becker 2019). Girls imitate this and, where their physicality is not enough, use digital filters to smooth hair and skin, lengthen legs, and make the stomach flatter (Götz 2019a, b). The use of social media can be associated with a change in self-perception and dissatisfaction with one's body. Studies on *Facebook* have frequently demonstrated a spontaneous association between viewing images of thin women and increased criticism of and dissatisfaction with one's own body (Cohen and Blaszcynski 2015; Eckler et al. 2017; Frost and Rickwood 2017; Mingoia et al. 2017). Frequent use of social media increases the likelihood of increased body dissatisfaction and susceptibility to feedback from peers in both girls and boys (De Vries et al. 2016). Girls are significantly more affected than boys (Hartas 2021). This effect is mitigated, for example, by a good relationship with the mother, but the effect cannot be completely eradicated (De Vries and Vossen 2019), as the crucial factor is probably the extent to which girls and women compare themselves with body images they consider attractive (Hogue and Mills 2019).

In the so-called "highly-visual social media" (HVSM) such as *Instagram* and *Snapchat*, the association between use and body dissatisfaction is even more consistent (Marengo et al. 2018). Increased use of *Instagram* among young women is associated with higher self-objectification, comparison with influencers, and internalization of a thin body image (Brown and Tiggemann 2016; Cohen et al. 2017). Fitness communities are of particular relevance, as the higher their use, the higher the tendency towards body dissatisfaction (Fardouly et al. 2018). In "Fitspiration" communities, very thin, fit people present their bodies as ideal and construct knowledge about health that initially seems to correspond to common health and nutrition

recommendations. However, "being healthy and fit" here primarily means "looking healthy and fit." Anorexia and Adonis complex are declared cultural phenomena, and people who do not conform to this ideal are stigmatized and pathologized. The constant calculation of calorie content in food, e.g., with corresponding tracking apps, the renunciation of sugar, and excessive physical activity, including daily photographing and posting of one's own flat stomach, are promoted. These potentially compulsive behaviors have the potential to accompany women into depression and eating disorders (Klapp and Klotter 2019).

► **Important** Social media, especially the very image-oriented sites like *Instagram*, can promote a decrease in satisfaction with oneself. In particular, "Fitspiration" communities pathologize any deviation from the ideal body, which is unattainable for most people.

23.4 Social Media and Eating Disorders

In a meta-analysis, Holland and Tiggemann concluded that the use of social media (at that time mostly *Facebook*) can be associated with disordered eating behavior (Holland and Tiggemann 2016). Girls who regularly post pictures of themselves on social media show a higher internalization of the thin ideal, more often take measures to control their eating behavior (McLean et al. 2015), and show more frequent bulimic symptoms (Cohen et al. 2018). This is particularly evident in communities where disordered eating behavior is the focus or where the eating disorder itself is promoted, such as the "Pro-ANA" movement (Eikey and Booth 2017). Websites in the "Fitspiration" and "Thinspiration" areas promote comparing one's own body with the very thin bodies depicted and can thus trigger symptomatic behavior in people with eating disorders (Griffiths et al. 2018).

In studies with people undergoing treatment for eating disorders, it becomes clear that social

media fits into the thoughts promoting eating disorders. Affected individuals compare themselves online particularly often with others and are more concerned with food, weight, and body image (Bachner-Melman et al. 2018). When studies address the subjective perspective of women with eating disorders, it becomes clear that *Instagram* is currently the preferred platform. The world of beautiful and perfect images fits particularly well into the disease symptoms. The images uploaded by women affected by an eating disorder are primarily body-related, and seven out of ten women use digital filters to improve their images—significantly more than people without a diagnosed eating disorder. The affected individuals describe, in part, a negative spiral in which they experience themselves as deficient and strive for perfect images, combined with a self-critical view of their own posts, a special attribution of importance to likes and comments, and following influencers (Götz et al. 2019; Wunderer et al. 2020).

- **Important** The use of social media and especially communities like “Pro-ANA” can accompany people into an eating disorder and promote harmful eating behavior.

23.5 What Might Help?

The one-sided, mostly extremely thin image of the female body puts immense pressure on girls and women and promotes body dissatisfaction. Accordingly, there is an urgent need for more diversity in body shapes, a minimum BMI, and breaking the repeatedly postulated claim that a slim figure is a prerequisite for happiness and social success. Responsible media professionals avoid discrimination based on weight and devaluation and criticism of body weight and individual body parts, and instead promote engagement with healthy nutrition (IZI/BFE 2016, p. 158 f.).

An important expansion to the dominant thin, athletic, and partly underweight bodies are contributions and websites on the topic

of “Body Positivity.” Posts with hashtags like #BodyPositivity, #healthateverysize, and #fitfamGermany criticize the dominant beauty ideal and advocate for an evidence-based paradigm shift in health promotion and more diversity in body image (Klapp and Klotter 2019; Cwynar-Horta 2016; Webba et al. 2017). While the goal of the fitness community is self-optimization, the body positivity community is about self-love (Klapp and Klotter 2019, p. 364).

Another approach is the promotion of media literacy, a critical examination of formats like *Germany’s Next Topmodel* (Götz and Mendel 2016a, 2016b) or the exposure of digital alterations of images on social networks. However, knowing that the images have been altered does not provide relief on its own. When young people know that an image has been retouched and idealized, it even increases the spontaneous effect of body dissatisfaction regarding their own appearance (Harrison and Hefner 2014). In a study on the “Instagram vs. Reality” campaign, in which influencers published a combination of their original images and the staged and digitally altered images, a generally positive (but not significant) effect on self-esteem and appreciation of one’s own body was observed. The surveyed women recognized the idea and intention behind the campaign (“Nobody is perfect,” “The images on Instagram are mostly fake”), but this does not protect them from being unsettled by the idealized images in their own body feeling (Tiggemann and Anderberg 2019). One of the few empirically proven and effective moderating factors in increased body dissatisfaction after using and viewing idealized images on social media is knowledge of feminist content and the need for equality (Feltman and Szymanski 2018). In this respect, there is much to be said for introducing girls and young women to thoughts and knowledge about gender.

- **Important** Promoting critical media literacy, feminist knowledge, and the appreciation of counter-images like #BodyPositivity can help.

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Part III
Psychological Comorbidity



Affective Disorders and Anxiety Disorders

24

Jörn von Wietersheim

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24.1 Comorbidity in Mental Disorders

In the field of mental disorders, comorbidities, i.e., the simultaneous presence of several mental disorders, are relatively common. Here, the diagnostic criteria of several disorders apply simultaneously. From the data of the German Federal Health Survey 1998 (Wittchen and Jacobi 2001), it can be seen that 52% of diagnosed cases had only one disorder, while 48% met the criteria for two or more disorders simultaneously. These relatively high comorbidities lead to discussions about the extent to which the descriptive diagnostic schemes such as ICD-10/11 or DSM-IV and DSM-5 really capture independent diagnoses.

To investigate comorbidity, different methodological approaches can be chosen. For instance, a distinction is made between cross-sectional, longitudinal, and family studies. Each of these approaches offers advantages and disadvantages. Cross-sectional studies are most commonly used, asking whether different disorder patterns are present simultaneously or have been present in the past. Longitudinal studies, on the other hand, offer the possibility of tracking how disorders can also replace each other. In family-related studies, it can be examined to what extent disorders occur more frequently in families. It must also be taken into account which methods are used to determine the presence of a diagnosis. Often, this is done with clinical or semi-standardized interviews; sometimes, the diagnosis is made only on the basis of questionnaires filled out by the patients. Scientifically more accurate are the standardized interviews (e.g., “Structured Clinical Interview for DSM-5 [SCID]”) for capturing the diagnosis. Furthermore, it must be considered which

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sample was examined. Studies on treatment-seeking patients or patients in treatment often yield different results than population-based studies. Patients in treatment are usually somewhat more severely ill. On the other hand, it is often difficult to conduct population-based studies. Older patients show higher rates of comorbidity than younger ones. The region in which the studies were conducted may also play a role. Another problem is the question of a control or comparison group. It would be necessary to investigate how often a diagnosis, e.g., depression, occurs in the general population in order to then examine whether patients with eating disorders have a higher rate of depression than would be expected from the general population. The concept of so-called lifetime diagnosis of particular importance. This means that patients have met the criteria for the diagnosed disorder at least once in their life.

This chapter focuses on the comorbidities of eating disorders and obesity with affective disorders and anxiety disorders. Affective disorders include, in particular, depression in its various manifestations (depressive episodes, recurrent depressive disorder, dysthymia or persistent depression). There are also various forms of anxiety disorders (phobias, generalized anxiety disorder, panic disorder). Many studies have assessed comorbidities in eating disorders. However, the change from DSM-IV to DSM-5 must be taken into account: The criteria for eating disorders as well as definitions for depressive and anxiety disorders have been changed. As a result, the study results are only partially comparable, and the respective diagnostic codes used need to be considered.

24.2 Anorexia nervosa

Depression ("major depression" according to DSM) is the most common comorbid disorder in patients with anorexia nervosa (AN), with most studies reporting a mean lifetime comorbidity of about 50–70%. An additional 35–40% of patients with AN have a history of milder depressive episodes ("minor depression"),

dysthymia or persistent depression. Given the high rate of depression, the question arises whether these are really separate disorders or whether, for example, depression can also be a consequence of malnutrition. On the other hand, depression may also occur before the onset of AN symptoms. It is likely that there is a complex interaction rather than a one-sided causation in one direction or the other. Bipolar disorders (manic-depressive disorders) are rather rare in patients with AN, with a prevalence of less than 10%. Anxiety disorders, however, are very common in patients with AN. A lifetime comorbidity rate of about 65% is reported, with social phobia and obsessive-compulsive disorder being the most common conditions. With improvement of or recovery from AN symptoms, comorbid symptoms often also decrease.

Table 24.1 shows some studies on comorbidity in AN. These show comorbidities (lifetime) between 40% and 80% with depression and between 20% and 60% with anxiety disorders. Comorbidities with obsessive-compulsive disorders are significantly rarer, but still at a generally high level, of up to 20%. Patients with restrictive AN show somewhat fewer comorbidities than patients with binge-eating/purging type AN.

24.3 Bulimia nervosa

Bulimia nervosa (BN) also shows high comorbidity rates with affective and anxiety disorders. The lifetime prevalence of comorbid affective disorders in BN is reported to be between 50–80%. Major depression ranges between 40% and 60%. In a community-based cross-sectional study, 38% of patients with BN showed evidence of at least one depression in their lifetime; this was three times higher than the rate in individuals without a psychiatric diagnosis. In one study, it was found that in 60% of patients with BN, the affective disorder was already present before the onset of BN, in 34% it followed the onset of BN, and in 5% it began simultaneously with BN. High rates of comorbid anxiety

Table 24.1 Comorbidity in anorexia nervosa (lifetime diagnoses)

Study	Recruitment	N AN	Depression	Anxiety disorder	Obsessive-compulsive disorder
Godart et al. (2004)	Inpatients and outpatients, restrictive type	111	44% MD	49% GAD 31% SP 14% AP	17%
Godart et al. (2004)	Inpatients and outpatients, binge-eating/purgung type	55	49% MD	46% GAD 20% AP	22%
Bühren et al. (2014)	First diagnoses with AN	148	38% MD 5% DY	7% SP 1% GAD 2% specific phobias	8%
Ulfvebrand et al. (2015)	Eating disorder centers in Sweden, patients with restrictive AN, current comorbidity	889	25% MD 2% DY	28% GAD 14% SP 13% specific phobias	7%
Ulfvebrand et al. (2015)	Eating disorder centers in Sweden, patients with binge-eating/purgung AN, current comorbidity	454	38% MD 4% DY	35% GAD 17% SP 16% specific phobias	8%
Udo and Grilo (2019)	Population sample, survey with SCID for DSM-5	276	50% MD 25% DY	22% GAD 21% PD 15% SP	n/a

N AN Number of patients with anorexia nervosa, MD Major depression, DY Persistent depression (dysthymia), SP social phobia, GAD generalized anxiety disorder, AP agoraphobia, PD panic disorder, n/a no information

Table 24.2 Comorbidity in bulimia nervosa (lifetime diagnoses)

Study	Recruitment	N BN	Depression	Anxiety disorder	OCD
Kaye et al. (2004)	Patients from various centers	282	Not recorded	16 % SP 8 % GAD	40 %
Spindler and Milos (2004)	Patients seeking treatment	126	53 % MD	50 % (not subdivided)	–
Ulfvebrand et al. (2015)	Eating disorder centers in Sweden, current comorbidity	2279	36 % MD 4 % DY	32 % GAD 14 % SP 16 % spec. Phobias	4 %
Udo and Grilo (2019)	Population sample, assessment with SCID for DSM-5	92	77 % MD 35 % DY	26 % GAD 18 % PD 14 % SP 14 % spec. Phobia	n/a

N BN Number of patients with Bulimia nervosa, KG Control group, MD Major depression, DY Persistent Depression (Dysthymia), SP social phobia, GAD generalized anxiety disorder, PD Panic disorder, n/a no information

disorders are also found in BN, with reported rates of 40–60%. The most common anxiety disorder is generalized anxiety disorder. Table 24.2 summarizes some studies on the comorbidity of BN. In one study, a relatively high rate of obsessive-compulsive disorders was also found.

24.4 Binge Eating Disorder

Comorbidities are also common in binge-eating disorder (BED) (Table 24.3). In particular, comorbidities with major depression (rates of 50–60%) and anxiety disorders (20–50%) are

Table 24.3 Comorbidity in binge eating disorder (lifetime diagnoses)

Study	Recruitment	N BES	Depression	Anxiety Disorder	OCD
Bulik et al. (2002)	Population study, female twins, BMI >30	59	48% MD	49%	–
Grilo et al. (2009)	Population study	404	47% MD 7% DY	37%	3%
Wilfley et al. (2000)	Patients with BES in treatment	162	58% MD	29 %	1%
Ulfvebrand et al. (2015)	Eating disorder centers in Sweden, current comorbidity	498	33% MD 6% DY	26% GAD 20% SP 22% specific phobias	2%
Udo and Grilo (2019)	Population sample, assessment with SCID for DSM-5	318	70% MD 33% DY	33% GAD 23% PD 21% SP 24% specific phobia	n/a

N BES Number of patients with binge-eating disorder, *KG* Control group, *MD* Major depression, *DY* Persistent depression (*dysthymia*), *GAS* Generalized anxiety disorder, *PD* Panic disorder, *SP* Social phobia, *n/a* no information

found. Obsessive-compulsive disorders hardly occur. Compared to healthy control subjects, patients with BED show significantly higher rates of depression and anxiety disorders. Overall, the comorbidity rates are similar to those of other eating disorders.

► **Important** The eating disorders anorexia nervosa, bulimia nervosa, and binge eating disorder are associated with approximately the same number of comorbidities, primarily depression and anxiety disorders. About 50% of patients can be expected to have such comorbidities.

It remains to be considered whether BN and BED, in particular, could also be seen as “modern” expressions of depression or anxiety disorders. Changed sociocultural factors (spread of media, increased thinness ideal) might have led to these new psychological manifestations.

24.5 Obesity

Obesity is often associated with psychosocial stress and problems. Comparisons of people with and without obesity in the general population have led to somewhat different results, depending on the samples studied (age, gender,

BMI, treatment desire). However, more recent studies have mostly confirmed a positive relationship between overweight or obesity and the prevalence of mental disorders. In these studies, affective disorders and anxiety disorders are most prominent (Herpertz et al. 2006). This relationship appears to be more pronounced in women than in men and increases with increasing overweight/obesity. Patients with obesity seeking treatment for weight loss show significantly higher psychological comorbidity than people with obesity or normal weight in the general population.

24.6 Summary and Conclusions

Comorbidities with affective disorders, especially depression, and anxiety disorders are common in patients with eating disorders. In clinical practice, it can be assumed that more than half of those affected currently meet or have previously met the criteria for another mental disorder diagnosis. Depression and anxiety disorders are most likely to be expected. Depending on the current severity of these additional symptoms, psychotherapeutic or pharmacological treatments should be adjusted. During treatment, it should be noted that symptoms may change and shift, e.g., eating disorder symptoms

may decrease, but depressive symptoms may increase. The discussion of whether the triad of eating disorders, depression, and anxiety disorders really represent different disorders or are rather expressions of a common underlying disorder should continue.

Conclusion

Comorbidities, especially depression and anxiety disorders, are common in eating disorders. Depending on the severity, psychotherapeutic and pharmacological treatments should be adjusted accordingly.

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Psychological Comorbidity and Personality Disorders

Ulrich Schweiger

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Mental disorders can be observed as isolated, individual disorders, but they can also occur together with other mental or medical conditions (comorbidity). Traditional European classification systems have attempted to summarize a person's illness and symptomatology in a main diagnosis, preferably based on etiology. In contrast, the descriptive, operationalized criteria-oriented American DSM system allows for a multitude of simultaneous (comorbid) diagnoses of mental disorders.

- **Important** Comorbid disorders are not rare exceptions in patients with eating disorders (Udo and Grilo 2018).

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For example, in the German DEGS1-MH study, at least one mental disorder was diagnosed in 28% of participants, with 56% having one, 22% having two, 10% having three, 6% having four, and 7% having five or more disorders (Jacobi et al. 2014). The majority of severe disorders can be found among participants with high comorbidity (Kessler et al. 1994). This association between comorbidity and disease severity was also confirmed in the NCS replication study (Kessler et al. 2005). While 22% of individuals with only one mental disorder were classified as seriously ill, this figure was 50% for those with three or more diagnoses. This finding is consistent with the observation that comorbid patients make up the vast majority of individuals in many treatment centers in the area of inpatient treatment.

Comorbidity has a significant impact on treatment and therapy planning. In general, the evidence base for therapeutic procedures only applies to the populations defined in the respective controlled studies. Both in pharmacotherapeutic research and in most psychotherapy

studies, comorbid patients are often excluded or underrepresented due to the inclusion and exclusion criteria. Strictly speaking, the conclusions from such studies cannot be transferred to comorbid populations.

- **Important** If psychotherapy X is found to be effective in (monomorbid) patients with an eating disorder in several controlled studies, the conclusions about the effectiveness of this treatment cannot necessarily be extended to patients suffering from an eating disorder plus major depression or addiction.

The difficulty in finding an evidence base for the treatment of comorbid groups lies in the large number of possible permutations in the combination of mental disorders. In the replication of the NCS, for example, 19 diagnoses were assessed, which already represents a significant reduction of the over 300 possible diagnoses in the DSM. From these 19 diagnoses, 524,288 possible permutations result, of which 433 were actually observed in the study (Kessler et al. 2005).

25.1 Prevalence of comorbidity between eating disorders and other mental disorders

25.1.1 Eating Disorders and Depressive Disorders

About 50% of patients with AN, 76% of those with BN, and 66% of those with BED have a lifetime diagnosis of major depressive disorder. The numbers for chronic depression (persistent depressive disorder, PDD) are also very high: AN 22%, BN 35%, and BED 33% (Udo and Grilo 2018). The point prevalence of depressive disorders is higher when acute eating disorder symptoms are present. In long-term studies, patients who no longer meet the criteria for an eating disorder also show a lower frequency of depressive disorders. The prevalence of comorbid depressive disorders is higher in bulimic eating disorders and in patients with both an eating

disorder and a personality disorder. In the temporal development, the eating disorder usually precedes the depressive disorder.

25.1.2 Eating Disorders and Anxiety Disorders

About 41% of patients with AN, 45% of those with BN, and 59% of those with BED have a lifetime diagnosis of one or more anxiety disorders (Udo and Grilo 2018). Specific prevalences are, for generalized anxiety disorder: AN 22%, BN 26%, and BED 33%; for panic disorder: AN 21%, BN 18%, and BED 23%; for agoraphobia: AN 11%, BN 10%, and BED 13%; for social anxiety disorder: AN 9%, BN 14%, and BED 23%; for specific phobias: AN 15%, BN 14%, and BED 24%. In the development of eating disorders from childhood, adolescence, and adulthood, the eating disorder is often preceded by perfectionism, emotion avoidance, and anxiety.

25.1.3 Eating Disorders and Obsessive-Compulsive Disorders

About 41% of patients with an eating disorder have a lifetime diagnosis of obsessive-compulsive disorder (Kaye et al. 2004): AN 35% and BN 40%. Conversely, about 10% of patients with obsessive-compulsive disorder suffer from an eating disorder. Possible bridges between the disorders are difficulties in dealing with intrusive thoughts from the realm of compulsion (e.g., contamination, catastrophes, symmetry, ethical or religious themes) and eating behavior (e.g., weight, nutrition) (Meier et al. 2020).

25.1.4 Eating Disorders and Posttraumatic Stress Disorder

About 23% of patients with AN, 32% of those with BN, and 32% of those with BED have a lifetime diagnosis of posttraumatic stress

disorder (Udo and Grilo 2018). In particular, adverse experiences in childhood are associated with all subtypes of eating disorders. The association between eating disorders and PTSD may be mediated by difficulties in emotion regulation (Rijkers et al. 2019).

25.1.5 Eating Disorders and Disorders with Psychotropic Substances

Approximately 60% of patients with AN, 67% of those with BN, and 68% of those with BED have a lifetime diagnosis of a disorder related to psychotropic substances (Udo and Grilo 2018). Alcohol (AN 49%, BN 61%, and BED 52%) and nicotine (AN 39%, BN 43%, and BED 40%) are particularly significant, but disorders with the entire spectrum of legal and illegal substances are also observed. Possible common mechanisms lie in the areas of emotion regulation, impulsivity, and difficulties in establishing value-oriented behavior (Claudat et al. 2020). Patients with the combination of eating disorder and substance abuse also show a higher frequency of other mental disorders on Axis I and personality disorders.

25.1.6 Eating Disorders and Sexual Disorders

There are no studies on comorbidity with sexual disorders based on diagnostic interviews. The available studies are limited to small, clinical samples. A majority of underweight patients with AN, BN, and BED describe a broad spectrum of sexual dysfunctions (Dunkley et al. 2020). Possible moderating factors exist in the areas of psychoendocrinology, body satisfaction, sexual traumatization, and emotion regulation.

25.1.7 Eating Disorders and Personality Disorders

Approximately 35% of patients with AN, 51% of those with BN, and 56% of those with BED

have a lifetime diagnosis of a personality disorder (Udo and Grilo 2018). The most common personality disorders are avoidant, obsessive-compulsive, and borderline personality disorder (BPD). Patients with a personality disorder have a significantly increased risk of developing disturbed eating behavior (Johnson et al. 2006). The intensity of personality disorder symptoms decreases when there is a remission of the eating disorder. The presence of a personality disorder is associated with a lower likelihood of remission of an eating disorder. Regarding comorbidity with eating disorders from the perspective of another mental disorder in the direction of eating disorder, studies have mainly reported on BPD. Here, about 54% also suffer from an eating disorder (Zanarini et al. 2010). While initially, AN, BN, and BED were similarly common, patients with comorbid BED predominated in the long-term course. Patients with a Cluster-C personality disorder are also more likely than chance to suffer from an eating disorder.

25.1.8 Cluster Analyses of Comorbid Disorders in Eating Disorders

Cluster analyses in groups of patients with eating disorders lead to a classification into three groups, the largest of which is characterized by the absence of significant comorbidity. The second group can best be characterized by comorbidity with a Cluster-C personality disorder. In this group, there is a moderate level of functional impairment. The particularly severely ill group can be described by comorbidity with BPD (Wonderlich et al. 2005; Thompson-Brenner and Westen 2005).

25.2 Delineation of Differential Diagnosis vs. Comorbidity

In the differential diagnosis of eating disorders, it should be noted that almost all diagnostic groups of mental disorders can be associated with changes in eating behavior. In order to

diagnose an eating disorder, an abnormality in eating behavior must be at the center of a mental disorder and explain a significant portion of the impairment in psychosocial functioning caused by a mental disorder, and not be completely derived from the symptoms of the other disorder. In a typical depressive episode with loss of appetite and weight loss, an eating disorder is not automatically diagnosed. However, if, for example, an intense association between low weight and emotion regulation is evident in the affected patient and there was already an intense restrictive eating behavior before the depressive episode, both diagnoses must be considered. Depressive disorders can also lead to significant weight gain (atypical depression). Dementia syndromes can be associated with significant weight loss. Cannabis use regularly leads to binge eating. In contrast, the use of cocaine, amphetamines, or opiates can lead to restrictive eating behavior and underweight. In schizophrenia, food-related delusions, such as poisoning delusions, can result in massive weight loss. Food-related compulsive actions or specific phobias can have a significant impact on nutrition and body weight. Patients with obsessive-compulsive disorders have a lower average body weight than comparison groups.

25.3 Mechanisms of Interaction between Eating Disorders and Other Mental Disorders

25.3.1 Comorbid Disorders as a Specific Risk Factor for Eating Disorders

Substance-related disorders, depressive disorders, anxiety disorders, or personality disorders can increase the risk of developing an eating disorder.

► **Important** In particular, substance-related disorders or borderline personality disorder can lead to a destabilization of behavioral control and thus promote bulimic symptoms.

The loss of appetite associated with depressive disorders can become independent in a specific context through operant learning processes. Bulimic eating behavior can bring about a pronounced reduction in anxiety and tension. Restrictive eating behavior can antagonize intrusive thought content through the resulting attentional focus on food-related topics, leading to a significant reduction in subjective suffering. Successful control over eating behavior can also become a significant support for self-confidence, which has been impaired by other illnesses. These short-term favorable effects, which reduce tension and subjective suffering, can lead to negative reinforcement of disturbed eating behavior in the sense of a learning process.

25.3.2 Comorbid Disorders as a Complication of Eating Disorders

Due to the secrecy associated with eating disorders and the high expenditure of time and money, an eating disorder can lead to an increase in unpleasant interpersonal experiences, feelings of failure, financial distress, and a decline in social support over the long term. Chronic eating disorders often result in patients being excluded from the lives of their peers, leading to deficits in social competence. These, in turn, are important conditions for the development of comorbid mental disorders, particularly depressive disorders and anxiety disorders.

Furthermore, it is likely that neurochemical mechanisms play an important role in comorbid disorders. Continuous or intermittent malnutrition, which is characteristic of all forms of eating disorders, interferes with a variety of neurotransmitter and neuropeptide systems. Particularly well-described are changes in the serotonergic, noradrenergic, and limbic-hypothalamic-pituitary-adrenal (LHPA) systems, the stress hormone, reward, and allocation systems. In many places in the neuroendocrine system, there is an overlap between systems that regulate food intake and allocation of metabolic energy to the brain and various organ functions, and

systems responsible for the regulation of behavior and emotions.

25.3.3 Common Risk Factors for Eating Disorders and Comorbid Disorders

Changes in the serotonergic system can promote both dysregulation of eating behavior and mood, as well as compulsive or insecure behavior. Similarly, transdiagnostic factors could increase the risk for a broad spectrum of mental disorders, such as neuroticism, perfectionism, disturbances in interoception, disturbances in emotion regulation, emotional instability, emotion avoidance, difficulties in delaying reward, limited social cognitive skills, including mentalization, and limited metacognitive skills. In this spectrum model, it is assumed that various mental disorders represent expressions of quantitative variations with identical etiology and pathophysiology (pathoplasty). The model is supported by findings that when exploring the factor structure of a spectrum of mental disorders, the assumption of a general factor of psychopathology (*p*-factor) is a plausible solution (Rosenstrom et al. 2019). However, there is no consensus on the exact nature of this factor.

- **Important** Various genetic or psychological variables can represent common risk factors for the development of both eating disorders and comorbid disorders.

25.4 Therapy for Comorbid Disorders Including Eating Disorders

So far, only a small number of studies have systematically considered the influence of comorbidity on the therapy process in eating disorders. Comorbid disorders do not seem to systematically influence the extent of symptom reduction in indication-specific eating disorder treatment. However, comorbid patients show an increased extent of general symptom burden and

psychosocial impairment, which is reduced by indication-specific treatments but remains at an elevated level compared to non-comorbid populations. Overall, this results in a significantly poorer level of psychosocial functioning in comorbid populations after therapy. This often also leads to greater difficulties in obtaining a therapy place with a disorder-specific offer.

At the level of therapy planning, various approaches to deal with the problem of comorbidity are conceivable. One obvious possibility is the addition of therapy methods. Patients with an eating disorder and a Cluster-C personality disorder, for example, receive eating disorder-specific treatment, supplemented by training in interpersonal skills or a specific program for treating social phobia. An alternative is to focus on a strategically important common risk factor. In this case, overcoming perfectionism or acquiring emotion regulation skills could be at the center of therapeutic efforts. To prioritize therapy goals, there is the pragmatic consideration that behaviors that endanger therapy, hinder learning processes, or jeopardize the implementation of other therapy elements should be addressed first. For example, a comorbid dependence on benzodiazepines would be given high priority, as this group of substances is capable of significantly slowing down learning processes.

25.4.1 Treatment for Eating Disorders and Depressive Disorder

The depressive disorder often decisively justifies the therapy motivation. Clinical experience shows that overcoming depressive symptoms without normalizing eating behavior is unlikely. Learning processes as the basis of cognitive-behavioral interventions and psychopharmacological interventions with antidepressants are potentially disrupted by a malnutrition situation. The pronounced focus of attention on food and malnutrition-related neurochemical changes can be cited as explanations for this blocking of the therapeutic effect. Interventions for patients with the combination of eating disorder

and depressive disorder should always combine interventions to normalize eating behavior with other antidepressant strategies.

25.4.2 Treatment for Eating Disorders and Cluster-C Personality Disorder

Many treatment programs include elements that target perfectionism, interpersonal skills, and emotion regulation, thus addressing transdiagnostic mechanisms between eating disorders and Cluster-C personality disorder.

25.4.3 Treatment for Eating Disorders and Cluster-B Personality Disorder

This group represents a particular problem group, as they fit poorly into programs that are predominantly geared towards the needs of patients with eating disorders and Cluster-C personality disorders. Initial treatment approaches for this patient group use a combination of elements from dialectical behavior therapy(DBT) and elements from classical approaches to disorder-specific treatment of eating disorders.

25.4.4 Treatment for Eating Disorders, Anxiety Disorders, Obsessive-Compulsive Disorder, and PTSD

For the treatment of comorbid panic disorder with agoraphobia, social phobia, and specific phobias, similar principles apply to those already described for the comorbid Cluster-C personality disorder. The focus is on the additional use of exposure techniques and the training of emotion regulation and interpersonal skills. The combination of an eating disorder with an obsessive-compulsive disorder represents a particular problem situation. Specific

psychoeducation, additional elements of cognitive therapy and exposure tailored to the obsessive-compulsive disorder, and interventions that can improve dealing with perfectionism are required (Shafran et al. 2002). In the treatment of patients with eating disorders and PTSD, a method of eating disorder treatment is usually offered first, followed by a specific method for treating PTSD. It should be noted that relinquishing problematic eating behavior can initially lead to a worsening of PTSD symptoms, e.g., in the form of intrusions. Conversely, problematic eating behavior can weaken the effectiveness of the exposure components of PTSD treatment.

25.4.5 Eating Disorders and Disorders with Psychotropic Substances

Abstinence from substance use is an essential prerequisite for the effectiveness of psychotherapeutic interventions and for improving behavioral control in patients with eating disorders. Due to its effectiveness in both eating disorders and substance use disorders, the use of dialectical behavior therapy has been suggested for this target group (Claudat et al. 2020). In cases of high severity of the addictive disorder, abstinence-oriented therapy in a specialized clinic may be necessary as a first measure. Otherwise, it is recommended to integrate substance abuse-focused interventions into outpatient or inpatient eating disorder treatment.

25.4.6 Eating Disorders and Sexual Disorders

Systematic studies are not available. Case studies describe pronounced difficulties in implementing classical sexual therapeutic concepts in the target group of women with eating disorders. Normalization of weight leads to an increase in sexual drive.

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Non-Suicidal Self-Injury and Eating Disorders

26

Paul Plener

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When considering the subject areas of Nonsuicidal Self-injury (NSSI) and eating disorders, it is noticeable that both disorders usually begin in adolescence, are more frequently found in female patients, and also have in common that there is damage to the body that is consciously sought or at least willingly accepted. While this book extensively addresses various aspects of eating disorders, this chapter will primarily focus on the connections to NSSI, so that a brief overview of NSSI will be provided first, before the connections to eating disorders and therapeutic interventions are discussed in more detail in a second step.

26.1 NSSI: An Overview

NSSI is defined as self-inflicted, direct damage to body tissue that is undertaken without suicidal intent. This includes socially unacceptable body tissue damage. Tattoos, piercings, dermal anchors, or other forms of body modification, are excluded from this definition (Plener et al. 2018). NSSI is not found as a disease entity in the ICD-10, ICD-11, or DSM-5. However, the DSM-5, Section 3 (the “conditions for further study”) provides a definition describing an NSSI syndrome. It also stipulates that a certain frequency (on five or more days within the last twelve months) must be present to reach the NSSI syndrome (APA 2013).

Adolescents usually begin to injure themselves at around the age of 13, with a peak frequency at 15–16 years, and a decrease can be described as they enter young adulthood (Plener et al. 2015). In a recent meta-analysis, the lifetime prevalence of NSSI in adolescents was reported to lie at about 23%, based on over 200 studies conducted worldwide (Gillies et al.

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2018). It was found that self-injurious behavior is more common in girls than in boys. It was also shown that the prevalence has increased since the 1990s (Gillies et al. 2018). Looking at the situation in Germany, studies in school populations among adolescents have reported a lifetime prevalence between 25 and 35%, which clearly shows that Germany is also one of the nations with the highest prevalence rates within Europe (for an overview see Plener et al. 2018).

In terms of the functionality of and motives for NSSI, the literature points to both intrapersonal and interpersonal functions of NSSI (Nock 2010). The main motive for NSSI found in most studies is an emotion regulation function in the sense that negative affect can be controlled by NSSI. A function in the sense of self-punishment is also frequently mentioned in studies on NSSI motives. In addition, there are interpersonal functions that can influence the maintenance or initiation of NSSI (Taylor et al. 2018). In this context, NSSI can serve to set a social signal and communicate a negative emotional state through the injury. It can also help secure attention or recognition in some peer groups. In this case, intra- and interpersonal motives do not exclude each other, but often, an interpersonal conflict situation triggers an aversive emotional state that can then be controlled by NSSI. NSSI thus serves as a (dysfunctional) coping strategy in the sense of emotion regulation.

26.2 Associations Between NSSI and Eating Disorders

When examining the question of an association between NSSI and eating disorders, a high comorbidity with NSSI was found in patients who had suffered from an eating disorder. In the meta-analysis by Cucchi and colleagues (2016), 27.3% of patients with an eating disorder were described as having NSSI, with a higher percentage of NSSI among those with BN (32.7%) than among those with AN (21.8%), and patients with binge eating disorder (BED) lying in between. Looking at the prevalence rates from the perspective of NSSI, a

study of 118 participants showed that two-thirds of people with NSSI had exhibited at least one disturbed eating behavior within the last week, with the most frequent behaviors being at least weekly binge eating or fasting (each 57.6%) (Yiu et al. 2014). In a British longitudinal study, it was shown that NSSI two or more times at the age of 14 was a strong predictor for the development of an eating disorder at the age of 17 (Wilkinson et al. 2018). Regarding the severity of NSSI and eating disorders, it was shown that an increase in the frequency of NSSI was also associated with a greater severity of the eating disorder. It was also found that an increase in eating disorder symptoms led to a worsening of NSSI symptoms, with this relationship being moderated by the presence of emotional dysregulation. An analysis by Muehlenkamp et al. (2011) of 422 young adult women treated for an eating disorder found an association between traumatic experiences in childhood and NSSI. This connection was mediated by lower self-esteem, increased levels of psychopathological abnormalities, and dissociative phenomena. An association also emerged between reduced self-esteem due to traumatic events and body dissatisfaction, which also influenced NSSI (Muehlenkamp et al. 2011). In a study of 93 patients with AN, BN, and other eating disorders who had a history of NSSI or suicide attempts, the factor of increased impulsivity was particularly associated with NSSI in the context of eating disorders (Sagiv and Gvion 2020). Higher anxiety traits were also found in those eating disorder patients who had NSSI (Giner-Bartolome et al. 2017). In another study of a large clinical population ($N = 648$), patients with a combination of NSSI and eating disorders exhibited higher emotional reactivity than patients with an eating disorder without accompanying NSSI. Among those patients with eating disorders, higher emotional reactivity and more frequent NSSI were found especially in patients with BN compared to patients with AN (Smith et al. 2017). In terms of the association with suicidal behavior, a study of approximately 500 college students clearly demonstrated that those students who had a combination of NSSI

and suicidal thoughts were more affected by eating disorder pathology than those who only had NSSI (Eichen et al. 2016). Overall, it can be summarized that the relationship between NSSI and eating disorders is likely to be bidirectional (for an overview, see Kiekens and Claes 2020), with the assumption that risk factors may overlap.

When examining the co-occurrence of NSSI and eating disorders, the question arises as to whether there is a common etiology that assumes different forms at the symptom level. Claes and Muehlenkamp proposed a risk factor model in 2014 (Fig. 26.1). The model considers whether common proximal and distal risk factors play a role, which can then lead to the onset and maintenance of both NSSI and eating disorders.

Distal risk factors encompass individual-specific factors, such as temperament and personality traits, including high emotional reactivity, a reduced ability to tolerate negative affective states, as well as compulsive personality traits,

perfectionism, or increased impulsivity. These interact with predisposing social factors such as cultural influences (unrealistic body stereotypes or self-objectification) or the family environment (high levels of control and criticism with low family connectedness and low emotional support). Traumatic events, such as abuse, mistreatment, or bullying, also seem to play a role in the genesis of both NSSI and eating disorders (Claes and Muehlenkamp 2014).

Proximal risk factors may include emotional dysregulation, cognitive distortions (such as low self-esteem or strong self-criticism), low acceptance of one's body, dissociative phenomena, the influence of peers, and psychiatric disorders. When stressful life events occur, NSSI or eating disorder symptoms are activated as a (dysfunctional) way to cope with these events. This strategy must also be understood in terms of an interaction, insofar as the triggering proximal factors can be maintained by the chosen "problem-solving" approach (Claes and Muehlenkamp 2014). This perspective is

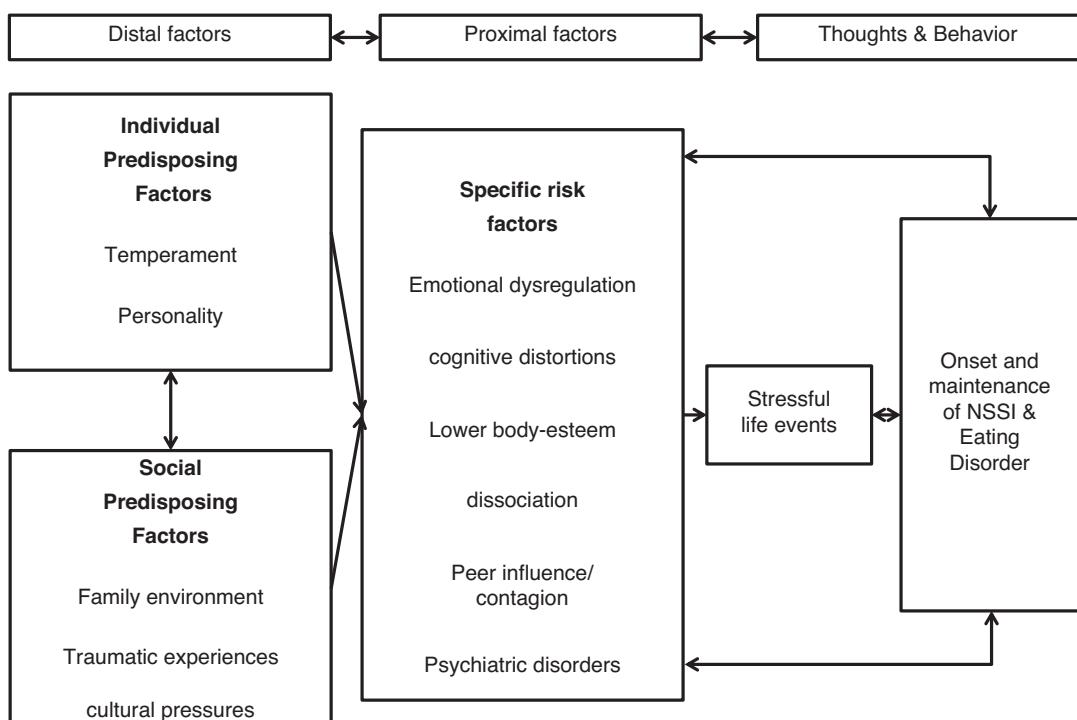


Fig. 26.1 Model of the development of NSSI and eating disorders. (Modified from Claes and Muehlenkamp 2014)

particularly interesting in light of the findings from the Benefits and Barriers model by Hooley and Franklin (2018). Here, specifically for NSSI, a negative self-association is also placed at the focus of the genesis of NSSV, which can be understood as overlapping with the model by Claes and Muehlenkamp (2014). NSSI (as well as eating disorders) thus becomes a compensatory mechanism that serves to maintain the individual under stress.

A possible overlap in the functions of NSSI and eating disorders was also investigated by Muehlenkamp et al. (2019) in 676 adult patients (about half of whom had either NSSI or an eating disorder). While a general overlap in motives was shown, a further examination also revealed differences in the subjective salience of individual functions for the respective behaviors. Affect regulation, anti-dissociative effects, communication of stress, and interpersonal influence were identified as functions with higher relevance for NSSI. Among the functions with higher relevance for eating disorders were interpersonal boundary setting, peer belonging, and autonomy. The function of self-punishment was equally relevant for both NSSI and eating disorders (Muehlenkamp et al. 2019).

Research on the triggering conditions of NSSI and eating disorder behavior, which in recent years has increasingly employed ecological momentary assessment (EMA) paradigms, demonstrates the functionality of NSSI and eating disorder behavior in everyday life. This involves the regulation of intrapersonal difficulties (especially the reduction of negative affect) as well as the regulation of interpersonal difficulties in daily life (Kiekens and Claes 2020). In a diary study with young adults, it was shown that NSSI usually followed a feeling of rejection or interpersonal conflicts. Binge-eating episodes were more common after watching television or experiencing feelings of self-hatred. On days when NSSI was performed, there was a significantly worse mood in the evening, especially compared to days when dieting was practiced (Turner et al. 2016). In relation to the joint model of Claes and Muehlenkamp (2014), it can

be understood how a high comorbidity of NSSI and eating disorder behavior can develop under similar risk conditions and with comparable functionality in controlling intrapersonal and interpersonal stressors. In both disorder patterns, insufficient emotion regulation against the background of a negative self-association plays a significant role.

Moving away from the common genesis towards possible long-term consequences, the question remains to what extent NSSI and eating disorders can have common “end stages.” Both behavioral disorders show increased rates of suicidality. Furthermore, Kiekens and Claes (2020) pointed out that both NSSI and the presence of an eating disorder represent a risk factor for future additional mental illnesses. Associations can be found with impaired family functioning, reduced emotion regulation ability, identity disorders, lower self-esteem, lower quality of life, stigma, and academic problems (Kiekens and Claes 2020).

26.3 Therapy for NSSI and Eating Disorders

When dealing with therapeutic dimensions in NSSI, it can be noted that there is now good evidence for various psychotherapeutic methods in reducing NSSI (Kothgassner et al. 2020). In this context, particular attention should be paid to the effectiveness of cognitive behavioral therapy (CBT), dialectical behavior therapy for adolescents (DBT-A), and mentalization-based therapy for adolescents (MBT-A). Kiekens and Claes (2020) pointed to the effectiveness of CBT and family-based therapy (FBT) in the psychotherapeutic treatment of eating disorders. This raises the question of what a therapeutic approach for comorbid NSSI and eating disorders might look like. So far, there are no good data for such an assessment, as therapy studies have focused either on NSSI or on eating disorders as the final outcome.

For adults, Marino et al. (2020) proposed a decision-making model, according to which

dialectical behavior therapy appears to be indicated when a personality disorder is in the foreground. This is understandable in the context of treating underlying personality traits that permanently influence eating disorder dynamics. In addition to the good effectiveness of DBT in treating NSSV, there are also modifications of DBT for treating eating disorders, and it seems possible to address both disorder areas well within the concept of a DBT treatment (Walsh and Eaton 2014).

In clinical practice, situations will often arise where prioritization based on clinical urgency is necessary, and the treatment focus must be set accordingly. In cases of severe starvation, which severely impair physical health and may even lead to a threat to life, these must be treated as a priority. In these cases, it will be appropriate to focus primarily on the immediate treatment of the eating disorder and ensure adequate food intake and physical stabilization. Once the immediate danger, such as food deprivation, subsides, the focus should then shift to other self-harm behaviors (such as NSSI). If NSSI and suicidality are the primary acute methods of self-harm, this behavior should be at the forefront. This is also in line with the idea of a hierarchy of treatment goals in DBT.

In therapeutic work, overlapping underlying mechanisms that ultimately manifest in eating disorder symptoms or NSSI will often be identified at this point. Recognizing these parallels can also be important in order to proactively address potential symptom shifts. This point is also emphasized by Peats (2014) regarding the combined psychotherapeutic intervention for eating disorders and NSSI using CBT. As in the specific treatment of NSSI and eating disorders, the goal is to identify cognitive distortions and work with them. In addition, alternative behavioral strategies must be developed. Peats (2014) also emphasizes that the two problem areas must be considered as interconnected. Here, the focus is primarily on the need to identify automatic assumptions that influence negative affect and resulting maladaptive behaviors.

In the context of the joint treatment of eating disorders and NSSI, a new development in the field of online therapy should also be mentioned. In an initial pilot study, Bjureberg et al. (2018) demonstrated that the application of an online version of “Emotion Regulation Individual Therapy for Adolescents” (ERITA) led to a reduction in NSSV, while at the same time reducing accompanying self-harm symptoms (in the form of binge-eating behavior). This is particularly relevant in the context of resource allocation and overcoming barriers to accessing psychotherapeutic help for adolescents. As noted by Kiekens and Claes (2020), DBT is indeed considered effective, but is often not widely available and requires significant resources. The further development of online therapy formats could occupy a place in the sense of a stepped-care approach and offer a resource-saving and—due to the low threshold for access, especially for adolescents—an interesting therapeutic option.

Conclusion

Both NSSI and eating disorders involve harm to the body, and overlapping mechanisms are often reported in the literature on risk factors. In light of this consideration, both eating disorder symptoms and NSSI can be understood as attempts at (dysfunctional) coping with stressful events, which are often based on a longer-lasting history of distal and proximal risk factors. Due to the similar conditions of origin, it is also understandable why the emphasis in joint therapeutic approaches is on acquiring emotional regulation skills and identifying and addressing dysfunctional cognitions. Particularly in the field of CBT and DBT, existing approaches to treating NSSI or eating disorders seem to complement each other well. Given the increased prevalence of NSSI and eating disorders in the adolescent age group, special attention should be paid to the expansion of (online) therapy options with low-threshold access.

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Mechanisms of Addiction in Eating and Weight Disorders

27

Sabine Steins-Loeber and Georgios Paslakis

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27.1 Introduction

Eating and weight disorders are associated with a variety of comorbid disorders (Chaps. 24–26 in this book). There is clear evidence of an association between overweight or obesity, eating disorders, and alcohol use disorder. In particular, binge eating disorder (BED) and bulimia nervosa (BN), i.e., those eating disorders associated with binge eating, seem to be associated with alcohol consumption, while anorexia nervosa (AN) is not or to a lesser extent associated

with alcohol use disorders in studies (Bahji et al. 2019). Much of the research focuses on the comorbidity of clinically diagnosed substance use disorders and eating and weight disorders. However, symptom-level investigations provide important insights. For example, several studies showed a negative relationship between the frequency of drinking alcohol and BMI, but a positive relationship between the intensity of consumption (“binge drinking”) and BMI. The results of these studies suggest that the comorbidities between eating and weight disorders and substance use disorders observed at the diagnostic level could be due to pathological behavioral patterns based on similar mechanisms and being attributable to similar underlying vulnerability factors. Against this background, this chapter aims to provide an overview of the current state of research on the importance of mechanisms of addictive behavior in the development of eating and weight disorders. Furthermore, the concept of “food addiction” will be addressed. Finally, treatment options will be discussed.

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27.2 Models of the Development and Maintenance of Dependent Behavior

Based on studies in animal models, neurobiological explanatory approaches postulate a subcortical sensitization of dopaminergic neurotransmission in the mesolimbic reward system. This sensitization leads to this system becoming hypersensitive to reward-associated stimuli, such as alcohol and alcohol-associated stimuli. Through processes of classical conditioning, substance-associated stimuli appear particularly salient (“rewarding”), and affected individuals show changes in mesolimbic-mesocortical systems when confronted with addiction-associated stimuli (e.g., images of alcoholic beverages, images from online games, shopping-associated stimuli). It has been shown that these changes are associated with reported craving and relapse frequency (B. Vogel et al. 2019; Vollstädt-Klein et al. 2012).

Of great importance for the maintenance of dependent behavior are also impairments of those cognitive functions that enable self-regulated and goal-directed behavior and override automatic reactions. In the course of addiction development, there is a transition from voluntary pleasure-driven habits to highly automated, habitual, and compulsive behaviors characterized by a loss of control. These cognitive control processes include, for example, the regulation of attention, the weighing of action alternatives, or the inhibition of inappropriate (unfavorable) behavioral responses. Deficits in inhibition ability when confronted with addiction-associated stimuli are a central predictor of relapse frequency in alcohol-dependent patients after qualified withdrawal treatment (Czapla et al. 2016). Furthermore, both substance-related and non-substance-related addictions have been shown to influence instrumental addiction-associated behavior when confronted with conditioned addiction-associated stimuli using the Pavlovian-to-Instrumental-Transfer (PIT) paradigm. For example, the experimental presentation of a nicotine- or alcohol-associated stimulus

leads to an increased instrumental response to obtain a nicotine- or alcohol-associated reward, a so-called PIT effect. Similar effects are also found in relation to gaming or internet shopping applications (V. Vogel et al. 2018).

► **Important** In addiction development, automated behavioral responses triggered by conditioned stimuli, along with the inability to inhibit these responses may play an important role.

27.3 Mechanisms of Dependent Behavior in Eating and Weight Disorders

A number of empirical studies have used paradigms from addiction research to investigate whether similar mechanisms are important in the development and maintenance of eating and weight disorders. These are experimental paradigms that can be used to investigate processes of reward processing and cognitive control and regulatory functions. In our own work, for example, we have dealt with the salience of alcohol-associated and food-associated stimuli and the impairment of cognitive control and regulatory functions in alcohol use disorder, obesity, and BED. It was found that subjects with obesity showed comparable activation patterns in the mesolimbic-mesocortical system when presented with food-associated stimuli as alcohol-dependent patients when presented with alcohol-associated stimuli (Grosshans et al. 2012). In subjects with obesity, a positive correlation between the level of neural activation, the plasma concentration of the appetite-regulating hormone leptin, and BMI was also demonstrated. These results suggest that, in addition to the salience of food stimuli in the control of food intake, homeostatic control circuits also seem to play an important role. Patients with obesity and BED show deficits in inhibition when presented with food-associated stimuli (Kollei et al. 2018). This illustrates that there is an interaction between the salience

of food-associated stimuli and self-regulation abilities. There also seems to be an association between the plasma concentration responses of leptin after a glucose tolerance test and deficits in inhibitory ability when presented with food-associated stimuli; however, no differences were found between women with a diagnosis of AN, BN, or BED and healthy control subjects (Wollenhaupt et al. 2019). Regarding a preferred attentional reaction (so-called attentional bias) when presented with images of high-calorie foods, a parallel can be observed between patients with BN and BED and the attentional bias towards alcohol images in alcohol-dependent patients.

Recently, initial review articles have been published arguing that mechanisms of dependent behavior may also be important in the development and maintenance of AN. So far, the majority of studies on the mesolimbic reward system in AN have largely focused on disorder-independent, generally rewarding stimuli, such as winning money or being presented with tasty foods (see also the corresponding Chap. 30 in this book). Imaging studies in this context point to an aversive-anxious processing of high-calorie foods and an increased activation in brain regions associated with inhibitory control. In women with AN, an avoidance bias regarding food and overweight bodies can also be observed (Paslakis et al. 2016). Thus, “conventional” and “disorder-incompatible” reward stimuli may not sufficiently address the reward system of patients.

In the current discussion regarding the development and maintenance of AN, the hypothesis is also put forward that disorder-compatible stimuli (e.g., images of underweight female bodies, images of physical activity) are processed appetitively, leading to a sensitization of the reward system that maintains problematic behavior patterns. For instance, when female participants were instructed to imagine that their own body corresponded to a presented body (either underweight or normal weight) and then report on their feelings, women with AN showed stronger activations in reward system structures,

particularly in the ventral striatum, during self-related processing of images of underweight bodies compared to normal-weight bodies; the opposite pattern was found in healthy participants. In both EEG and eye-tracking studies, as well as studies in which the blink reflex was recorded as a measure of appetitive valence, women with AN showed an attentional bias for images of underweight female bodies and images of physical activity, or a positive processing of underweight bodies or physical activity. Accordingly, O’Hara and colleagues (O’Hara et al. 2015) postulate a “reward-centered” model of AN, which assumes that food-associated stimuli are experienced as aversive, while disorder-compatible stimuli (such as underweight body images, physical activity) are processed positively and activate the mesolimbic reward system. As a result, restrictive eating behavior and disorder-compatible behaviors (e.g., fasting, physical activity, frequent weighing, etc.) may more easily acquire the character of automatic habitual behaviors and contribute to the maintenance of the disorder. Comparable to addiction disorders, there would thus be a transition from goal-directed to automated habitual behaviors in response to confrontation with disorder-compatible stimuli.

► **Important** In a series of studies, clear parallels were demonstrated between eating and weight disorders and addiction disorders. These particularly concern stimulus-dependent appetitive reactions and impairments of cognitive control and regulatory functions.

Despite the parallels shown between addiction disorders and eating and weight disorders, it is also necessary to explicitly point out differences between these two groups of disorders. These include, for example, personality traits (pathological perfectionism, anxious-compulsive traits, increased rigidity and over-control vs. increased impulsivity, risk-taking behavior, “novelty seeking”) and the socio-economic conditioning framework (e.g., prevailing societal thinness ideal vs. negative perception of

substance use). The relationship is further complicated by the fact that eating is essential for life and is controlled by a network of homeostatic mechanisms, separate from the dopaminergic reward system. Finally, psychotropic substances activate the dopaminergic reward system much more strongly than natural reinforcers such as food. However, it should also be considered that similar mechanisms are at work in behavioral addictions as in substance-related dependence. This leads to the currently unresolved question of whether addiction aspects in eating and weight disorders correspond more to a substance-related or a substance-independent (behavioral) addiction.

27.4 The Concept of “Food Addiction”

The concept of “Food Addiction” (FA) was originally used as an explanatory approach for obesity. This was based on studies that showed reduced striatal dopamine receptor activity in obesity, similar to observations in substance-related addiction disorders. However, studies have often failed to replicate this finding. As described in the previous section, there are clinical-phenomenological similarities between eating or the tendency to overeat and addiction disorders. Patients often report phenomena such as craving for certain types of food, difficulties in limiting food intake (loss of control), or continuing to eat/overeat even though their health condition would not actually allow it. Occasionally, there are reports that patients react nervously or even in an anxious-depressed manner if they do not consume certain types of food (as if they were going through “withdrawal”) - or conversely, that patients use food to regulate themselves emotionally, and also that they constantly need to eat more to achieve such effects (which could be considered a manifestation of “tolerance”). For all of these aspects, which point to symptoms of dependence on food, there is already a series of empirical findings in humans.

Whether a specific type of food can be “addictive” is not conclusively proven. Animal studies have shown that a high sugar or fat content in food or the highly palatable combination of high sugar and fat content is associated with reduced dopamine receptor function and that withdrawal from sugar in animal experiments leads to increased anxiety. Such results shaped the concept of “sugar addiction”. Human studies provided evidence more for the combination of high fat content and processed sugar as an addiction-promoting factor in food - compared to sugar as a single component (Markus et al. 2017). Crucial in the animal studies was that the experimental manipulation of the food composition only led to addiction-like patterns in the animals in conjunction with variations in availability. It was therefore the intermittent availability of food that served as a factor for the development of compulsive eating - rather than a genuinely addictive property of sugar. This was also supported by findings in rats that constant access to highly palatable food did not lead to activation patterns in the dorsolateral striatum, in contrast to rats that received the same food under intermittent conditions (Furlong et al. 2014). Such prerequisites for the development of food addiction are not found in today’s humans mostly due to the present-day unrestricted availability of food.

Of course, it is true that both addictive substances and energy-rich, highly palatable food are associated with increased activity in the striatum in both animals and humans. Similarly, weight gain is associated with altered striatal activation in response to the consumption of highly palatable food or even just stimuli that predict the availability of such food. Other brain regions involved in the pathomechanisms of addiction (prefrontal cortex, amygdala) also show changes regarding the consumption of highly palatable food and in obesity. Ultimately, however, these phenomena are not specific to addiction disorders. To account for the possibility of addictive eating behavior despite the lack of clear evidence for the presence of an addiction-causing food component, some authors

have suggested the term “eating addiction” (instead of “food addiction”).

The Yale Food Addiction Scale (YFAS) was developed to assess FA, and has now also been developed and evaluated based on the DSM-5 criteria for addiction. While studies found that up to 88% of participants with FA had obesity (Pedram et al. 2013), FA is by no means specific to obesity. Among people with overweight/obesity, 24.9% show symptoms of FA; this is also the case for 11.1% of healthy individuals (Pursey et al. 2014). Further studies showed overlaps between FA and BN, FA and BED, and FA and OSFED (Jiménez-Murcia et al. 2019). Although the clinical phenotype of binge eating and FA shows overlaps, they are still two separate entities.

In summary, it can be stated that the construct of FA is not definitively established. There are arguments both for and against the adoption of this construct, with the overall arguments for its adoption seeming to outweigh those against. It seems clear that FA and obesity or a clinical phenotype characterized by binge eating (e.g., in the context of BED) represent separate concepts, the specific etiologies of which have yet to be clarified. Thus, FA remains an exciting and steadily growing field of research.

27.5 Therapy

Based on the demonstrated importance of mechanism-dependent behavior in eating and weight disorders and the concept of “food addiction,” the relevance of other and new treatment concepts for eating and weight disorders is increasing. Conventional treatments such as cognitive behavioral therapy may not adequately address highly automated processes, which are associated with the desire for food and associated dysfunctional behavioral responses, especially in the early phase of information processing. From such considerations, stimulus exposure trainings (“food cue exposure”) and computerized trainings (e.g., Approach Bias Modification Training, ABM) were developed. The aim of these training types is to extinguish assumed

disorder-inherent appetitive reactions or to convert approach reactions to salient stimuli into preferred avoidance reactions (“avoidance bias”). Originally developed as an add-on training in the standard treatment of patients with alcohol use disorder, with positive results in reducing drinking amounts and relapse rates, such training has also been successfully used in other substance use disorders (e.g., nicotine, cannabis) and eating disorders (Loijen et al. 2020). Nevertheless, these are essentially experimental studies, the methodology of which has often been questioned (small case numbers, lack of or inadequate control groups, etc.) and whose effectiveness requires further evidence.

Research is also concerned with targeting specific brain regions using novel interventions such as real-time fMRI-guided neurofeedback, transcranial magnetic stimulation (TMS), and transcranial direct current stimulation (tDCS), Chap. 32 in this book. As described in detail in the previous section, both in AN, BN, and BED as well as in obesity and addiction disorders, two systems in the brain seem to be essentially involved; on the one hand, the system that causes hypersensitivity to salient/rewarding stimuli (e.g., ventral striatum, amygdala, anterior insular region, ventromedial prefrontal cortex including orbitofrontal cortex), and on the other hand, the system that ensures sufficient cognitive control over food or addictive substances (e.g., anterior cingulate, lateral prefrontal cortex including dorsolateral prefrontal cortex) (Val-Laillet et al. 2015). Some studies have shown positive effects of TMS on bulimic and anorectic psychopathology through treatment protocols targeting the dorsolateral prefrontal cortex. Invasive methods, such as deep brain stimulation (DBS) in reward-relevant brain regions (such as the nucleus accumbens), have also been successfully applied in patients with AN. Despite some negative study results, the preliminary results of this type of research in eating and weight disorders suggest that these methods could make a significant contribution to expanding the treatment arsenal available to us today (Dalton et al. 2017). The underlying mechanism of effectiveness remains unclear (e.g., change in attentional

bias vs. modification of inhibitory control), and the results need to be further verified through placebo-controlled studies.

► **Important** Therapeutic interventions that address automated habitual behavioral responses may also play an important role in the treatment of eating and weight disorders.

27.6 Summary

There are overlaps between eating and weight disorders and addiction disorders in terms of phenomenology, comorbidity, pathophysiology, neurobiology, and treatment options. In this chapter, arguments for and against the conceptualization of eating and weight disorders as addiction-like behaviors are presented. The controversial concept of “food addiction” is also introduced. Overall, eating and weight disorders can be considered as addiction disorders for at least a portion of those affected. Since the treatment of eating and weight disorders remains a major challenge from a therapeutic perspective, expanding our understanding of the significance of dependent behavior mechanisms may represent enormous progress for treatment. Novel treatment methods such as stimulus exposure and computer-assisted trainings, as well as various methods of neurostimulation could make significant contributions.

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Part IV

**Biological and Medical Aspects of
Eating Disorders**



Hunger and Satiety

28

Reinhard Pietrowsky

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From a biological perspective, food intake is controlled by hunger and satiety. Hunger leads to the initiation of appropriate appetitive behaviors that prepare for food intake, eventually resulting in food consumption. This triggers the activation of satiation processes, which lead to the termination of food intake and a period of satiety. In addition to these more short-term regulatory processes, long-term regulatory processes control the maintenance or achievement of a certain body weight through hunger and satiety.

Although food intake is thus a basic biological activity, its regulation is not solely controlled by physiological, metabolic, and sensory factors, but also by a multitude of psychological processes. Numerous examples of social control of food intake can already be found in the animal kingdom. In humans, the susceptibility of food intake to psychological and social factors

is even more pronounced. This applies not only to healthy, undisturbed eating behavior but also, to a particularly high degree, to disturbed eating behavior.

In the following, an overview of the individual phases of food intake and the associated satiation processes will be given first. Then, biological, sensory, and psychological factors of hunger and satiety will be presented. Finally, central nervous mechanisms of hunger and satiety regulation in relation to the regulation of body weight will be described.

28.1 The Process of Food Intake

The process of food intake can be divided into different phases, each of which is associated with specific biological or psychological aspects of satiation:

- cephalic phase,
- gastric phase,
- intestinal phase.

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28.1.1 Cephalic Phase

In the cephalic phase, there is not yet any direct contact of the food with the digestive organs. Sensory stimuli emanating from the food (optical, olfactory, gustatory, possibly acoustic) cause the body to prepare for food utilization via the central nervous system (CNS). The importance of the cephalic phase is emphasized by the fact that, for example, the mere sight, smell, or expectation of food can already cause 50% of the maximum possible gastric acid secretion. In addition to an increased secretion of gastric acid, there is also an increased release of gastrin and somatostatin from the stomach during the cephalic phase. Furthermore, an increased release of insulin can be observed (Pietrowsky et al. 1988). The nervous and endocrine mechanisms initiated in the cephalic phase lead, on the one hand, to an increased sensation of hunger, and on the other hand, to the activation of endocrine mechanisms that result in centrally mediated satiation. This means that food intake is terminated a certain time after it has begun, even if the physiological imbalance caused by food deprivation has not yet been compensated for.

28.1.2 Gastric Phase

The gastric phase, characterized by the presence of food components in the stomach, usually overlaps with the cephalic phase, as central functions are already activated by this preceding phase. During the gastric phase, there is further gastric acid secretion. The stretching of the stomach also causes a decreased sensitivity of the CNS to olfactory and taste stimuli (Pietrowsky et al. 1988).

28.1.3 Intestinal Phase

During the intestinal phase, i.e., the presence of food in the intestine, various peptides are released from the intestinal mucosa, e.g., cholecystokinin (CCK), neuropeptides, and

somatostatin. These hormones perform essential functions in food utilization and are also important peripheral satiation signals (below). The presence of small amounts of food in the intestine leads to satiation. This effect is independent of stomach distension. It is mediated neurally and humorally, with CCK being considered the essential humoral factor. The satiating effect of CCK is dependent on prior cephalic stimulation (Pietrowsky et al. 1988).

Conclusion

The process of food intake thus triggers a cascade of biological and psychological processes, starting with the first sensory contact with the food. These lead to the termination of food intake (satiation) and a period without hunger and without further food intake (satiety).

28.2 Biological, Sensory, and Psychological Factors of Hunger and Satiety

28.2.1 Biological Factors

Biological factors that influence hunger and satiety can be found both in the periphery and in the CNS. **Peripheral factors** include the filling state of the stomach, the amount of macronutrients in the blood, and hormonal regulatory processes that originate in the gastrointestinal tract. **Central influencing factors** are hormonal and central nervous regulatory processes that originate in the brain, and the central nervous control of body weight. It is likely that all of these factors play a role in the development of hunger and satiety, without any single factor being able to explain eating behavior on its own.

The **filling state of the stomach** appears to be a crucial factor for the occurrence of hunger. However, it has been shown that signals from the stomach are not necessary for the development of hunger sensation, as hunger feelings are also described after gastric resection. A

reduction in dietary **macronutrients** (glucose, fat, proteins) in the blood below a certain level is also considered a central indicator for triggering a hunger sensation, and accordingly, there are glucostatic, lipostatic, and aminostatic theories of hunger, each of which considers the level of the respective nutrient as central for the triggering of hunger and food intake (Pietrowsky et al. 1988). However, these theories cannot explain why hunger persists in some cases despite high levels of the respective substances.

28.2.1.1 Peripheral Hormonal Regulatory Processes

Of particular importance for the regulation of hunger and satiety are peripheral hormonal regulatory processes. These include hormones that are released in the digestive tract by food intake and act as satiety signals in the brain. The most important of these hormones is cholecystokinin (CCK), which is released from the intestine by the intake of food, especially fat, but also already in the cephalic phase. Using the example of CCK, a mechanism of peripheral-hormonal satiety regulation will be illustrated. CCK fulfills important functions for fat digestion. At the same time, information about the level of CCK in the blood reaches the brain via CCK receptors on vagus afferents, and the circulating CCK can also cross the blood-brain barrier via so-called circumventricular organs and enter the brain itself. In the brain, CCK induces satiety processes via numerous CCK receptors located there or via the vagus stimulation triggered by CCK, which ultimately leads to the cessation of food intake. These satiety processes consist of both a reduced feeling of hunger and psychological changes, such as reduced attention and decreased appetence for food stimuli (Pietrowsky 1990). The satiating effect of CCK seems to depend on stimulation with food stimuli (cephalic phase).

In addition to hormones from the gastrointestinal tract that induce central nervous satiety (CCK, somatostatin, glucagon-like peptide 1, peptide YY), hormones from the body's fat cells (leptin) and the pancreas (insulin, amylin) can also trigger centrally mediated satiety. Leptin,

insulin, and amylin are released in proportion to the amount of body fat and cause a decreased food intake. Thus, they fulfill the function of regulating body weight. In addition, insulin, leptin, and CCK interact synergistically in the sense that the satiating effect of CCK is more pronounced at high insulin or leptin levels (Drazen and Woods 2003).

28.2.1.2 Central Nervous Hunger and Satiety Regulation

The central nervous hunger and satiety regulation describes those structures and processes in the brain in which the corresponding motivational sensations (hunger, satiety) and the associated homeostatic behaviors (food intake or termination of food) are triggered. Triggers can be sensory events (e.g., the sight of food) or the release of the mentioned satiety hormones.

The so-called dual-center theory assumes that the hypothalamic areas of the **lateral hypothalamus** (LH) and the **ventromedial hypothalamus** (VMH) are responsible for the emergence of hunger and satiety. Thus, the LH is considered the hunger center, because its activation leads to increased food intake, while the VMH is considered the satiety center, because its activation triggers the termination of food intake (Pietrowsky et al. 1988). It can also be assumed that the LH is under a tonic inhibitory influence of the VMH. Recently, other core areas of the hypothalamus have been recognized as important for the control of food intake. These are, in particular, the arcuate nucleus (infundibularis) and the paraventricular nucleus. In these nuclei, the processing of information from adipose tissue or the pancreas seems to take place (Woods et al. 2000).

The importance of the hypothalamus for hunger and satiety regulation has also been confirmed by imaging studies. In the hungry state (compared to the sated state), there is an increased regional cerebral blood flow in the hypothalamus. In addition, under conditions of hunger, other brain regions were found to be more strongly activated: insular cortex, anterior cingulate, hippocampus, thalamus, caudate nucleus, and cerebellum (Tataranni et al. 1999).

Under conditions of satiety, the prefrontal cortex was more strongly activated than under conditions of hunger. While the activation of the insular cortex under conditions of hunger probably indicates emotional and gastrointestinal reactions to hunger, the activation of the prefrontal cortex under conditions of satiety may be an expression of memory processes, such as those that occur in connection with food intake (e.g., encoding the location of food finding).

28.2.1.3 Genetic Factors

The importance of biological factors in hunger and satiety regulation is also evident in the role of genetic factors. It has been known for several years that genetic defects can lead to a loss of satiety behavior and thus to a loss of control over eating behavior. Animal experimental studies with genetically modified mice, which have a disturbance in leptin production (so-called ob/ob mice), were able to show that these animals gain an extreme amount of weight due to the lack of leptin formation, as leptin is missing as a long-term effective satiety signal (Sect. 28.3). In humans, the Prader-Willi Syndrome (disorder on chromosome 15) is associated with a genetically determined overproduction of the appetite-increasing hormone ghrelin (Sect. 28.3) and leads to massive weight gain after the 12th month of life.

28.2.2 Sensory Factors

Sensory factors play a significant role in food intake and for hunger and satiety. They assume an intermediate position between biological and psychological factors of hunger and satiety regulation, as they interact with both. Sensory characteristics of food, such as taste, smell, appearance, etc., lead to food being perceived as more or less palatable. The palatability of food, as the sum of its sensory characteristics, is directly related to the hypothalamic control of food intake. Thus, a lesion of the LH, i.e., the hunger center, leads to a loss of food intake that depends on the palatability of the offered food. The more palatable the food is, the weaker the

appetite loss caused by the LH lesion, i.e., very palatable food is still consumed, whereas sensorily less appealing food is not (Pietrowsky 1990).

However, even after destruction of the VMH, i.e., the satiety center where animals exhibit excessive overeating, the animals eat particularly large amounts when the food is especially palatable (Pietrowsky 1990). This is reflected in the "cephalic phase hypothesis", which states that hyperphagia after VMH lesion is under strong sensory control. Reflex reactions of the cephalic phase of food intake, such as salivation or insulin secretion, are, according to this theory, excessively pronounced in the VMH syndrome. A VMH lesion, therefore, does not lead to a general lack of satiety according to this hypothesis, but to an increased food intake upon exposure to (palatable) foods.

In addition to its influence on conditioned processes of food intake, the sensory quality of food also has an important function for its reinforcement value. The work by Rolls and colleagues showed that the sensory stimuli emanating from food lead to an increase in excitation of hypothalamic neurons associated with the reward value of food (Rolls 1975). Sensory stimuli originating from food thus have a rewarding character as discriminative cues. It was also shown that the rewarding effect of food can be differentially conditioned to previously neutral stimuli (Rolls 1985).

In general, the more palatable a dish is, the more of it is eaten (Sørensen et al. 2003). However, the effects of palatable food on hunger or satiety are not trivial. For example, palatable food can cause people to feel hungrier after consumption than less palatable food. Another effect is that palatable food is more satiating than an energy-equivalent amount of less palatable food (Sørensen et al. 2003).

28.2.3 Psychological Factors

Psychological factors that constitute hunger and satiety are essentially **emotional** and **cognitive processes**. In addition, **social factors**, which

are mediated through psychological attribution processes, also influence hunger and satiety. The cognitive and emotional factors can be considered psychological correlates of hunger or satiety, which are suitable for facilitating the corresponding need satisfaction.

28.2.3.1 Cognitive Factors

Cognitive factors that influence hunger and satiety are primarily selective attention to food stimuli (and resulting in more intensive processing of these stimuli) and an increased cognitive fixation on food stimuli, which is reflected in increased mental engagement with food stimuli. Increased selective attention to food stimuli is a central characteristic of hunger and an essential psychological component of it. It leads to food stimuli being recognized or discovered more quickly. Ambiguous stimuli are also more likely to be assessed as food-related. Satiety, in turn, leads to a decrease in selective attention to food stimuli which no longer have a processing advantage over other stimuli. Such a reduction in selective attention to food stimuli is a specific characteristic of satiety induced by satiating hormones (Pietrowsky 1990). Many of these cognitive processes occur preattentively, so they are not accessible to conscious experience.

Increased mental engagement with food stimuli is an expression of a tonically increased activation of the corresponding memory networks under conditions of hunger, which constitute semantic and primarily episodic content related to eating, food, fasting, etc. Since many people with eating disorders also have a strong cognitive fixation on their own body and appearance, it can be assumed that the mental representations of the figure and body are associatively activated in these individuals. Using experimental psychological paradigms (e.g., emotional Stroop test, Dot-Probe paradigm), the cognitive aspects of hunger and satiety can be precisely quantified. Disturbances of these cognitive characteristics of hunger and satiety are a typical feature in patients with eating disorders and are likely to be partly responsible for the development or maintenance of the eating disorder. For example, individuals with eating disorders are

characterized by a lack of a decrease in cognitive fixation on food stimuli after food intake.

28.2.3.2 Emotional Factors

Similar to the cognitive characteristics of hunger and satiety, emotional factors, such as the appetitive evaluation of food stimuli, can also be understood as an expression of the activation of corresponding memory structures. Hunger is accompanied by a need-specific activation of positively-valenced aspects of these memory structures. Under satiety, this activation decreases and can turn into a negatively-valenced evaluation, i.e., food items are perceived as aversive. The emotional evaluation of food-related stimuli is an important aspect of hunger and satiety, which in turn naturally also influences the cognitive processing of food-relevant stimuli. It is important to note that the relationship between hunger and satiety on the one hand and their cognitive and emotional characteristics on the other hand is not unidirectional, but that these cognitive and emotional characteristics also constitute the extent of hunger and satiety.

28.2.3.3 Social Factors

Social factors, such as social norms, social comparison processes, and cultural influences, can influence hunger and satiety indirectly through attribution processes, in addition to their direct influence on eating behavior. Although psychological factors can directly influence hunger and satiety, their impact on other influencing factors of eating behavior is even stronger than their direct effect on hunger and satiety (Pietrowsky 2006).

28.3 Hunger and Satiety and the Regulation of Body Weight

In the hypothalamus, humoral signals reflecting the fat content and thus the body weight are incorporated into the control of satiety and eating behavior. In the arcuate and paraventricular nuclei, this information is processed with the involvement of local peptides, ultimately

resulting in the induction of hunger or satiety to maintain long-term body weight stability. In the case of too low body weight, hunger is generated, leading to increased food intake and an increase in body weight. In the case of too high body weight, satiety processes are initiated, leading to reduced food intake and a decrease in body weight.

The control processes in the arcuate and paraventricular nuclei exert their influence on food intake through the hypothalamic core areas of the lateral and ventromedial hypothalamus (Sect. 28.2.1.2). If these processes result in a signal for reduced food intake, this activates the VMH; if they result in a signal for increased food intake, this activates the LH. It is crucial that both LH and VMH induce hunger or satiety by modulating the satiety signals from the peripheral humoral satiety system. Activation of the VMH leads to an enhancement of the satiety signals, while activation of the LH leads to a weakening of the humoral satiety signals. This modulation appears to take place in the nucleus tractus solitarius of the brainstem, to which the peripheral satiety signals project via afferent nerves (Drazen and Woods 2003).

Thus, a closed control loop emerges: Humoral satiety signals (e.g., CCK) regulate the amount of food consumed in the short term. The current nutritional state determines, via leptin, ghrelin, and insulin, a higher-level goal for increased or decreased food intake in a hypothalamic control system, and this modulates the effect of the humoral satiety signals. Through the cumulative effect of enhanced or weakened satiety signals, long-term changes in body weight occur. Since the effects of satiety signals are not only physiological but also psychological, the current nutritional state modulates the cognitive and emotional correlates of hunger and satiety via leptin and insulin. For a more detailed description of the very complex processes of hypothalamic satiety regulation, I refer to the contribution by Ehrlich and Tam in this book (Chap. 29).

Conclusion

In summary, it can be stated that hunger and satiety are indeed basic biological determinants of eating behavior; however, in humans, they are only one aspect of many that control eating behavior. Ultimately, hunger and satiety are also psychologically determined constructs that are operationalized through corresponding behaviors. In the simplest case, this occurs through food intake. However, when mediating psychological processes are taken into account, a much more complex picture emerges. Hunger and satiety also have a motivational-emotional component, which is reflected in both the desire to eat or not to eat, as well as in the emotional and cognitive evaluation of food stimuli and the resulting cognitive processing of food stimuli. Finally, these cognitive processes can be considered not only as a consequence of hunger and satiety, but as their essential determinants. These psychological processes can become so significant that they – as in the case of eating disorders – overlay the biological hunger or satiety signals and lead to pathological fasting or overeating.

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Peripheral Peptide Hormones, Neuropeptides, and Neurotransmitters

Stefan Ehrlich and Friederike I. Tam

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29.1 Peripheral Peptide Hormones and Neuropeptides

29.1.1 Basics

The neuronal control circuits of appetite regulation involve complicated and often redundant systems with interactions of peripheral (e.g., gustatory and afferent vagal stimulation as well as secretion of gastrointestinal peptide hormones and peptides from adipose tissue) and central mechanisms (e.g., the secretion of neuropeptides). The most important anatomical locus of weight regulation is the hypothalamus, particularly the nucleus arcuatus. The possibilities for

in vivo investigation of central nervous mechanisms of weight regulation in humans are limited. The findings described below are therefore based predominantly on results from animal experimental studies. Numerous peripheral peptide hormones and neuropeptides are involved in the regulation of food intake (Table 29.1).

The peripheral peptide hormones are secreted by adipose tissue (leptin) or the gastrointestinal tract (ghrelin, peptide YY [PYY], cholecystokinin [CCK]). Leptin (anorexigenic) and ghrelin (orexigenic) represent important, opposing systemic mediators in the neurobiological regulation of food intake and energy homeostasis. Leptin is produced in white adipose tissue in adipocytes and secreted pulsately. The level of serum leptin is dependent on body fat mass and energy intake (positive correlation). Ghrelin is mainly synthesized in enteroendocrine cells of the stomach, but also in the rest of the gastrointestinal tract. It occurs in two forms in the body (deacylated and acylated), with its appetite-stimulating function being exerted by the acylated form. In the fasting state, ghrelin levels correlate negatively with BMI and body fat mass. Ghrelin levels and, to a lesser extent, leptin levels are

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Table 29.1 Important peripheral peptide hormones (secreted in the gastrointestinal tract and adipose tissue) and central neuropeptides of weight regulation

	Anorexigenic	Orexigenic
Central	Melanocyte-stimulating hormone (α -MSH) Corticotropin-releasing hormone (CRH) Oxytocin	Neuropeptide-Y (NPY) Agouti-related peptide (AgRP) Melanin-concentrating hormone (MCH) Orexin-A
Peripheral	Leptin Peptide YY (PYY) Cholecystokinin (CCK)	Ghrelin

subject to a presumably food intake-dependent circadian rhythm. Before meals, ghrelin concentration rises steeply and falls again at the end of food intake. This suggests a role for ghrelin in the initiation of food intake.

► **Important** The most important anatomical locus of weight regulation is the hypothalamus.

Leptin probably causes a reduction in the secretion of the highly potent orexigenic neuropeptides neuropeptide-Y (NPY), agouti-related peptide (AgRP), and orexin-A by deactivating orexin- and NPY/AgRP neurons and an increase in the secretion of the anorexigenic melanocyte-stimulating hormone (α -MSH) by activating proopiomelanocortin/cocaine-amphetamine-regulated transcript neurons (POMC/CART neurons). In addition to its anorexigenic effect, leptin also initiates an increase in energy expenditure, thermogenesis, and lipolysis. Ghrelin probably binds to NPY/AgRP and POMC/CART neurons in the arcuate nucleus via growth hormone (GH)-secretagogue receptors. In contrast to leptin, ghrelin increases the secretion of the orexigenic neuropeptides NPY and AgRP and inhibits POMC/CART neurons. Furthermore, ghrelin stimulates the secretion of GH.

► **Important** In the fasting state, rising ghrelin levels together with falling leptin levels are likely crucial for the central induction of hunger.

The exact physiological effect of the hormones PYY and CCK, formed in the endocrine L-cells of the distal small intestine and colon, is the subject of intensive research. The serum levels of both hormones rise steeply postprandially and remain elevated for several hours. This suggests that the meal-related increase in PYY and CCK represents a short-term satiety signal. PYY also reduces intestinal motility and the secretion of ghrelin (Fig. 29.1). The neuropeptide oxytocin is primarily formed in the hypothalamus and appears to lead to a reduction in food intake and body weight, in addition to a variety of other central and systemic effects.

29.1.2 Findings in Eating Disorders

The most important findings on changes in peripheral peptide hormones and neuropeptides in anorexia nervosa (AN) and bulimia nervosa (BN) are summarized in Table 29.2. There are numerous studies on the peripherally secreted peptide hormones, which will be discussed in the following.

29.1.2.1 Leptin

The anorexigenic leptin plays an important role in the hypothalamic control of weight regulation. Untreated patients with AN in the acute phase of the disorder show reduced leptin serum and cerebrospinal fluid levels due to decreased body fat content and low food intake (Monteleone and Maj 2013). In contrast, the concentration of the soluble leptin receptor in the blood is increased, which could lead to

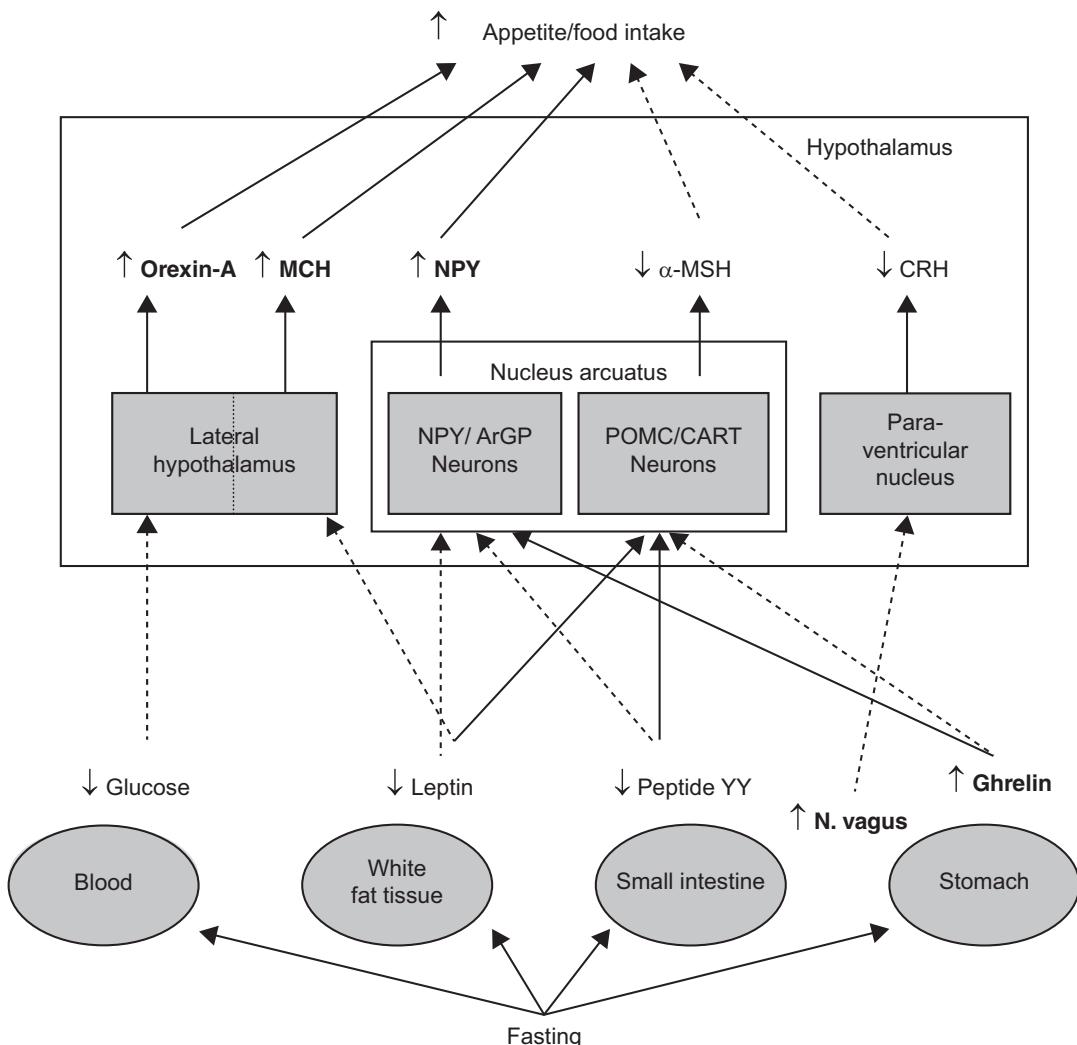


Fig. 29.1 Simplified representation of the neuroendocrine regulatory mechanisms of weight regulation during fasting. The long arrows indicate the influence of the mediators (dashed arrow = inhibitory influence, solid arrow = stimulating influence). The small arrows next to the mediators indicate the changes in the fasting state (\uparrow = concentration increased, \downarrow = concentration decreased); mediators with appetite-increasing effects are in bold. For example, the glucose concentration is decreased in the fasting state, reducing its inhibitory effect on the lateral hypothalamus. Due to the partial removal of this inhibition, more appetite-increasing orexin-A is released, thereby stimulating food intake. Abbreviations: AgRP = agouti-related peptide, CRH = corticotropin-releasing hormone, MCH = melanin-concentrating hormone, α -MSH = melanocyte-stimulating hormone, NPY = neuropeptide-Y

reduced bioavailability of free leptin as a protective mechanism (Smitka et al. 2013). During inpatient treatment, leptin levels increase in patients with AN depending on premorbid weight and the rate of weight gain, whereby a very steep increase in leptin may potentially lead to difficulties in further weight gain and

promote short-term weight loss (Monteleone and Maj 2013; Holtkamp et al. 2004).

Excessive physical activity occurs in approximately 30-80% of patients with AN and in a proportion of patients with BN during the acute stage of the disorder (Hebebrand et al. 2003). The semi-starvation-induced hyperactivity of

Table 29.2 Neuroendocrine changes in AN and BN during the acute phase of the disorder (\uparrow = concentration increased, \downarrow = concentration decreased, n = concentration normal, *in CSF* = in cerebrospinal fluid, *in bl.* = in blood, i.e., in serum or plasma, – = no findings). If studies had produced different findings, multiple concentration values are shown (e.g., $\uparrow \downarrow n$, if some studies showed increased and others decreased or normal concentrations). In the case of postprandial findings, the concentration values \uparrow , \downarrow , or n indicate the absolute concentration after food intake, with the underlying mechanism described in parentheses

		AN	BN
Peripheral Peptide Hormones	Leptin in CSF	\downarrow	-
	Leptin in bl.	\downarrow	$\downarrow n$
	Soluble Leptin Receptor in bl.	\uparrow	$\uparrow n$
	Ghrelin in bl.	\uparrow	$\uparrow n$
	Ghrelin in bl. postprandial	\uparrow (with increased basal concentrations despite relative postprandial decrease)	\uparrow (with reduced postprandial decrease) or n
	PYY in bl.	$\uparrow n$	n
	PYY in bl. postprandial	\uparrow (with increased basal concentrations or increased postprandial increase) or n	$\uparrow \downarrow$ (with reduced or increased postprandial increase) or n
	CCK in bl.	$\uparrow n$	$\downarrow n$
Neuropeptides	CCK in bl. postprandial	\uparrow (increased basal concentrations and increased postprandial increase) or n	\downarrow (with reduced postprandial increase) or n
	NPY in CSF	\uparrow	n
	NPY in bl.	$\uparrow \downarrow n$	\uparrow
	AgRP in bl.	\uparrow	-
	Orexin-A in bl.	$\uparrow \downarrow n$	-
	α -MSH in bl.	$\downarrow n$	-
	Oxytocin in CSF	$\downarrow n$	n
Neurotransmitters	Oxytocin in bl.	$\downarrow n$	n
	Serotonin metabolite 5-HIES in CSF	$\downarrow n$	n
	Dopamine metabolite HVS in CSF	$\downarrow n$	n
	Dopamine metabolite HVS in bl.	\uparrow	\uparrow
	Norepinephrine or metabolite MHPG in CSF	n	\downarrow
	Norepinephrine or metabolite MHPG in bl.	\uparrow	n

rats serves as a biological model for increased physical activity during fasting (Hebebrand et al. 2003). This behavioral change in rats under food restriction appears to be mediated by the fasting-related decrease in leptin levels. Administration of recombinant leptin in rats leads to a complete suppression of starvation-induced hyperactivity (Exner et al. 2000). In patients with AN, a low

leptin level during the acute phase of the disorder correlates with a high degree of excessive physical movement and restlessness (Ehrlich et al. 2009; Holtkamp et al. 2006). This suggests that a reduced leptin level may also be involved in the development of increased physical activity in patients with eating disorders.

The majority of patients with BN show reduced or normal leptin levels in the blood during the acute phase of the disorder (Smitka et al. 2013). However, patients with frequent binge-purge episodes show reduced leptin concentrations despite a normal body mass index (BMI). Some patients continue to have low leptin levels even after overcoming BN. It remains unclear whether there is a connection to a high pre-morbid weight and a tendency for weight gain (Smitka et al. 2013).

29.1.2.2 Ghrelin

In the acute state of AN, ghrelin concentrations in the fasting state are increased (orexigenic stimulation), and it is possible that patients with AN in the cachectic state have a reduced sensitivity to ghrelin's appetite-enhancing effect (Bernardoni et al. 2020; Culbert et al. 2016). As in normal-weight control subjects, external application of ghrelin analogs in patients with AN could, however, lead to an increase in food intake (Hotta et al. 2009; Fazeli et al. 2018). Although no differences in the relative postprandial decrease in ghrelin levels were found in patients with AN, absolute ghrelin levels are also increased postprandially (Monteleone and Maj 2013).

Patients with BN in the acute state of the disorder show normal or increased ghrelin levels in the fasting state (Smitka et al. 2013). Data on the postprandial concentration course of ghrelin in patients with BN is also heterogeneous (Culbert et al. 2016). However, particularly in the cephalic phase of digestion, when food intake is expected, there seems to be an increased ghrelin secretion, which could lead to a strong feeling of hunger and thus promote binge eating (Culbert et al. 2016).

29.1.2.3 PYY

Studies on the anorexigenic peptide hormone PYY in patients with AN have yielded inconsistent results (Berner et al. 2018). So far, predominantly increased or normal PYY concentrations have been described in the acute stage of AN (Tam et al. 2020; Fernández-Aranda

et al. 2016; Eddy et al. 2015). The question of whether increased PYY concentrations have a pathophysiological significance in AN (anorexigenic stimulation) needs further investigation. For acutely ill patients with BN, predominantly normal PYY concentrations are described in the fasting state (Culbert et al. 2016). Study results on the postprandial PYY concentration course are heterogeneous for both patients with AN and BN (Berner et al. 2018). In patients with BN, a decreased PYY secretion in response to food intake could promote the occurrence of binge eating (Culbert et al. 2016).

29.1.2.4 CCK

The data on CCK in the fasting state and postprandially in patients with acute AN is contradictory (Culbert et al. 2016). Increased or normal basal CCK levels have been reported. In BN, basal CCK levels have been reported as normal or decreased, and the postprandial increase seems to be disturbed (Culbert et al. 2016). This could contribute to the maintenance of the disorder by a reduced feeling of satiety after food intake (Smitka et al. 2013).

29.1.2.5 Centrally Secreted Neuropeptides of Weight Regulation

The data on the central mediators—the orexigenic NPY, AgRP, and orexin-A, as well as the anorexigenic α -MSH—is less reliable. It is not always clear to what extent measurements of these partially relatively unstable parameters in peripheral blood reflect the concentration or effect in hypothalamic tissue, and secretion of the aforementioned mediators has been detected at low concentrations in peripheral tissues. While measurements in cerebrospinal fluid indicated increased NPY levels in acute AN, the data on NPY concentrations in the blood of patients with AN is contradictory (Smitka et al. 2013). In BN, there is evidence of increased peripheral NPY concentrations (Smitka et al. 2013). Peripheral AgRP levels in AN have been described as elevated and normalize with weight gain (Merle et al. 2011).

There is no data on BN so far. In summary, the findings on NPY and AgRP in AN can best be explained as a compensatory counter-regulation in the underweight state. The findings on orexigenic orexin-A and anorexigenic α -MSH in AN are also contradictory. Autoantibodies against α -MSH may play a role in AN and BN (Fetissov and Hökfelt 2019). The anorexigenic oxytocin has been described as reduced or normal in the blood of patients with AN in the fasting state, while a reduction in cerebrospinal fluid was only found for patients with the restrictive but not with the binge/purge subtype (Plessow et al. 2018). Initial studies are investigating whether intranasally administered oxytocin could influence the eating behavior of patients with AN. So far, there is no evidence of changes in oxytocin concentration in BN (Plessow et al. 2018).

29.2 Neurotransmitters

29.2.1 Basics

In addition to the peripheral peptide hormones and neuropeptides, the monoaminergic neurotransmitters (serotonin, dopamine, norepinephrine) are involved in the regulation of food intake. A drug-induced increase in intrasynaptic serotonin (5-HT) or direct activation of 5-HT receptors results in a reduction of food intake, whereas a decrease in serotonergic transmission seems to be associated with increased food intake and weight gain. In contrast to serotonin, central administration of norepinephrine results in increased food intake via stimulation of α -adrenergic receptors in the paraventricular hypothalamus. In addition, a β -adrenergic satiety-activating system seems to exist in the pernifocal region of the hypothalamus. Thus, norepinephrine stimulates or inhibits food intake depending on the site of stimulation. Dopamine metabolism plays an important role in the rewarding and reinforcing aspects of food intake. The application of low doses of dopamine stimulates food intake, while higher doses have anorexigenic effects.

29.2.2 Findings in Eating Disorders

Changes in neurotransmitter systems in AN and BN can be investigated either indirectly—in cerebrospinal fluid, blood, or by means of metabolites in urine—or directly using positron emission tomography (PET) or single-photon emission computed tomography (SPECT). Studies using functional magnetic resonance imaging (fMRI) can also provide insights into neurotransmitter systems by applying specific behavioral paradigms and mathematical models. The use of PET and fMRI has increased in recent years in research on eating disorders. The results are described in detail in Chaps. 30 and 32. The most important findings on changes in neurotransmitters in AN and BN based on findings in cerebrospinal fluid, blood, and urine are summarized in Table 29.2. Only a few studies so far have investigated to what extent abnormalities in neurotransmitter systems persist after overcoming AN and BN. Disturbances that persist after remission of the disorder could correspond to an intrinsic vulnerability (“trait-marker”).

29.2.2.1 Serotonin

In the acute stage of the disorder, reduced or normal concentrations of the 5-HT metabolite 5-hydroxyindoleacetic acid (5-HIES) were detected in the cerebrospinal fluid of patients with AN, while normal concentrations were found in patients with BN (Kaye 2008; Gerner et al. 1984). In contrast, increased 5-HIES concentrations in the cerebrospinal fluid were measured in weight-rehabilitated, former patients with AN and individuals recovered from BN (Kaye 2008). These persistent abnormalities in recovered AN and BN could indicate increased serotonin activity as a “trait-marker” in the sense of a common intrinsic vulnerability of the serotonin system. Deviations in serotonergic markers measured in blood platelets in former patients with AN support such an assumption (Ehrlich et al. 2010). Temperament factors, such as conflict avoidance, behavioral inhibition, and anxiety and tension, are also associated with

the serotonin system. In patients who developed anorectic symptoms during adolescence, such temperament factors as well as persistence (ability to stick to something, but also rigid behaviors) were described in childhood. Former AN and some BN patients are characterized by compulsiveness, perfectionism, and negative affect. Behaviors described in patients with AN before and after overcoming the eating disorder seem similar to those associated with a hyperserotonergic state. Based on this, Kaye (2008) developed a pathophysiological model for the development of AN, in which calorie reduction at the beginning of the disorder improves such symptoms by reducing tryptophan (as an essential amino acid for the synthesis of serotonin) and thus positively reinforces weight loss. In line with this, a temporary experimental reduction of central serotonin synthesis by acute tryptophan depletion has an anxiety-reducing effect in former patients with AN (Kaye et al. 2003). In contrast, acute tryptophan depletion in patients with BN tended to exacerbate symptoms (Bruce et al. 2009; Kaye et al. 2000). Impulsive behaviors and transitions to borderline personality disorders are also common in patients with BN, so different subgroups may need to be considered. In line with a dysfunctional serotonergic neurotransmitter system are findings on the pharmacological efficacy of selective serotonin reuptake inhibitors (SSRI) in eating disorders. The effect of SSRIs in reducing binge-eating episodes in BN is well documented (McElroy et al. 2019). In contrast, the benefit of SSRIs in the context of relapse prevention in AN is not well established.

29.2.2.2 Dopamine

The influence of dopamine metabolism on the reward system and food intake is complex and appears to involve various interactions with other neurotransmitters such as serotonin or peripheral neuropeptides such as ghrelin and leptin (Monteleone et al. 2018). The results in eating disorders are inconsistent, and the pathophysiological significance of the findings is unclear. Acutely underweight patients with AN show reduced or normal levels of the

dopamine metabolite homovanillic acid (HVA) in cerebrospinal fluid, but increased HVA levels in blood (Kaye et al. 1984; Gerner et al. 1984; Castro-Fornieles et al. 2008). In the acute stage of BN, patients had normal HVA concentrations in cerebrospinal fluid, whereby frequent binge eating episodes were associated with reduced HVA levels (Kaye et al. 1990). In blood, increased HVA concentrations were detected in active BN (Bowers et al. 1994). For weight-rehabilitated former patients with AN, reduced or normal HVA concentrations were described compared to healthy control participants, and for recovered patients with BN, normal HVA concentrations were reported (Kaye et al. 1984, 1999). It is not yet clear whether the neurobiological changes in the reward system in the acute stage of AN or BN should be considered as adaptations to the acute disorder or as “trait markers” (Monteleone et al. 2018).

29.2.2.3 Norepinephrine

For norepinephrine or its metabolite 3-methoxy-4-hydroxyphenylglycol (MHPG), normal cerebrospinal fluid levels were found in the acute stage of AN, but increased concentrations were measured in serum (Kaye et al. 1984; Gerner et al. 1984; Bowers et al. 1994). Patients with BN show reduced norepinephrine concentrations in cerebrospinal fluid in the acute stage but normal MHPG concentrations in blood (Kaye et al. 1990; Bowers et al. 1994). For former, weight-rehabilitated patients with AN and individuals recovered from BN, normal MHPG concentrations were described compared to healthy control participants (Kaye et al. 1999).

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Reward System in Eating Disorders and Obesity

30

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30.1 General Neural Reward Processing

Survival-essential behavior is ensured by primary, natural reward stimuli, such as food and water. In the neural processing of reward stimuli, essentially three components can be distinguished, which can also be differentiated at the neurobiological level.

The **desire** for a reward, the “wanting”, describes the behavioral salience of a reward stimulus, which is modulated by dopaminergic neurotransmission in the mesolimbic system. This system originates in the ventral

tegmental area in the midbrain and projects via dopaminergic neurons to the ventral striatum, with the nucleus accumbens as another core region.

The **pleasure** of receiving a reward, the “liking”, is mainly modulated by opioid projections in prefrontal/orbitofrontal brain regions and is typically associated with activation of the gustatory cortices in the orbitofrontal cortex (secondary gustatory cortex) and the insular region (primary gustatory cortex) for food stimuli. These brain regions are essential for the conscious perception of the hedonic aspect of food intake.

The third component, “**reward-dependent learning**”, is based on a prediction error between “wanting” (reward expectation) and “liking” (received reward). Whenever a reward is higher than expected, a phasic increase in dopaminergic firing rate in the mesolimbic reward system can be observed. This phasic dopamine signal serves action monitoring, learning gain, and behavior optimization. In

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experimental brain imaging, the desire for food (“wanting”) is usually provoked using visual reward stimuli, while the hedonic component (“liking”) is investigated by receiving food or enjoying a food item.

30.2 Relationship between Neural Reward Processing and Eating Behavior

In recent research literature, the influence of changes in the neural reward network is intensively discussed as a relevant factor for the development and maintenance of eating disorders and obesity. The reward system is closely interconnected with the lateral hypothalamus as a core region of homeostatic hunger-satiety regulation. Food intake is stimulated by the anticipated or experienced pleasure of food, which is mediated by the activation of the reward system. The reward value of food can be influenced by both metabolic factors (e.g., fasting) and psychological factors (e.g., depressive episode). An altered reward experience for food stimuli is considered a fundamental mechanism for disturbed eating behavior.

- **Important** The reward network represents an important component in the development and maintenance of eating disorders.

30.3 Anorexia nervosa

Patients with anorexia nervosa (AN) are characterized by a decreased desire for food and sexuality (inappetence) as well as a loss of enjoyment of life (anhedonia). Both aspects are associated with a dysfunction of the dopaminergic reward system. Thus, it was initially assumed that AN patients have a generally reduced responsiveness of the reward system. This assumption is contradicted in part by animal experimental studies, which demonstrated a sensitization of the dopaminergic reward system under food restriction and weight

loss. Conversely, overfeeding and weight gain appear to cause a desensitization of dopaminergic neurotransmission. The extent to which these neuroplastic changes in the reward system are influenced by hormones of short-term (e.g., ghrelin) and long-term energy regulation (e.g., leptin) is currently being intensively investigated. Initial findings show that in AN, not only is the hypothalamus’ response to food stimuli reduced, but also the cooperation between the hypothalamus and reward network is severely limited. This suggests a reduced influence of homeostatic signals on reward-associated neuronal reactivity in AN. In line with animal experimental studies, patients with AN show increased responsiveness of the reward system to unexpected taste stimuli compared to overweight controls. The extent to which patients with AN, independent of weight and compared to normal-weight controls, show increased activation of the reward system in response to food stimuli is currently unclear, and findings are contradictory. However, increased activation of the reward system in response to starvation-associated stimuli (e.g., images of underweight women or women engaging in excessive exercise) was also demonstrated compared to normal-weight controls using functional imaging. It is assumed that the excessive exercise despite severe underweight is mediated by the dopaminergic reward system. The fatal combination of persistent hunger and hyperactivity has long been known from animal experimental studies. In an environment with limited food availability and free access to a running wheel, rats show an inverse relationship between activity level and consumed food amount. If the experiment is not terminated, the rats die from the persistent negative energy balance. This phenomenon is referred to as the “auto-addiction” model of anorexia. Thus, the assumption of a generally reduced responsiveness of the reward system in patients with AN has not been confirmed. Rather, it can be assumed that the underweight leads to an increased responsiveness of the patients’ reward system, which may positively reinforce the pursuit of thinness

and hyperactivity. At the same time, there is an increased activation of neuronal control regions in response to food-associated stimuli. An increased influence of control regions on general reward reactivity is also evident in remitted patients with AN.

In addition to the mentioned model, the so-called “reward contamination theory” is discussed in the literature. This assumes that patients with AN primarily perceive rewarding stimuli, such as food, as aversive, whereas they experience punishing (aversive) stimuli, such as hunger, excessive physical exercise, or images of emaciated bodies, as rewarding. It is noteworthy that under the striatal release of dopamine, patients with AN paradoxically experience increased anxiety instead of joy. These still preliminary findings suggest that the altered dopaminergic reward processing is directly related to the increased anxiety in patients with AN during food intake. This might also explain why patients with AN have problems discriminating between positive and negative rewards. In summary, current findings indicate that underweight and food restriction lead to a sensitization of the reward system, with specific conditioning for starvation-associated stimuli. These changes provide a potential neurobiological explanation for patients’ restrictive eating behavior and the pursuit of the lowest possible weight.

► **Important** The “starvation” in patients with AN seems to be positively motivated and reinforced (reward through starvation). This contradicts the previous hypothesis that restrictive eating behavior is primarily an expression of anhedonia.

30.4 Bulimia nervosa

The clinical picture of bulimia nervosa (BN) is characterized by recurrent binge eating episodes, accompanied by a feeling of loss of control over food intake. Patients with frequent binge-purge episodes show decreased levels of dopamine breakdown products in the cerebrospinal fluid.

This central dopamine deficiency is most likely a result of downregulation of the dopamine system due to excessive binge-purge episodes. If recovery occurs with normalization of eating behavior, these changes are reversible. In a functional brain imaging study, the majority of acutely ill patients with BN showed a decreased responsiveness of the reward system to visual food stimuli and gustatory stimuli, including sugar. Furthermore, patients with BN showed a decreased striatal dopamine release under provocation with amphetamines and a decreased binding to μ -opioid receptors in the temporoinsular cortex in a positron emission tomography study (PET ligand study). Thus, patients with BN seem to specifically compensate for their hyporesponsive reward system through recurring binge eating episodes to achieve a comparable pleasure experience. For other reward stimuli (e.g., monetary rewards), there were no differences between patients with BN and healthy controls. However, it is unclear whether the decreased responsiveness of the reward system to food is a cause or consequence of the recurring binge eating episodes. Studies in remitted BN patients show an increased reactivity of the primary gustatory cortex to food stimuli. This might indicate an exaggerated perception of hunger signals and thus represent a triggering factor for the development of BN. The recurring binge eating episodes may then lead to a desensitization of the reward system for food, as observed in functional imaging studies.

In animal experiments, binge eating can be imitated through a specific feeding schedule. Rats that are intermittently given access to a high-calorie sugar solution exhibit binge cravings for sugar over time, induced by repeated deprivation. The behavior of the rats corresponds well to the characteristic vicious cycle of restrictive eating behavior and binge eating in patients with BN. Furthermore, the food consumed by patients with BN during a binge is usually characterized by a high calorie content (e.g., high sugar content). In animal experiments, it has been demonstrated that the intermittently offered high-calorie sugar

solution leads to a sensitization of the reward system. The sugar-dependent rats also show cross-sensitization to other drugs such as alcohol, amphetamines, etc. Over the course of recurring sugar cravings, a tolerance develops, which is accompanied by an increase in the size (calorie content) and frequency of the “binge eating” episodes. Acute abstinence or administration of naloxone (opioid antagonist) leads to typical somatic and psychological withdrawal symptoms in these animals.

In summary, the animal experimental findings suggest that bulimic eating behavior can lead to neuroplastic changes in the reward system, which has parallels with classical addiction disorders. However, it should be noted that sensitization of the reward system in rats has only been demonstrated for sugar and not generally for high-calorie foods.

Furthermore, it has been shown that the responsiveness of the reward system to food stimuli in patients with BN is significantly dependent on affective mood. In phases of negative mood, there is an increase in the experienced reward value for food stimuli. Patients with BN, therefore, deliberately use food to reduce negative emotions, which further enhances the rewarding effect of eating.

The behavior of patients with BN shows numerous parallels with classical addiction disorders. Animal experimental studies confirm that disturbed eating behavior with a typical alternation of restrictive eating behavior and excessive binge eating, accompanied by “purging” behavior, can lead to addiction-like changes in the reward system. So far, it is still unclear to what extent findings of a hypo- and hyperresponsive reward system represent different stages of the disorder in patients with BN.

► **Important** Bulimia nervosa shows parallels to addiction disorders in terms of symptoms and in the results of neuronal research .

30.5 Binge Eating Disorder

The clinical picture of binge eating disorder (BED) also has binge eating as its core pathology, but unlike BN, it is not followed by compensatory behaviors. Furthermore, there are minor differences between BN and BED regarding the phenomenology of binge eating. While patients with BN typically consume large amounts of food very quickly and over a very short period of time, patients with BED much more often consume a large amount of food over a longer period of time, which is referred to as “grazing” or “nibbling” in the Anglo-American context. Moreover, restrictive eating behavior does not regularly precede the binge eating in patients with BED. So far, there have been very few studies on the reward system regarding the clinical picture of BED. In an fMRI study, patients with BED showed increased activation in the medial orbitofrontal cortex during exposure to high-calorie food images compared to healthy controls and patients with BN. Furthermore, it was shown that the receipt of food-associated rewards is also associated with increased activation in this region. The medial orbitofrontal cortex encodes the reward value of a stimulus and is also relevant for the enjoyment of food. Recent findings suggest that a reduced influence of control regions on hedonic reactivity represents a core aspect of BED. The “craving” typical for BED (i.e., strong desire) is seen as a result of the imbalance between reward sensation and impulsivity. Furthermore, overweight individuals with BED more often have the G-allele of the μ -opioid receptor gene (OPRM1) compared to individuals without BED. This allele is associated with an increased enjoyment experience when consuming food. These still very preliminary findings indicate a hyperresponsive reward system to food stimuli in patients with BED. The differential activation patterns of the reward system between BN and BED may explain differences in the behavioral

manifestation of binge eating between the two clinical pictures.

- **Important** The recurring binge eating of patients with BED may be based on an increased enjoyment experience (hedonia).

30.6 Obesity

The eating behavior of obese patients without eating disorders is characterized by overeating without loss of control while maintaining a regular meal structure. These individuals show increased activation in the gustatory and somatosensory cortex during anticipation ("wanting") and receipt ("liking") of a food stimulus. At the same time, however, a lower activation in the dorsal striatum is observed during the receipt of a reward. One explanation for this would be a "dynamic vulnerability model" of obesity, which postulates that an initial hyperresponsivity of both somatosensory/gustatory regions and the ventral striatum leads to increased food intake and preference for high-calorie foods. For example, adolescents at high risk for obesity show a hyperactive reward system that reacts more strongly not only to food stimuli but also to monetary rewards. As a result of the over-nutrition resulting from this, some individuals experience a downregulation of dopaminergic D₂ receptors in the ventral striatum, resulting in a weakened striatal response to food stimuli. However, it has been shown that cue stimuli indicating impending food intake are associated with an increased response of the reward system, thus increasing the motivation for food intake.

Furthermore, genetic studies show that obese individuals with BED, in contrast to obese individuals without BED, have a more frequent occurrence of the Taq1A allele of the D₂ receptor gene. This allele is associated with a 30-40% reduction in striatal D₂ receptors. Thus, obese individuals seem to consume more food to achieve the same rewarding effect. In addition,

obese individuals show abnormal connectivity between different regions of the reward system. A weakened connectivity between the amygdala and the reward network can lead to a dysfunctional modulation of the emotional component of food stimuli. This results in an imbalance, with a predominance of hedonically motivated food intake encoded by the reward system. Additionally, studies in obese individuals show that hunger selectively increases the activation of the reward system for high-calorie stimuli.

The role of peripheral satiety signals is increasingly coming to the fore in theories on the development and maintenance of obesity due to their strong influence on the neural reward network. In addition to a dysfunctional energy homeostasis, there is a weakened response of the hypothalamus to satiety hormones - a phenomenon that further reinforces the influence of hedonic food intake.

- **Important** In obesity, a reward-deficit hypothesis is currently assumed, insofar as the increased food intake serves primarily to stimulate a hyporesponsive reward system.

Conclusion

The findings listed here illustrate the relevance of the neural reward network in the development and maintenance of eating disorders and obesity. Due to the still preliminary nature of the results and the sometimes contradictory findings, further studies are needed to create a more accurate picture of these relationships. Future studies will focus more on differentiating between the desire ("wanting") and the enjoyment of consuming food ("liking"). Furthermore, there are hardly any longitudinal studies to date that allow differentiation as to whether the described changes in the reward system are a cause, consequence, or "scar effect" of the respective disorder. Of particular interest in the longitudinal course are also additional aspects of habit formation, which maintain the disorder

despite negative consequences. The disturbed eating behavior and weight changes in individuals with eating disorders and obesity lead to metabolic changes that are closely interrelated with the reward system. The aim of future studies should be to better understand these relationships and interactions.

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Neuropsychological Findings in Eating Disorders

Martin Schulte-Rüther and Kerstin Konrad

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31.1 Research Questions

The thinking of patients with anorexia nervosa (AN) in the acute state of starvation usually appears to be severely restricted and rigid. Psychotherapeutic measures are therefore sometimes difficult or less effective in this phase. It is therefore all the more astonishing that a large proportion of patients still manage to maintain

relatively stable academic and professional performance over a long period. In contrast, patients with bulimia nervosa (BN) and binge eating disorder (BED) are often described as impulsive, and it is assumed that increased impulsivity, together with increased reward sensitivity, can contribute to uncontrolled eating behavior.

For many years, neuropsychological studies have been investigating cognitive performance in patients with eating disorders and the question of whether deficits represent trait characteristics of the disorder and contribute to its development or only occur during the acute phase (e.g., due to starvation effects) or are long-term consequences of the disorder.

While early studies focused on general cognitive deficits, a large part of the subsequent research has taken a closer look at specific facets of neurocognitive function. Functions that are believed to directly contribute to the psychopathology of eating disorders, particularly in

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the areas of inhibitory control, decision-making, central coherence, cognitive flexibility, attentional bias, and working memory, have been primarily investigated. Most studies on inhibitory control have focused on eating disorders characterized by binge eating, whereas set-shifting and central coherence have been primarily studied in patients with AN. Studies on attentional bias and decision-making have been conducted more evenly across different eating disorder diagnoses.

However, many of the existing studies are characterized by heterogeneous samples in terms of severity, chronicity, diagnostic criteria, and existing comorbidities, making the interpretation of the findings difficult. More recent studies show a greater focus on specific functions and allow for a hypothesis-driven analysis of even more subtle neuropsychological deficits. In addition, extensive meta-analyses are now available for certain areas of functioning, providing a clearer picture of cognitive deficits.

The following presents the individual findings for various areas of functioning. The majority of studies focus on AN and BN, but there is an increasing number of studies investigating cognitive functions in BED, obesity,

and overweight without further eating disorder symptoms.

31.2 Attentional Bias

Attention processes can be involved in the generation and amplification of emotions. Conversely, the conscious control or redirection of attention processes also has a regulatory effect on emotions. In particular, attentional bias, i.e., the tendency to over-focus on certain information in the environment, is relevant for eating disorders, as the excessive preoccupation with body- and food-related stimuli may contribute to the maintenance of eating disorder symptomatology by directing the limited cognitive resources to disorder-relevant stimuli and thus distorting the perception and interpretation of the environment. The most commonly used assessment methods for evaluating attentional bias in eating disorders are the modified Stroop task (Stroop 1935, p. 1935) and variants of the dot-probe task (MacLeod et al. 1986) (Fig. 31.1). The modified Stroop interference task measures the time it takes to name the

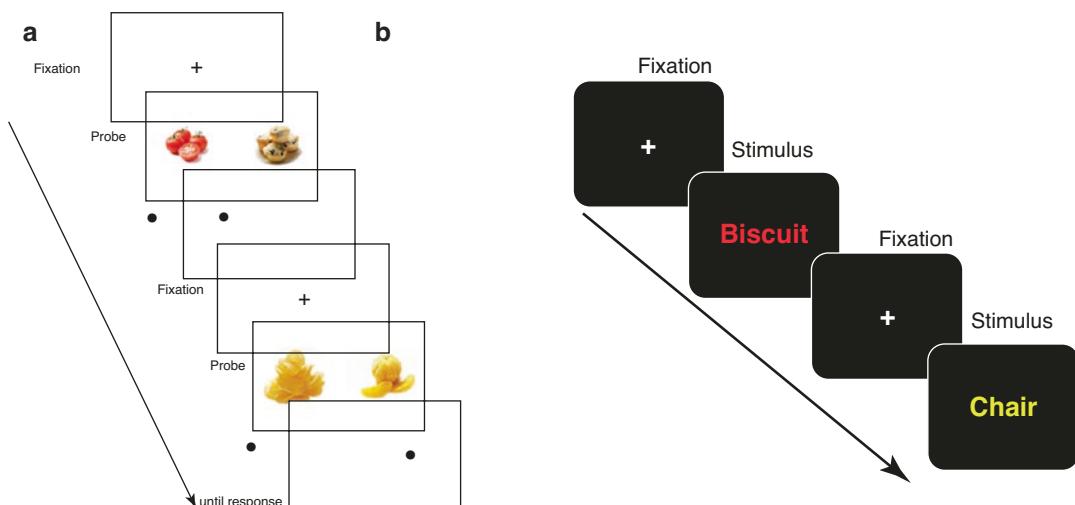


Fig. 31.1 a,b. **a** Example of a **dot-probe paradigm with food-related stimuli** modified according to Meule and Platte 2016). Images of high-calorie and low-calorie foods are presented, and participants must respond with a left or right button press depending on the position of the dot. **b** Example of a **STROOP paradigm with food-related stimuli** (modified from Van Holst et al. 2018). Food and neutral words are presented, and participants must indicate the color of the word by pressing the button that reflects this color

color of a written word when the word itself is either neutral (e.g., “hat”) or disorder-sensitive (e.g., “fat”). An attentional bias is inferred if the presence of a disorder-sensitive word increases the time it takes to name the color of the word. In the dot-probe task, pairs of stimuli (e.g., an image related to food or body and a neutral image) are presented, followed by a dot (the probe) at one of the two locations previously occupied by an image. Participants are then asked to make a quick response to the position of the dot. An attentional bias is indicated if reaction times (RTs) are reduced in trials where the dot appears at the location of the disorder-relevant stimulus or, conversely, increased when the dot appears at a different location, suggesting that attention was automatically shifted to the location of the disorder-relevant stimulus.

Several systematic reviews and meta-analyses focusing on comparisons of adults with AN, BN, and BED with normal weight or control participants found relatively consistent evidence for an attentional bias in AN and BN compared to healthy controls (HC) towards food words in the Stroop task with overall effect sizes in the small to medium range (AN $d = .38$; BN $d = .43$). Similarly, a systematic review found consistent evidence for biases towards food stimuli in BED without compensatory behaviors, albeit with more inconsistent evidence in BN. However, a more consistent pattern in BN was found for Stroop studies with weight/shape and threat stimuli, which reported a greater attentional bias in BN compared to controls. A meta-analysis of dot-probe task performance revealed a large attentional bias towards negative shape-related stimuli ($d = .80$) and away from positive eating and shape-related stimuli ($d = -.83$) in AN and BN compared to controls. Finally, several systematic reviews included studies that measured attentional biases in eating disorders by tracking eye movements during the viewing of disorder-relevant versus neutral stimuli. Although the overall results are quite heterogeneous, they suggest that women who engage in binge eating have difficulty disengaging from food cues, whereas women with BN exhibit both an attentional bias towards food images and

avoidance of neutral stimuli. Additionally, there is limited evidence suggesting that women with BN have difficulty disengaging from images of other women with a low BMI and tend to avoid images of people with a high BMI.

► **Important** Overall, there is fairly reliable evidence for an attentional bias in women with eating disorders compared to control participants.

However, research suggests that the presence of an attentional bias and whether it is primarily characterized by hypervigilance or avoidance tendencies likely depends on a combination of several factors (e.g., stimulus timing, type of stimulus, and diagnosis) (see review by Smith et al. 2018).

Based on experimental findings on attentional bias, treatment approaches have recently been formulated that aim to modify the selective attentional bias in patients with eating disorders (Attentional Bias Modification Treatment, ABMT; see Renwick et al. 2013). The goal of the intervention is conscious attentional control, i.e., diverting attention away from anxiety-provoking thoughts. Initial results suggest that modifying attentional biases can lead to improvements in binge eating and other eating disorder symptoms (Boutelle et al. 2016). A recent meta-analysis showed that a single training session of inhibitory control in a laboratory study led to a significant reduction in the selection or consumption of food and alcohol (Jones et al. 2016). However, there is still little research on the long-term transfer of such effects to everyday life.

31.3 Learning and Memory

Findings on impaired learning and memory functions are mainly available for AN, but are overall inconsistent. A few studies point to deficits in the area of implicit learning, e.g., when learning **number sequences** (“Hebb’s Digit Recurring Sequences”), **visual-spatial sequences** (“Corsi block-tapping test”) or category membership. In **conditioned associative**

learning of words and geometric shapes (“conditional-associative learning”), patients with AN (but not patients with BN) showed deficits when emotionally neutral target words were used, but not when using disorder-specific target words (e.g., from the area of high-calorie foods). Several studies discuss deficits in explicit memory functions in the area of **working memory**. In individual studies, acutely underweight patients with AN have shown poorer performance in visual-spatial rather than verbal short-term memory. For the executive component of working memory, more consistent impairments seem to emerge, which is in line with the findings on attention (Sect. 31.4) and executive functions (Sect. 31.5). Thus, poorer performance in memory tasks with higher complexity (e.g., “Dual Span Memory Task”) or increasing demands on learning performance is found in patients with eating disorders compared to healthy control subjects. In several studies, poorer memory performance was demonstrated for the immediate and delayed recall of more extensive verbal material (such as longer number sequences, word lists, factual texts, or stories).

31.4 Executive Functions, Reward Processing, and Decision-Making

“Executive functions” enable flexible action control and self-regulation. They refer to cognitive functions for the control and coordination of mental processes that serve the achievement of defined, overarching goals. Executive functions have been the focus of many studies in recent years, and several comprehensive meta-analyses are already available. Paradigms for measuring **cognitive flexibility**, i.e., the ability to switch back and forth between different tasks, cognitive operations, or rule patterns and coordinate them flexibly (set-shifting), as well as paradigms of **inhibitory control**, are well studied. In conjunction with motivational factors, particularly reward processing (Chap. 30), executive functions play a crucial role in more complex processes of decision-making and problem-solving.

Decision-making is closely linked to reward processing, as it involves the evaluation of action options based on previously experienced positive or negative events. There are now numerous studies in this area as well, which further examine deficits in eating disorders.

Studies in AN show clear impairments in set-shifting with medium effect sizes. This is usually investigated using the “Trail Making Test”, the “Wisconsin Card Sorting Test”, and the “Haptic Illusion Task” (Wu et al. 2014). The deficits seem to be more pronounced for patients with restrictive symptoms and less pronounced for patients with binge/purging symptoms. Patients whose weight has stabilized or who no longer show symptoms of an eating disorder usually show some improvement, but the majority of studies point to a persistent deficit.

Deficits related to **reward processing and decision-making** have been mainly investigated using the “Iowa Gambling Task”. In this task, participants typically learn to make advantageous decisions after a few rounds by preferring a small gain with low risk and avoiding and minimizing the risk of long-term losses despite a possible high gain. Patients with AN show lower performance (medium effect size) (Wu et al. 2016), which is more pronounced in the restrictive subtype than in the binge/purging subtype and more pronounced in the acute phase than after weight rehabilitation (Guillaume et al. 2015). Consistent with this, patients with AN prefer long-term higher gains in the future over immediate lower gain options in studies using delay-discounting paradigms (Steinglass et al. 2017). However, it should be noted that such tasks require not only the ability for **prospective decision-making** but also **learning from reward contingencies**.

In addition, there are findings that suggest general abnormalities in the dopaminergic reward system in patients with AN (see Chap. 30). Besides individual studies on general deficits in learning reward contingencies and deviations in approach and avoidance learning in the context of food stimuli, there are numerous imaging findings that show atypical activation patterns in striatal regions for reinforcement learning paradigms.

It should be noted that the vast majority of findings on deficits in cognitive functions in AN and weight-rehabilitated AN are based on studies in adults. The findings in children and adolescents are much more inconsistent. Possible explanations for this could be that some neuropsychological deficits either fully develop only after a longer period of illness or become more detectable with the complete maturation of cognitive functions in adulthood (Bentz et al. 2017).

In BN, deficits in “set-shifting” and signs of weak central coherence are also evident, with effect sizes similar to those in AN (Lang et al. 2014; Wu et al. 2014). Another meta-analysis showed clear deficits in inhibitory control in eating disorders with bulimic symptoms, with “Stroop,” “Go-NoGo,” or “Stop-Signal” tasks commonly used (Wu et al. 2013). Large effect sizes were found for BN specifically in tasks related to disease-related stimuli, and small effect sizes for general tasks. In AN (binge/purgating subtype), a large effect size was also found for general tasks, while no significant effect was observed for BED across all studies. However, it should be noted that there are relatively few studies available for AN and BED. Deficits can also be demonstrated for BN in the “Iowa Gambling Task” (Wu et al. 2016).

For patients with BED or obesity, a number of studies are now also available. Here, deficits in cognitive flexibility and decision-making are also indicated for patients with BED, which in some studies are even more pronounced than in AN, but overall, the findings are inconsistent (Cury et al. 2020). There is also evidence that obesity and overweight (without further eating disorder symptoms) are also associated with neurocognitive abnormalities, particularly in terms of inhibitory control.

31.5 Central Coherence and Theory of Mind

Furthermore, there is a series of studies on “**weak central coherence**” in eating disorders. Weak central coherence describes a cognitive style that prefers the processing of details at the

expense of holistic processing of information. Here, there are relatively clear findings of deficits in tasks that examine **central coherence** in AN (e.g., “Embedded Figures Test,” “Rey-Osterrieth Complex Figures Test,” “Modified Block Design Test,” etc., see also Lang et al. 2014). The results show both deficits in global information processing (medium to large effect sizes) and advantages in processing details (medium effect sizes). There are also indications of weak central coherence in patients with BN, with similar effect sizes as in AN (Lang et al. 2014; Wu et al. 2014).

Current research also focuses on studies on **Theory of Mind (ToM)** in eating disorders. This refers to the ability to recognize the mental states of others and to empathize with other people. Since ToM abilities play a significant role in the success of social interactions and interpersonal relationships, which are crucial for the course of eating disorders, numerous studies in recent years have investigated possible ToM deficits in various eating disorders. In a recent meta-analysis with 15 studies (677 individuals with AN or BN and 514 controls), it was shown that AN was associated with significant ToM deficits, which were more pronounced in the acute stage of the disorder. Minor deficits in ToM were observed in patients with BN and in weight-rehabilitated patients with AN. Both cognitive perspective-taking and decoding mental states (ToM decoding) were found to be impaired in acute AN. The impairment of ToM decoding in BN was moderate, and there was no evidence of a significant deficit in ToM perspective-taking (Bora and Köse 2016). Thus, the observed ToM deficits could be particularly relevant for the treatment of AN and may be related to poor insight into the disorder, treatment resistance, and social impairments of the patients.

It has been discussed whether abnormalities in the areas of “central coherence” and “set-shifting” might represent a neuropsychological endophenotype of the eating disorder, as abnormalities are often found in clinically remitted patients as well as in healthy first-degree relatives. Results from twin studies also suggest a certain genetic component.

Cognitive remediation therapy

This is a relatively new complementary therapy approach for AN with the aim of modifying characteristic neuropsychological profiles and associated cognitive thinking styles. Building on the findings of neurocognitive deficits, especially in the area of executive functions, this approach aims to specifically train neuropsychological functions. The combination of specific training and practical exercises with everyday relevance is intended to break up rigid thought patterns and promote flexibility and holistic information processing, as well as train metacognitive abilities. Initial randomized controlled trials show improvements in neurocognitive abilities such as “set-shifting” and tasks related to central coherence, as well as improvements in eating disorder symptomatology (Dahlgren and Rø 2014). However, further longitudinal studies with larger samples and longer follow-up intervals are needed to adequately assess the durability and generalizability of the effects, as well as the optimal therapeutic dose of such training.

long-term weight stabilization, it is still open whether neurobiological and neuropsychological abnormalities are consequences of the disorder or already occur premorbidly.

The exact relationship between neurobiological markers and neuropsychological performance deficits is also still largely unexplored. There are studies that reported significant but weak correlations between structural changes and cognitive deficits, but these findings were not replicated in other studies.

A possible explanation for the heterogeneous neuropsychological findings in eating disorders may also lie in differences in neuroendocrine changes. Initial studies have therefore investigated the relationship between neurohormonal and cognitive changes in patients with AN. So far, the influence of estrogens, cortisol, allopregnanolone, and dehydroepiandrosterone has been examined, and the influence of neuropeptides in animal experimental studies (ghrelin, leptin, peptide YY). Initial findings suggest interesting relationships of learning and memory processes with steroid and neuropeptide levels, confirming the fundamental importance of neurosteroids for hippocampal functions. In line with this, recent imaging studies have also shown that the normalization of hormonal factors may be a better predictor of the normalization of abnormalities in brain structure in patients with eating disorders than weight rehabilitation itself (Chui et al. 2008)

The majority of all patients with eating disorders show symptoms of a depressive or dysthymic disorder during the course of the illness. Moreover, patients with AN in particular show an increased likelihood of symptoms of generalized anxiety disorder or obsessive-compulsive disorder. One may therefore assume that reported neuropsychological abnormalities do not specifically occur in patients with eating disorders, but are at least partially attributable to comorbid symptoms, especially as a large number of studies do not adequately control for comorbid disorders. In terms of depression, many studies show a relationship between the

31.6 Factors Influencing Neurocognitive Deficits

Many studies have found evidence of structural brain changes and changes in brain metabolism in patients with eating disorders, especially in the state of acute starvation. It is unclear whether these abnormalities are completely reversible after weight rehabilitation and long-term weight stabilization, particularly after prolonged starvation during the critical pre- and peripubertal developmental phase (Chap. 32).

► **Important** Since structural and functional brain changes may not be completely reversible even after weight rehabilitation and

extent of symptoms and cognitive deficits, but this usually cannot explain observed group differences alone (Abbate-Daga et al. 2015). There is also evidence for a correlation between neuropsychological test performance and dispositional anxiety, with inconsistent findings on the influence of anxiety levels at the time of the examination.

For obvious reasons, there is very little literature on the question of whether long-term malnutrition per se can lead to neuropsychological abnormalities. Long-term deprivation (up to 24 weeks) has only minimal and fully reversible effects on cognitive abilities (Minnesota Starvation Experiment, Keys et al. 1950). Single case studies in AN show that even with extreme underweight, cognitive functions can largely remain within the normal range. Short-term food deprivation (up to 24 hours) in participants without eating disorders appears to have no general negative effects on cognitive performance, but subtle deficits are occasionally found in tasks related to executive functions (e.g., “set-shifting,” “central coherence”; Sect. 31.4).

31.7 Neuropsychological Findings in the Course of Therapy

Some longitudinal studies collect neuropsychological data not only during the acute phase of illness (Hemmingsen et al. 2020). However, the determination of a second assessment time point after successful therapy varies considerably depending on the study, limiting the comparability of the findings, and not all studies take into account possible practice effects for the tasks used. Some studies reported no or only weak unspecific improvements across all examined functional areas, and occasionally even deteriorations in certain test results, while others found improvements after successful weight rehabilitation. In children and adolescents with AN, relatively consistent improvements in general processing speed are found. Persisting deficits are mainly found in the area of cognitive

flexibility (e.g., “set-shifting”). Cross-sectional studies have reached similar findings, with clinically remitted patients often showing slightly better neuropsychological performance compared to acute patients; however, differences compared to healthy controls can often still be detected in this group.

The question of whether neurocognitive deficits in eating disorders represent stable trait characteristics or rather fluctuate in a state-dependent manner can be better answered in the future by using new methods, such as “ecological momentary assessments” (EMA), in intensive longitudinal designs. EMA assessments, for example, allow the recording of binge eating episodes using repeated smartphone-based diary queries and short neurocognitive tasks that can also be performed in the patients’ everyday lives on their smartphones. In individuals without eating disorders, it has already been shown that inhibition deficits are strongly situation-dependent, raising the question of which neurocognitive deficits in eating disorders reflect state or trait phenomena and what are the momentary antecedents or consequences of such deficits in relation to the occurrence of specific eating disorder symptoms.

31.7.1 Can Neuropsychological Performance Predict the Course of the Eating Disorder?

Usually, no direct correlations are found between the neuropsychological functional level and the course of the eating disorder or the response to treatment. In corresponding studies, no consistent reliable predictors for therapy success after a defined period (usually defined as successful weight rehabilitation) or discharge from the clinic were identified based on neuropsychological test results. There is evidence that patients who still show consistent neuropsychological deficits in several areas at discharge are more likely to relapse.

31.8 Conclusion and Outlook

In general, based on the findings available in the literature so far, it can be summarized that some (albeit rather small to moderate) relatively consistent differences in specific cognitive functions can be demonstrated in patients with eating disorders compared to healthy controls. This applies, for example, to attentional bias for eating disorder-specific stimuli, cognitive flexibility and central coherence, and decision-making. However, recent meta-analyses have shown that many impairments persist across the established categories of eating disorders. In AN, impairments are sometimes still detectable even after weight rehabilitation. It remains unclear in which cases persistent functional impairments are indicative of trait characteristics, i.e., expression of premorbid impairments that are relevant for the pathogenesis and course of the eating disorder (possibly also in the sense of a neuropsychological endophenotype of the eating disorder), and in which cases the identified neuropsychological deficits primarily characterize state features that are more or less reversible, but may also represent lasting consequences of the eating disorder. In order to make reliable statements about this in future studies, longitudinal studies are needed that investigate neuropsychological parameters in combination with biological markers and personality factors in the acute stage, after successful weight rehabilitation (linked to a more uniform definition and demarcation of acute and remitted eating disorder symptoms), and in the long-term course. On the other hand, studies should also be increasingly conducted that are suitable for demonstrating a genetic component of the neuropsychological abnormalities (e.g., twin studies). Recently, the focus has shifted from relatively broad neuropsychological screenings to more sensitive testing methods in combination with larger sample sizes. This should be further expanded in the future to better capture subtle neuropsychological deficits in patients with eating disorders, as well as differences between subgroups, overlaps between disorder patterns, and the influence of comorbid symptoms.

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Imaging Techniques in Eating Disorders

32

Ursula Bailer

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32.1 Overview

The use of modern neuroradiological and nuclear medicine examination methods in the investigation of the pathophysiology of eating disorders has gained increasing importance over the past two decades. There is now ample evidence that changes in central nervous serotonin and dopamine metabolism may play a role in the pathogenesis of eating disorders. However, this evidence comes primarily from studies that use indirect methods to characterize central nervous neurotransmission, such as the determination of the concentration of certain neurotransmitters or their breakdown products in cerebrospinal fluid or the hormonal response to specific pharmacological stimulation tests.

► **Important** Imaging techniques for visualizing the brain make it possible to measure both regional brain activity and the function of neuromodulators in vivo, and subsequently identify neuronal circuits that contribute to eating disorder-specific symptoms such as restrictive eating behavior, body image disturbance, “binge-purging,” etc.

A variety of examination methods are available for this purpose. Structural examination methods such as computed tomography (CT) or magnetic resonance imaging (MRI) provide general information about structural deviations of the brain, e.g., regarding the volume of individual brain regions. Magnetic resonance spectroscopy (MRS) allows the investigation of brain metabolism by identifying and quantifying specific metabolites. Positron emission tomography (PET), Single-Photon Emission Computed Tomography (SPECT), and functional magnetic resonance imaging (fMRI) allow for statements about changes in regional cerebral blood flow or glucose metabolism. These examinations can

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be performed either with or without activation, depending on the research question, i.e., with or without a specific provocation test. The function of neurotransmitter receptors and transporters can be investigated using SPECT and PET and corresponding specific radioligands (so-called tracers).

32.2 Anorexia nervosa

32.2.1 Computed Tomography and Magnetic Resonance Imaging

From CT and MRI examinations, it is known that patients with anorexia nervosa (AN) in the disordered state have enlarged sulci and ventricles and a reduced brain volume. However, it remains unclear whether these deviations in the disordered state are attributable to changes in white or gray matter or the extracellular space. A reduction in gray matter has been repeatedly found, both in the disordered and in the remitted state of the disorder; the results regarding white matter are inconsistent. More recent studies on the integrity of white matter using “diffusion tensor imaging” have found losses in some brain regions, but the case numbers are still small and do not yet allow for a conclusive assessment, and the exclusion of possible artifacts (e.g., enlarged ventricles or other cerebrospinal fluid spaces that could lead to an artificially reduced integrity of white matter) requires further methodological clarification and possibly re-analysis of previous studies. Deficits in gray matter were found mainly in the limbic system, particularly in the amygdala, hippocampus, and cingulum, i.e., regions of emotion processing, as well as in the putamen, a structure in the basal ganglia that plays a role in learning but also in the regulation of the dopaminergic system.

Conclusion

The structural changes found appear to be rather unspecific; at least, no connection with neuropsychological variables such as anxiety, depression, attention, or memory has been found in the studies conducted so far. Likewise, the atrophy present in the disordered state seems to be completely reversible within the context of a longer remission and weight normalization. Furthermore, it is not certain whether these are generalized changes in the brain or whether there are regional differences.

32.2.2 Magnetic Resonance Spectroscopy

MRS provides information about possible nerve cell damage by determining metabolites such as choline-containing substances, N-acetylaspartate (NAA), creatine and phosphocreatine, glutamate/glutamine, and myo-inositol. In adolescent patients with AN, increased choline-containing substances were found in relation to creatine, while the NAA: choline ratio in the occipital white matter was reduced. These changes, which can be interpreted as disturbed cell membrane turnover, were reversible after the patients' recovery. Two other studies showed reduced values for phospholipids in frontal and occipital regions, which in turn correlated positively with the body mass index (BMI), and a positive correlation between reduced myo-inositol in the frontal white matter and BMI. Reduced values for NAA and creatine in the dorsolateral prefrontal cortex seem to be associated with a reduced attention performance in these patients, especially for NAA.

32.2.3 Positron Emission Tomography (Single-Photon Emission Computed Tomography)

32.2.3.1 Without Activation

The majority of studies used SPECT to measure cerebral blood flow. Here, hypoperfusion in the temporal lobe was found in 13 out of a total of 15 examined patients with AN, which persisted even after the patients had gained weight. In a case report of two patients with AN, bilateral hypoperfusion in frontal, temporal, and parietal regions was observed, which regressed after 3 months of remission of the eating disorder. Hypoperfusion in the medial prefrontal cortex, anterior cingulate, insular region, and temporo-parietal, occipital, and orbitofrontal cortex was also confirmed by other studies with comparatively larger case numbers. Only one study so far has found hyperperfusion in the thalamus and in the area of the amygdala and hippocampus. There is only one PET study on the representation of cerebral blood flow in patients with AN in the disordered state. In contrast to the SPECT studies, this study found no significant difference compared to healthy controls, in terms of either hypo- or hyperperfusion in the aforementioned regions. To what extent the hypoperfusion found in the SPECT studies conducted so far in various regions is also a consequence of methodological differences needs to be further clarified.

Follow-up studies that included patients in the underweight state and after weight gain generally showed an increase in perfusion in the dorsolateral and medial prefrontal cortex and, with limitations, in the anterior cingulate. Complete normalization also seems to occur after a longer-lasting remission of the eating disorder (>1 year), similar to the study on cerebral atrophy.

A series of PET studies focused on glucose metabolism in AN patients and found frontal and parietal hypometabolism in the disordered state, which normalized after weight gain occurred.

Conclusion

In previous studies on cerebral blood flow and glucose metabolism, changes in the form of hypoperfusion or hypometabolism in frontal, temporal, and parietal regions were found in AN in the disordered state. Normalization seems to occur after weight gain. Small case numbers, lack of subdivision into subtypes of AN (restrictive vs. binge/purge type), and methodological differences render it difficult to make a final assessment, especially for the disordered state. With the availability of functional magnetic resonance imaging (fMRI) for the representation of functional differences, these aforementioned examination methods have also increasingly receded into the background.

32.2.3.2 With Activation

Only a small number of PET or SPECT studies have used a provocation test to investigate neuronal activity. The consumption of cake resulted in increased brain activity in frontal, parietal, temporal, and occipital regions in patients with AN compared to healthy controls. Merely viewing food showed increased activity in the right parietal and prefrontal areas in patients with AN of the binge/purge type compared to healthy controls and patients with AN of the restrictive type. In a PET study, viewing high-calorie foods led to greater temporo-occipital activation compared to viewing low-calorie foods.

32.2.4 Functional Magnetic Resonance Imaging

Studies have also been conducted using fMRI, in which the viewing of food was used as a stimulus. It has been shown relatively consistently that patients with AN, compared to healthy controls, have increased activity in the medial prefrontal cortex, anterior cingulate, and striatum. A decreased neuronal activity in the insular region in response to a taste stimulus (sucrose

vs. water) also indicates a change in taste perception in these patients. The provocation with disorder-specific foods and taste stimuli mainly shows an increased neuronal response in both the emotion and fear networks in AN patients, which presumably leads to avoidance behavior.

Body schema disorders play an important role in the pathophysiology of eating disorders, so imaging techniques using fMRI have also addressed this issue. In patients with AN, viewing their own, but digitally distorted bodies, led to increased activation in regions associated with the frontal visual system and attention network (Brodmann area 9) as well as the inferior parietal lobe, while viewing similarly distorted bodies of other people did not result in such specific activation. In comparison, healthy controls showed no corresponding differentiation in this experimental setup. Thus, patients with AN seem to have a different visual-spatial processing of stimuli compared to healthy controls. Furthermore, it was found that women who compared their own body with that of another person showed increased activity in striatal, medial prefrontal regions and the insular region compared to men, in the sense of a gender-specific brain response, which might be related to the higher prevalence of eating disorders in women.

Another study investigating the reward system showed that remitted patients with the restrictive type of AN have difficulty differentiating between positive and negative feedback in the anteroventral striatum and perceiving the emotional significance of a stimulus compared to healthy controls. Instead, these patients seem to have increased activity in the dorsal caudate, a brain area associated with planning and consequences, and the activity in this region was correlated with anxiety.

Conclusion

It is difficult to compare the various fMRI studies in AN, as the studies differ in both imaging methodology and the stimulus used. Nevertheless, healthy controls and patients with AN seem to differ mainly in activity in

the temporal and prefrontal cortex and cingulate. These regions are crucially involved in the regulation of emotions and fear. To what extent these changes are specific to AN needs to be further clarified, as similar changes have also been found in obsessive-compulsive disorders. The activity in the parietal cortex and insula also appear to be regions that distinguish patients with AN from healthy controls, thus providing a possible explanation for the altered body perception. Patients with AN seem to have a reduced response to taste stimuli and other reward stimuli; this reduced stimulus response could possibly enable them to drastically reduce food intake, especially with regard to otherwise rewarding, mostly high-calorie foods.

32.2.5 Neurotransmitter Studies using SPECT and PET

The use of specific radioligands in conjunction with SPECT or PET allows for the visualization of serotonergic and dopaminergic receptors in the brain and, subsequently, for the development of a better understanding of neurotransmitter activity and their relationship to human behavior. Several radioligands exist for the serotonergic system, and the most frequently studied receptor is the serotonin(5-HT)_{2A} receptor, a postsynaptic receptor that is involved in the regulation of food intake, mood, and anxiety, and also plays a role in the action of antidepressants. It has been shown that patients exhibit reduced 5-HT_{2A} receptor binding, both in the disordered state and after remission. Remitted AN patients of the binge/purge subtype show reduced binding in the subgenual cingulum, as well as in the parietal and occipital cortex compared to healthy controls. Remitted patients of the restrictive subtype show additional reduced binding in the mesiotemporal cortex.

Another serotonin receptor is the 5-HT_{1A} receptor, a pre- and postsynaptic receptor that also plays an important role in the regulation of anxiety, mood, impulsivity, and food intake and

has a significant function in the action of anti-depressants. It has been found that remitted AN patients of the binge/purge subtype have significantly increased 5-HT_{1A} binding in frontal, pre-frontal, temporal, and parietal regions, as well as in the supra- and pregenual cingulum and in the dorsal raphe nuclei compared to healthy controls. Remitted AN patients of the restrictive subtype, on the other hand, did not differ significantly in 5-HT_{1A} binding from healthy controls. In the disordered state, the 5-HT_{1A} receptor binding is even more pronounced both pre- and postsynaptically. This could be a possible cause for the known lack of response of AN to, for example, selective serotonin reuptake inhibitors (SSRI) in the disordered state, as a down-regulation of the 5-HT_{1A} receptors, which is essential for the action of SSRI, may not be possible to a sufficient extent.

Remitted AN patients of the restrictive subtype showed increased serotonin transporter(5-HTT) binding, whereas remitted AN patients of the binge/purge subtype exhibited reduced 5-HTT binding. Regarding dopaminergic D₂/D₃ binding, only remitted AN patients of the restrictive subtype showed increased D₂/D₃ binding in the anterior ventral striatum compared to healthy controls (Table 32.1). Amphetamine-induced dopamine release led to increased anxiety in remitted AN patients, which positively correlated with dopamine release in the dorsal caudate, while healthy controls responded with the expected euphoria, which correlated with the

extent of released dopamine in the anteroven-tral striatum. The enjoyment of palatable food, which also leads to increased dopamine release, could therefore be experienced as anxiety-inducing by patients with AN and might explain why they primarily avoid this food. Moreover, studies have shown that certain characteristics frequently found in patients with eating disorders, such as “harm avoidance” (a measure of anxiety) or the desire to be thin, correlate with these aforementioned neural changes.

Conclusion

It can be assumed that the observed changes reflect a complex dysregulation of these neural circuits rather than representing the exact etiology. However, previous studies have shown serotonergic and dopaminergic dysregulation in brain regions associated with the limbic system. In general, these changes seem to be present in both the disordered and remitted states. The respective 5-HT receptor binding patterns differ between the different eating disorder subtypes in the remitted state, suggesting that there may be a distinct pathophysiology behind each eating disorder subtype. Similar binding patterns (i.e., increased 5-HT_{1A} and reduced 5-HT_{2A} binding) have also been found in other brain areas – such as temporal, cingulate, and parietal regions – indicating a distribution beyond the limbic system.

Table 32.1 Receptor and transporter binding potential in anorexia nervosa and bulimia nervosa in remission compared to healthy controls. (Mod. after Kaye 2008, with kind permission of Elsevier Publishing)

	AN	AN-BN	BN
Examined region	Medial orbitofrontal cortex, subgenual cingulum, medial temporal cortex		
5-HT _{1A} -BP	–	↑	↑
5-HT _{2A} -BP	↓	↓	–
Examined region	Anterior ventral striatum		
5-HTT-BP	↑	↓	–
D ₂ /D ₃ -BP	↑	–	–

BP Receptor and transporter binding potential, 5-HT_{1A} Serotonin_{1A} receptor, 5-HT_{2A} Serotonin_{2A} receptor, 5-HTT Serotonin transporter, D₂/D₃ Dopamine-D₂/D₃ receptor, AN restrictive type of anorexia nervosa, AN-BN binge/purge type of anorexia nervosa, BN Bulimia nervosa

↑ increased; ↓ reduced, – unchanged

32.3 Bulimia nervosa

32.3.1 Computed Tomography and Magnetic Resonance Imaging

A few studies have found pituitary changes, brain atrophy, and enlargement of the cerebrospinal fluid spaces. However, it is hardly possible to draw conclusions about the etiology or impact of these changes, as they are largely subject to short-term fluctuations in food intake.

32.3.2 Magnetic Resonance Spectroscopy

In a mixed group of patients with AN and BN, a prefrontal reduction of myo-inositol and lipid-containing substances was observed. Whether these changes were specific to BN, however, remains unclear.

32.3.3 Positron Emission Tomography (Single-Photon Emission Computed Tomography)

32.3.3.1 Without Activation

In the disordered state, a globally reduced blood flow could be found using PET, with a significant difference to healthy controls in the parietal cortex.

Depressive symptoms correlated in another study with regional blood flow in the left anterolateral prefrontal cortex. Two studies showed that regional cerebral blood flow normalized again after remission of the disorder.

32.3.3.2 With Activation

Before a test meal, patients with BN showed greater right (inferior) frontal and left temporal blood flow compared to healthy controls, but similar activation after the meal.

32.3.4 Functional Magnetic Resonance Imaging

Stimulation with disorder-specific food stimuli leads to reduced activation in the lateral prefrontal cortex in patients with BN, a region crucial for inhibitory control. Altered activities can be found in both the reward network and the anterior cingulate and insular regions (compared to healthy controls), although the direction of changes in the studies is still inconsistent and requires further clarification.

fMRI studies with a taste stimulus in patients with BN compared to healthy controls showed reduced activation in the reward network, including the ventral striatum, orbitofrontal cortex, anterior cingulate, insular region, and ventral prefrontal cortex. Since these regions play a role in the anticipation of potential reward, the reduced activation could be a sign of reduced reward anticipation in patients with BN, making them vulnerable to so-called overeating. Furthermore, a catecholamine depletion study found that the dopamine-associated reward network in patients with BN appears to be desensitized, leading to a decoupling between neurotransmitter function and behavioral response.

32.3.5 Neurotransmitter Studies using SPECT and PET

While 5-HT_{2A} binding does not differ from healthy controls in both remitted and disordered

states, it has been shown that 5-HT_{1A} binding is increased in both cases. The function of the serotonin transporter appears to be reduced in the disordered state, but shows no change in the remitted state compared to healthy controls (see Table 32.1). A generally reduced response in the reward network due to decreased μ-opioid binding in the temporoinsular cortex and reduced dopamine release after stimulation with amphetamines has also been postulated.

Conclusion

There are currently clear, and in many areas sufficiently replicated, indications of disturbed brain function in eating disorders. It is important to emphasize that these changes in brain function are mainly found in frontal, temporal, cingulate, and parietal regions in the disordered state, but often persist after remission of the disorder. This raises the question of whether the changes found in the remitted state represent a kind of “scar” caused by chronic malnutrition or other factors in the disordered state. This cannot be ruled out with certainty, and such questions cannot be adequately answered by cross-sectional studies. However, the results from imaging studies show clear relationships to behaviors, such as anxiety, which are known to have existed premorbidly and persist after remission of the disorder. Connectivity studies are also gaining increasing importance, with some finding reduced connectivity between reward centers and executive regions as well as between the frontal cortex and the amygdala. The latter could thus be relevant for abnormalities in emotion regulation. Imaging techniques for depicting brain function in eating disorders allow for expanding knowledge about possible underlying pathophysiological relationships and, subsequently, testing corresponding hypotheses.

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The Gut Microbiome in Anorexia Nervosa

33

Jochen Seitz

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In the case of AN, as well as depression, anxiety disorders, and stress reactions—and a long list of somatic diseases—a change in the gut microbiome is now well documented, and a causal involvement in the respective pathophysiology has been at least suggested by animal experiments.

“Gut microbiota” includes all bacteria, fungi, viruses, and archaea found in the intestine, with bacteria making up the main component. In the human intestine, there are about 500 different bacterial species, which are individually composed of about 2,000 possible candidates (Almeida et al. 2019). Many of them are still largely unknown and have never been cultivated and characterized. There are about as many bacteria in the intestine as eukaryotic cells in the entire rest of the body, and their total weight is estimated at 1–2 kg. The term “gut microbiome” usually refers to the entirety of all genes of these

500 different bacterial species, which outnumber the total number of human genes by a factor of about 150 (Sender et al. 2016).

Therefore, it is not surprising that these intestinal bacteria, more than previously assumed, perform a variety of useful functions for the human organism and have entered into a symbiotic relationship with it.

Overview

- Intestinal bacteria can break down and metabolize food components such as dietary fiber that would otherwise be lost to the body. This provides important building blocks such as short-chain fatty acids and vitamins, as well as an additional energy source. This has a significant influence on weight development.
- Furthermore, intestinal bacteria continuously interact with our immune system. In “quiet times,” they help “train” it, and when potentially invading

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pathological bacteria are present, they serve as an “advanced early warning system” for the immune cells of the intestinal wall and can activate them through cytokines. An intact microbiota cell lawn on the intestinal wall also has a placeholder function and makes it more difficult for pathogens to settle.

- Meanwhile, more and more is known about a direct interaction between intestinal bacteria and the brain and our behavior, the gut-brain axis. The enteric nervous system and direct connections to the brain, such as the vagus nerve, seem to play a role in this regard. In addition, metabolites, hormones, and cell wall components of bacterial origin constantly pass through the intestinal wall into the bloodstream. These can either have direct effects in the brain or indirectly through immune activation and inflammatory processes (Cryan et al. 2019).

Brain/Behavior:

- Microbiome interacts with the brain (“gut-brain axis”)
- Microbiome influences learning, anxiety and mood
- Microbiome modulates cell neogenesis in the brain

Intestinal tract:

- Microbes break down nutrients and influence energy intake and weight regulation
- Increased intestinal permeability in the AN animal model.

Immunology:

- Bacterial antigens cross the intestinal wall
- Low-grade inflammatory processes in AN
- Autoantibodies against hunger/satiety hormones

Intestinal microbiome:

- Dysbiosis: altered microbiome diversity and composition
- More protein fermenting taxa could degrade mucin degradation and thus increase intestinal permeability

Since all three areas are relevant for eating disorders, it is important to take a closer look at the role of gut microbiota in AN (unfortunately, there are hardly any findings on bulimia nervosa or binge eating) (Fig. 33.1).

33.1 Weight development

The gut microbiome has a decisive influence on the regulation of body weight through the energy made available per amount of food for the human body. In 2005, an altered gut microbiome was detected for the first time in patients with overweight, which seems to extract more energy from the same amount of food (Ley et al. 2005). Transplantation studies in so-called germ-free mice, which have grown up completely sterile without intestinal bacteria (germ-free, GF mice), provided evidence for a causal role of these bacteria: The transplantation of feces from overweight mice led to an increase in body weight of the recipient mouse compared to the transplantation of feces from normal-weight

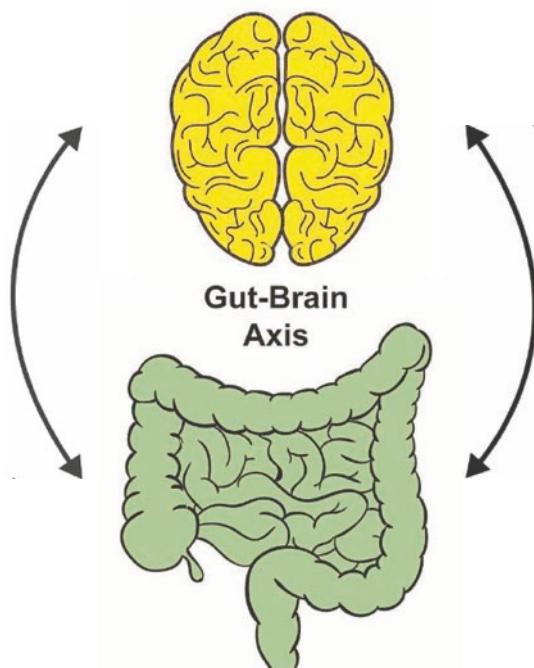


Fig. 33.1 Overview of the interactions between the microbiome and the body relevant for AN

mice—with the same diet. Conversely, the transplantation of feces from underweight children with kwashiorkor led to weight loss (Smith et al. 2013). Feces from patients with bariatric gastric reduction also led to a weight increase before surgery—after the surgery, however, this effect disappeared (Tremaroli et al. 2015). In 2019, a similar finding was made for the first time in patients with AN: Feces from patients with AN were transplanted into GF mouse mothers, whose offspring gained weight only half as fast as offspring of GF mouse mothers with the transplant of normal-weight control subjects (Hata et al. 2019). This demonstrated a causal relationship between the gut microbiome and weight development for the animal model in AN as well. Possibly, the different gut microbiome compositions found in patients with restrictive versus binge-purge AN (Mack et al. 2016) may even help to explain the different amounts of energy needed for weight gain (significantly more in restrictive AN), but further research is needed in this regard.

- Intestinal bacteria play an important role in energy extraction from food, which appears to be reduced in AN.

33.2 Immunology and Inflammation

Increased stress and cortisol levels, as often found in AN, can increase the permeability of the intestinal wall and thus the possibility of bacterial strain products entering the organism as described above. However, increased intestinal permeability has not yet been clearly demonstrated in AN. While there is evidence of even decreased permeability in the small intestine in patients, several studies in the activity-based anorexia animal model have shown increased permeability in the large intestine. Our own studies with this animal model, in which rodents receive less food and paradoxically show increased wheel running activity, also point towards an increase. Here, we were able to detect thinner intestinal walls, reduced

crypt depths, and decreased tight junction proteins (which regulate cell-cell tightness) (Trinh et al. 2021). The intestinal microbiome continuously interacts with the enterocytes of the intestinal mucosa and also has a major influence on permeability (e.g., in chronic inflammatory bowel diseases). In AN, during semi-starvation, an increase in mucus-degrading Firmicutes and Verrucomicrobia has been observed, with a simultaneous decrease in carbohydrate-degrading Bacteroidetes. The former have a selective advantage because they can use the mucins of the protective mucus layer as a food source—but this could also contribute to a further shift towards even greater permeability. As a result, bacterial metabolites or bacterial components such as lipopolysaccharides in the intestinal wall and blood could lead to inflammatory reactions and immune responses. In fact, low-grade chronic inflammation with increased inflammatory markers such as IL-6 and TNF-alpha is known from meta-analyses in AN (Dalton et al. 2018), which could possibly be related. Fetissov's research group was also able to demonstrate that patients with AN produce increased antibodies, e.g., against certain *E. Coli* bacterial components (Tennoune et al. 2014). These antibodies show cross-reactivity with hunger and satiety hormones such as ghrelin and alpha MSH and seem to influence their receptor bindings. In animal experiments, *E. Coli* administration not only specifically induced these antibodies but also influenced eating behavior, so this may also be relevant for the pathophysiology in humans. In addition, patients with AN generally have an increased occurrence of autoimmune diseases, which could also be related. For example, endocrine autoimmune diseases are 2.4 times more common and gastrointestinal diseases 1.8 times more common—Crohn's disease even 3.9 times more common than in control subjects (Raevuori et al. 2014). A case study describes a patient with Crohn's disease who also suffered from AN and both diseases improved significantly under immunosuppressive anti-TNF-alpha therapy (Solmi et al. 2013).

- Inflammation and (auto-)antibodies could thus represent important mechanisms in the pathophysiology of AN and the interaction with the intestinal microbiome.

33.3 Gut-Brain Axis

The (initially maternal) gut microbiome interacts from the very beginning with the normal (brain) development of humans and animals. For example, altered transmitter and growth hormone concentrations in the brains of germ-free (GF) mice and altered anxiety reactions have been detected. This is the reason why the detour via germ-free mouse mothers was chosen in the above-mentioned transplantation study with stool from patients with AN—so that the mouse offspring would no longer grow up without, but only with an AN-typically altered microbiome. Interestingly, in addition to poorer weight gain, these mice also showed increased anxiety and compulsiveness, two typical comorbidities of AN (Hata et al. 2019). Since the control animals did not show these effects, this behavior also seems to be causally induced by the stool of patients with AN. This is consistent with transplantation studies with stool from depressed patients, in which a depressive phenotype was also demonstrated in the rat model (Kelly et al. 2016). A quasi-complete secondary reduction of gut bacteria by various antibiotics in mice led in another series of experiments to a restriction of learning ability, which was associated with reduced neurogenesis in the hippocampus. Probiotic supplementation of lacto- and bifidobacteria was able to restore both learning ability and neurogenesis (Möhle et al. 2016). The brain volume reduction known in patients with AN and the possible underlying loss of astrocytes in the brain could also be related to the microbiome. Our own studies demonstrated a possible connection between the loss of gray matter and the diversity of the microbiome in the animal model (Trinh et al. 2021).

Most studies in patients with AN show a reduction in so-called alpha diversity, a measure

of the number of different bacteria in the gut of an individual patient (Seitz et al. 2019). Unfortunately, the findings are overall very heterogeneous, which is probably due to additional influencing factors on the microbiome, such as diet, previous development including mode of birth and breastfeeding, as well as exercise, other diseases, and medication use. A reduction in alpha diversity is usually associated with negative consequences, as the microbial community may no longer be able to respond as flexibly to disturbances. Reduced alpha diversity is also found in patients with obesity, depression, and chronic inflammatory bowel diseases, and in patients with AN was found to partly correlate with their eating disorder symptoms as well as their depression and anxiety (Kleiman et al. 2015). The so-called beta diversity, a measure of the heterogeneity of the microbiota composition of a group, also differs significantly in almost all studies in AN. However, which individual bacterial species are increased or decreased varies greatly from study to study, meaning that no uniform picture has yet emerged. It seems relevant, however, that these changes do not completely regress with weight rehabilitation (Schulz et al. 2020).

- This means that these microbiome changes in patients with AN are more than just a mere epiphenomenon of malnutrition or weight loss, but could represent a relevant part of the maintaining pathophysiology. This would also be consistent with the causal findings of the animal experiments described above.

This increases the chances that microbiome-centered therapies will one day complement the current AN treatment. These could be in the form of nutritional interventions, supplements, and prebiotics that stimulate the growth of specific gut bacteria. For example, omega-3 fatty acids influence inflammation and weight through the gut microbiome (Costantini et al. 2017). Interventions can also involve the direct administration of probiotics, i.e., living bacteria

with a positive influence on the course of the disorder. Initial results show a reduction in body weight in obesity due to *Akkermansia muciniphila* (Depommier et al. 2019) and a certain effectiveness of lactobacilli and bifidobacteria in anxiety and depression (Pirbaglou et al. 2016). Fecal transplants could then also be performed in patients, as they have shown excellent results in *Clostridium difficile* infections, such that this has already been included in the official guidelines. Initial case reports on fecal transplants in patients with AN show a mixed picture with weight gain in one case, and improvement in intestinal permeability and immune parameters, but no weight gain, in the second case.

- Nutritional interventions, pre- and probiotics, and possibly fecal transplants thus represent promising approaches for the exploration of future additions to conventional AN therapy.

In summary, it can be stated that research on the gut microbiome is developing rapidly and a significant role in the pathophysiology and psychopathology of AN is very likely. Through the sometimes relatively easy-to-implement intervention options, there is hope that this knowledge can also be used for the benefit of our patients in the near future.

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Part V

**Medical Complications and Somatic
Comorbidity**



Medical Complications in Anorexia Nervosa and Bulimia Nervosa

34

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In an observation period of 21 years after the initial inpatient treatment for severely ill patients with AN, the mortality rate was 16% (Zipfel et al. 2000). In this long-term study the most common causes of death resulting from somatic complications were infections (pneumonia, sepsis) and cardiovascular complications due to dehydration and electrolyte imbalances.

► **Important** AN is one of the most common causes of death among young girls and women aged between 15 and 25 years.

34.1 Physical Complaints and Laboratory Chemical Changes

Characteristic of patients with eating disorders in the initial phase of their illness is a lack of or even absent illness insight. The first contacts with healthcare providers therefore often occur due to physical sequelae rather than eating disorder symptoms. Physicians play an important role in the early detection and planning of further treatment processes for patients with eating disorders. The spectrum of reported physical complaints is very diverse. Table 34.1 summarizes the most frequently mentioned symptoms and complaints of AN and BN patients.

► **Important** Patients with eating disorders usually seek general practitioners, internists, gynecologists, orthopedists, and dentists first due to physical complaints; in doing so, patients often try to conceal the eating disorder.

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In patients with anorexia, numerous changes in laboratory chemistry can be observed. These include, among others

Table 34.1 Common physical complaints in AN and BN

	Anorexia nervosa	Bulimia nervosa
Vertigo, collapse tendency, acrocyanosis	+	-
Cold sensitivity, hypothermia	+	-
Abdominal complaints, constipation	+	+
Heartburn, pain in the throat area	+*	+
Parotid swelling	+*	+
Amenorrhea, fertility disorder	+	(+)
Apathy, concentration disorder	+	+
Muscle weakness, muscle cramps	+	(+)
Skeletal pain under strain	+	-
Teeth damage, tooth hypersensitivity	+*	+
Dry skin, hyperpigmentation	+	(+)
Lanugo hair, hair loss	+	-
Sleep disturbance with early waking	+	-

+ common; (+) rare; * only with vomiting

- Disorders of blood formation in the bone marrow (e.g., anemia, leukopenia with relative lymphocytosis),
- Enzyme increase in various organs (e.g., transaminases, salivary amylase),
- Shifts in electrolytes (e.g., hypokalemia, hypophosphatemia),
- Multiple hormonal changes (e.g., hypogonadotropic hypogonadism),
- Hypercholesterolemia.

The laboratory chemical changes are nonspecific but provide information about the severity and medical risk of the starvation process or purging behavior. Patients with eating disorders are particularly at risk due to rapidly occurring electrolyte changes. Purging behavior with self-induced vomiting leads to a loss of potassium and chloride. The abusive use of diuretics and laxatives for weight regulation can further

complicate hypokalemia due to potassium losses via the kidney and intestine. Furthermore, patients with AN have an increased risk of developing hypomagnesemia. The mentioned electrolyte changes can lead to serious complications, such as cardiac arrhythmias, reduced intestinal motility, renal insufficiency, and cerebral seizures. Patients with eating disorders often substitute electrolytes and vitamins without medical consultation. Therefore the absence of electrolyte changes does not rule out laboratory-effective purging behavior. Another laboratory chemical indication of frequent vomiting is hyperamylasemia (elevation of salivary amylase) or bilateral parotid swelling. If hypokalemia does not respond to potassium substitution, the magnesium level should be checked, as a magnesium deficiency can prevent the increase of potassium despite therapeutic substitution.

► **Important** There is a particularly high risk for the occurrence of severe hypokalemia when vomiting and simultaneous abuse of diuretics and/or laxatives occur.

Infections and inflammations are often detected very late in underweight patients with eating disorders. The reason for this is that patients with AN mostly do not develop the expected signs of infection, such as febrile temperatures, tachycardia, and increased inflammation parameters. In the assessment of infection signs and parameters, it should therefore be noted that AN patients often show a reduced increase in the mentioned parameters on the one hand, and on the other hand, an increase in the same parameters due to lower initial values (Cuntz et al. 2015; Zeeck et al. 2019).

34.2 Organ Manifestations

The following section will discuss medical complications in individual organ systems in more detail. Starvation-related changes can generally occur in all organs.

34.2.1 Cardiovascular System

Weight loss, regardless of an eating disorder, leads to sinus bradycardia, a decrease in the stroke volume of the heart, and a drop in systolic and diastolic blood pressure as an expression of a physiological adaptation process to reduced energy supply. Due to the resulting hypovolemia, rapid position changes from lying to standing can lead to orthostatic hypotension and even circulatory collapse. In addition to these functional changes, the most serious cardiovascular complications with possible death are primarily the occurrence of cardiac arrhythmias and myocardial atrophy. In patients with bulimia nervosa (BN) and normal body weight, cardiovascular complications occur less frequently than in patients with AN but can also be observed as a consequence of self-induced vomiting and hypokalemia.

The decrease in muscle mass of the heart's ventricles is disproportionately greater than the decrease in body weight. This may be related to a reduced left ventricular afterload (arterial hypotension) and reduced heart rate. The cells of the conduction system are also affected by the atrophy of the heart muscle. This leads to a ventricular repolarization disorder, which can be measured in the electrocardiogram (ECG) as an extended (frequency-corrected) QT time and increased QT dispersion (difference between the minimum and maximum QT time in a 12-lead ECG). Furthermore, chronically ill patients with AN show altered autonomic cardiac function with reduced heart rate variability. Both an extended QT time and reduced heart rate variability are considered risk factors for the occurrence of cardiac arrhythmias and sudden cardiac death. In addition, electrolyte changes, which are frequently observed in patients with eating disorders (e.g., hypokalemia), can increase the risk of lethal cardiac arrhythmias.

► **Important** In patients with AN, medications that prolong the QT time of the heart (e.g., tricyclic antidepressants) should not be administered or only under close ECG

monitoring. Furthermore, in the presence of an extended (frequency-corrected) QT time, regular monitoring of electrolytes (potassium, calcium, magnesium) should be ensured.

When measured echocardiographically and auscultatorily, a mitral valve prolapse can be detected in approximately 60% of AN patients. This usually does not result in a manifest mitral valve insufficiency and therefore has no clinical significance (Cuntz et al. 2016; Sachs et al. 2016).

34.2.2 Skeletal System

Significant, irreversible medical complications in chronic cases for AN and underweight BN patients range from reduced bone density to osteoporosis. Puberty is a sensitive phase of bone development, during which the maximum bone mass (so-called "peak bone mass") is achieved. Due to the typical onset of the eating disorder and underweight being around puberty, there is a reduced bone formation and a lower maximum bone mass. More than half of adolescents with AN show a reduction in bone density in the sense of osteopenia, and a quarter show osteoporosis as the most severe form of reduced bone density. In chronic cases of the disorder, 44% of those affected show osteoporotic bones after a disorder duration of eleven years. Trabecular bone structures in the area of the thigh and lumbar spine are particularly affected. In competitive athletes (e.g., ballet dancers), the disease, in combination with significant physical stress, can lead to pathological fractures and stress fractures at a young age. Moreover, those affected with long-lasting AN have up to a 4-fold increased fracture risk.

The mechanisms leading to reduced bone mass in patients with AN are complex. In contrast to postmenopausal osteoporosis, in which both bone resorption and bone formation are simultaneously increased (high-turnover osteoporosis), patients with AN show a so-called low-turnover situation with reduced bone formation and increased resorption. Thus, estrogen

deficiency, which is considered to be the cause of postmenopausal osteoporosis, cannot adequately explain the bone metabolism situation in patients with AN. It is currently assumed that it is an interaction of numerous factors. Here, underweight, hormonal factors such as reduced levels of estrogen, “*insulin-like growth factor*” (IGF-1), leptin, thyroxine (free T₃), and oxytocin, as well as increased levels of cortisol and the satiety hormone (PYY), malnutrition (calcium, vitamin D), and metabolic acidosis (resulting from fasting) play significant roles.

The most effective treatment measure for preventing osteoporosis is early weight gain in the normal weight range, accompanied by the normalization of eating behavior (S3 guideline). The substitution of calcium, vitamin D, and vitamin K₂ (menaquinone) can be supportive, especially in the early refeeding phase. The oral administration of estrogen-progestin preparations has not shown efficacy in previous intervention studies. In a recent review, there was evidence that transdermal application of 17-β-estradiol with cyclic progesterone application can at least prevent the progression of osteopenia (Robinson et al. 2017). Treatment should be reserved for patients who have amenorrhea for more than one year or for those whose menstruation does not resume after weight restoration. However, it should be considered with caution before the completion of longitudinal growth, as it can lead to premature closure of the epiphyseal plates. Other promising preparations such as IGF-1, dihydroepiandrosterone (DHEA), parathyroid hormone analogs (teriparatide), and bisphosphonates have only been administered and tested in the context of studies, but so far without data on long-term efficacy and safety (Fazeli and Klibanski 2018). In addition, the current S3 guideline recommends avoiding sports with increased vertical impact (e.g., ballet) or increased risk of falls (Cuntz et al. 2019).

34.2.3 Gastrointestinal Tract

Patients with eating disorders regularly report abdominal pain, nausea, feelings of fullness,

and constipation. Gastrointestinal complaints typically occur with a temporal delay after the onset of the eating disorder. Studies of gastrointestinal motility confirm delayed gastric emptying for solid food as well as slowed colonic transit time and defecation disorders for patients with AN. Previous studies on intestinal motility suggest that regular food intake and weight restoration can lead to normalization of motility function in remitted AN patients. In addition to food restriction, the motility disorder can be exacerbated by electrolyte shifts and the abuse of laxatives. In individual cases, this can lead to severe constipation or even paralytic ileus. In severely cachectic patients, autophagy of liver cells is often observed, and accompanied by an increase in transaminases and sinusoidal fibrosis, which can lead to liver insufficiency or even liver failure.

Furthermore, in bulimic patients, regularly self-induced vomiting often leads to acid-related inflammation and injuries to the esophagus. During vomiting, the increased pressure in the esophagus can cause tears in the mucosa in the area of the gastroesophageal junction in the sense of a Mallory-Weiss lesion, and continuous exposure of the esophagus to acid can develop cylindrical epithelial metaplasias, which can lead to Barrett's carcinoma after some years. A rare but life-threatening complication in patients with binge eating and vomiting is gastric dilation with tissue necrosis or gastric rupture (Sato and Fukudo 2015).

34.2.4 Skin and Teeth

In patients with eating disorders, a number of skin changes can be observed. As a result of starvation and malnutrition, Xerosis cutis (dry skin due to reduced sebum production), often associated with hyperpigmentation and pruritus, lanugo hair (reduced activity of the 5-α-reductase enzyme system), hair loss (increased telogen hair), acne, acrocyanosis, purpura (thrombocytopenia), stomatitis (vitamin deficiency), decubitus ulcers, and nail dystrophy are regularly observed. Furthermore, patients

with AN show a significantly delayed wound healing, which is attributed to hypothyroidism and zinc deficiency. Patients with BN also often show dry skin (xerosis cutis) and an increased tendency to develop acne (Strumia 2005).

A characteristic skin lesion as a result of self-induced vomiting is the Russell's sign. This is a callus formation over the finger joints (mainly on the index finger), which develops due to repeated lesions when inserting the fingers into the throat at the sharp-edged, acid-eroded incisors.

Furthermore, patients with regular vomiting report hypersensitivity of the teeth to hot, cold, and acidic foods. This is due to exposed dentin in advanced erosions of the tooth hard substance. The repeated exposure to acid leads to permanent damage to the enamel and dentin, resulting in a reduction of bite height. Moreover, patients with BN show an increased prevalence of caries due to excessive consumption of sweets with pre-damaged teeth.

Patients should be thoroughly informed about the causes, development, and prevention of tooth damage. After vomiting, the best possible neutralization of the acidic stomach contents should be pursued. Furthermore, erosive and acidic foods should be avoided.

► **Important** Within the first hour after self-induced vomiting, no mechanical oral hygiene (tooth brushing) should be performed, as this promotes the progression of acid-related tooth erosions.

34.2.5 Endocrine System

Anorexia nervosa is associated with numerous hormonal changes (Chap. 28). The changes are weight-dependent and show complete reversibility in the majority of cases after weight restoration. With regard to gonadotropic hormones, underweight leads to a reduced release of gonadotropin-releasing hormone (GnRH) from the hypothalamus and thus to a reduced production of sex hormones in the ovaries or

testes. Therefore, amenorrhea is common in AN. Patients with BN particularly show irregularities or absence of menstruation when they have a low weight. For this reason, weight normalization should be aimed for in cases of amenorrhea or menstrual irregularities (Chap. 28). Furthermore, anorectic patients typically show a low-T₃ syndrome with low triiodothyronine (T₃), but normal thyroxine (T₄) and thyrotropin (TSH). In this laboratory constellation, there is no treatment-requiring hypothyroidism, and substitution of thyroid hormones (e.g., L-thyroxine) is contraindicated due to an increase in basal metabolic rate and energy consumption.

Only in cases of clinically confirmed hypothyroidism should thyroxine be substituted, but with a cautiously titrated dosage (S3 guideline).

34.2.6 Kidney, Water, and Electrolyte Balance

Disturbances of water and electrolyte balance can lead to serious complications. A subgroup of patients with eating disorders significantly restricts not only food but also the amount of fluid they drink. Consuming fluid causes an unpleasant feeling of fullness in these patients and is therefore avoided. The risk of dehydration is further increased by the excretion of osmotically active ketone bodies (mainly in patients with AN), self-induced vomiting, or the abuse of diuretics. In addition to fluid restriction, some patients with eating disorders also show polydipsia to suppress hunger or increased fluid intake before weighing to manipulate their body weight.

Electrolyte changes, such as hypokalemia with metabolic alkalosis, are indicative of vomiting or abuse of diuretics, whereas hypokalemia with metabolic acidosis indicates abuse of laxatives. Patients with purging behavior are often well adapted to significantly reduced potassium levels. The risk of cardiac arrhythmias is less pronounced with chronic potassium losses than with acute potassium losses. Other electrolyte changes that can often be observed are hyponatremia, hypocalcemia, hypomagnesemia

and hypophosphatemia (especially during the refeeding phase). A serious complication of these electrolyte changes and dehydration is the development of hypokalemic nephropathy up to terminal renal insufficiency. Furthermore, the disturbed water and electrolyte balance leads to an increased occurrence of kidney stones (Forney et al. 2016).

The therapeutic compensation of electrolytes should be undertaken cautiously and not too quickly. In particular, the increase in sodium levels in hyponatremia should be slow, as rapid changes can lead to the dreaded complication of central pontine myelinolysis due to osmotic effects.

► **Important** The creatinine level in patients with AN is reduced due to decreased muscle mass. Therefore, advanced renal insufficiency may be present without detectable elevated creatinine levels. To assess kidney function, creatinine clearance should be determined.

34.2.7 The Refeeding Syndrome

This syndrome refers to symptoms and changes that can occur in extremely underweight patients ($\text{BMI} < 14 \text{ kg/m}^2$) when regular nutrition is resumed. The symptoms can be very variable and range from heart failure to neurological symptoms to the occurrence of severe infections. Most commonly, patients with refeeding syndrome report edema and pain in the musculoskeletal system.

Due to the metabolic change during the refeeding phase, there is an increased nutrient demand with dramatic fluid and electrolyte shifts between the extracellular and intracellular space. As a result, there is a pronounced drop in potassium and phosphate in the serum. Furthermore, due to the lack of glycogen stores in the early phase of food resumption, postprandial hypoglycemia (about 1-2 hours after the meal) often occurs. Almost regularly, there is a mostly harmless edema formation in the area of the ankles on both sides, which spontaneously regresses over time and is not of cardiac origin

in all but a few exceptions. Furthermore, latent nutrient deficiencies can become clinically significant in this build-up or regeneration phase due to the increased demand.

In rare cases, severe starvation-induced myocardial atrophy can lead to the occurrence of heart failure with pulmonary edema in the early phase of refeeding due to the altered hemodynamics.

For this reason, food intake in extremely underweight patients with AN should be carried out under close laboratory-chemical monitoring of electrolytes, blood pressure, and heart rate. Adequate phosphate intake through food is particularly important during this phase. So far, there is no empirical consensus on an optimal concept for refeeding in AN. However, studies suggest that in mildly to moderately underweight patients with AN, refeeding with higher calories compared to lower calorie intake ("underfeeding syndrome") seems to be advantageous, as long as electrolytes, fluid balance, and cardiovascular parameters are monitored (Garber et al. 2016).

Conclusion

The presented medical complications underline the urgent need for regular somatic follow-up examinations of patients with eating disorders to assess the medical risk.

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Gynecological Aspects in Anorexia Nervosa and Bulimia Nervosa

35

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35.1 Hormonal Disorders

35.1.1 Occurrence of Menstrual Cycle Disorders

According to current knowledge, menstrual cycle disorders are a consequence of malnutrition and deficiency in anorexia nervosa (AN) and bulimia nervosa (BN). They can also occur independently of significant weight loss and persist even after weight gain. The comprehensive

endocrine disorder of the hypothalamic-pituitary-gonadal axis as a symptom of AN was included in the diagnostic criteria according to ICD-10 and DSM-IV, but is no longer mentioned in both current classification systems (ICD-11, DSM-5). In women, this often manifests as primary or secondary amenorrhea. Although body weight in patients with BN is usually within the normal range, menstrual cycle disorders are found in about 50% of those affected. Amenorrhea is present in about 5%.

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Forms of Amenorrhea

- Primary amenorrhea refers to the absence of the first menstrual period after reaching the age of menarche.
- If menstruation is absent for more than three months in a woman who has already menstruated, it is called secondary amenorrhea.
- If a disturbance of the hypothalamic-pituitary regulatory circuit is primarily

responsible for the absence of menstruation, this is referred to as central amenorrhea, which can be further subdivided into hypothalamic and pituitary genesis.

35.1.2 Primary Amenorrhea

Menarche can be disrupted by physical, nutritional, and psychological factors. A weight loss of 10-15% of normal body weight delays pubertal development and menarche. Growth in height and breast development can also be disturbed. In general, these developmental delays are reversible, but in severe cases, they can persist.

35.1.3 Secondary Amenorrhea

In secondary amenorrhea, a weight loss of 10-15% of normal weight is usually the cause, but in 20% of patients with AN, amenorrhea precedes underweight. It is suspected that this phenomenon is due to a combination of psychological stress, excessive physical activity, and weight control measures. According to another hypothesis, an individual “set weight,” which may already be below normal weight in some patients, is necessary for maintaining menstruation. In addition to the absence of menstrual bleeding, other menstrual disorders, such as an extended follicular phase and a disturbed luteal phase, are observed in AN. From a biological perspective, it makes sense that reproductive functions are reduced or stopped when there is insufficient food intake, as successful reproduction requires energy reserves.

35.1.4 Endocrine Pathomechanism

The endocrine pathomechanism of amenorrhea in AN and BN appears to be primarily due to hypothalamic dysfunction with inhibition

of pulsations of LHRH (luteinizing hormone-releasing hormone) secretion and a qualitative disturbance of the gonadotropins FSH (follicle-stimulating hormone) and LH (luteinizing hormone).

The ovarian feedback loop

With the onset of puberty, the hypothalamus begins to regulate the adenohypophysis (anterior pituitary) via gonadotropin-releasing hormone (LHRH). The release of LHRH is not continuous, but pulsatile with a frequency of about 90 minutes. LHRH thus stimulates the formation and release of gonadotropins, FSH (follicle-stimulating hormone) and LH (luteinizing hormone), in the pituitary gland. These cause follicle maturation, ovulation, and corpus luteum formation in the ovary.

Studies show that even short-term fasting can lead to a prepubertal secretion pattern of gonadotropins, especially LH. The frequency of gonadotropin pulsations is then too low to ensure follicle maturation and selection up to ovulation in the ovary. In women with hypothalamic amenorrhea caused by extreme physical stress or underweight, reduced levels of LH, estradiol, and leptin were found. When leptin was raised to normal levels through injections, this led to an increase in the frequency of LH pulsations. The hormone leptin, discovered in 1994 and secreted by adipocytes, plays an important role in regulating the hypothalamic-pituitary-gonadal axis in the starvation state. In highly symptomatic AN, it is reduced due to weight loss, but can increase rapidly with weight gain. Current studies on the role of leptin in the female cycle suggest that this protein has a signaling character for the initiation of puberty. In addition, leptin appears to have a connecting function between nutritional status and the female cycle.

Endocrine disturbances in anorexia nervosa

- Decreased pulsatile secretion of LHRH
- Weak response of LH to LHRH
- Reduced concentration of gonadotropins and estradiol as well as testosterone
- Decreased feedback effect of estrogen on the pituitary gland
- Lack of follicle maturation and selection in the ovary
- Anovulation
- Reduced leptin levels

35.1.5 Oral Hormonal Contraceptives and Bone Metabolism

The reduction of bone density and osteoporosis as important, usually irreversible complications for patients with AN and underweight patients with BN were discussed in detail in the previous chapter. In addition to rapid weight gain and normalization of eating behavior, the resumption of menstruation is a strong predictor for the rehabilitation of bone density. Patients who gained weight within a year and whose menstruation resumed within this year had the greatest increase in bone mass. In patients with persistently low body weight and persistent amenorrhea, the reduction in bone density persisted. Although some studies (Mäimoun 2019) suggest that the administration of an oral hormonal contraceptive may limit the extent of bone density loss in young patients with AN, the application of estrogen-progestin preparations does not appear to be indicated in this case due to insufficient or absent effects on bone metabolism (Legroux 2019).

35.2 Fertility and Reproduction

The disorders AN and BN particularly affect the age group of 15-35-year-old women, in whom they occur with a point prevalence of 1% (AN)

and 1-3% (BN). These are therefore women in the midst of their reproductive age. However, the described hormonal disturbances significantly reduce fertility. Disturbances of the follicular and luteal phases lead to a reduced conception rate and an increased rate of spontaneous abortions. In acute AN, there is usually an ovarian dysfunction with anovulation and infertility. Most patients with restrictive AN are also not sexually active during this phase of the disorder. This can be attributed to a lack of acceptance or (partly hateful) rejection of one's own body, reduced self-esteem, insufficient sexual identification, inadequate detachment from primary caregivers, and loss of libido due to decreased levels of sexual hormones. The resumption of menstruation depends on the normalization of the function of the hypothalamic-pituitary-gonadal axis, which in turn is significantly influenced by the level of leptin. For normalization, a reconstruction of appropriate eating behavior and weight restitution is required. Numerous studies have shown that in the majority of patients with AN, menstruation resumes after weight gain. The likelihood of menstruation resuming is crucially dependent on the extent of weight gain, the body mass index (BMI), and the absolute body fat percentage. In one study, an absolute body fat percentage of over 21.2% was the most reliable predictor for the resumption of menstruation. There may be a delay of several months between the increase in body weight and the resumption of menstruation, so it seems advisable to inform patients about this and wait at least six months before conducting further examinations. In about 15-30% of patients, however, menstruation does not resume despite weight gain. Reasons for this can be persistent abnormal eating habits or underlying psychological problems. The duration of the eating disorder is also important for the absence of menstruation: the longer the disorder persists, the higher the risk of persistent amenorrhea. In chronic AN with persistent amenorrhea, infertility is present; at the same time, most affected individuals have no intention of becoming pregnant. The majority of women with AN whose

menstruation has resumed after overcoming the disorder and who have achieved normal body weight and eating behavior can fulfill an existing desire to have children naturally. A long-term study over 10-15 years in 173 patients with BN (Crow et al. 2006) showed no increased infertility rate compared to the general population. However, the literature also indicates lower birth rates and more frequent use of reproductive medical treatment by women with current or past eating disorders. A study of 66 Canadian women who visited a reproductive medicine clinic due to unfulfilled desire for children found that 8% had a diagnosis of AN or BN (Stewart et al. 1990). When atypical eating disorders according to DSM-IV (eating disorders not otherwise specified, EDNOS) were included, 17% of the women had an eating disorder. Among involuntarily childless women with oligomenorrhea or amenorrhea, this proportion was even 58%. None of the affected women reported an eating disorder on their own initiative. The observation that eating behavior disorders are not addressed voluntarily by patients in fertility treatment has been confirmed in other studies. It is therefore recommended to conduct a survey on weight development and eating behavior as well as a weight measurement as part of the reproductive medical examinations for involuntary childlessness. A retrospective study of over 2000 women who were treated for an eating disorder (AN, atypical AN, BN, atypical BN, or binge-eating disorder) in Helsinki from 1995 to 2010 showed more frequent childlessness and lower pregnancy and birth rates in the patient group than in healthy controls (Linna et al. 2013). The lowest pregnancy rate was found in women with AN. The frequency of pregnancy terminations was significantly increased in BN compared to healthy individuals. While 7.2% of women with eating disorders gave birth

after fertility treatment, this proportion was only 4.5% in healthy women. Freizinger et al. (2010) also found evidence of increased use of reproductive medical treatment by women with a current or past eating disorder. A longitudinal birth cohort study with pregnant women in the Netherlands showed more frequent reproductive medical treatment in women with BN compared to healthy individuals (Micali et al. 2015).

► **Important** In general, women with AN or BN can become pregnant naturally after successful treatment. However, there is evidence of lower birth rates and more frequent use of reproductive medical treatment in women with current or past eating disorders.

35.3 Pregnancy and Birth

About 1% of all pregnant women have a history of AN or BN. Even if eating disorders are present, uncomplicated pregnancies and deliveries are possible, but the rate of pregnancy complications is increased.

35.3.1 Anorexia nervosa

The incidence of AN during pregnancy is about 19%. A pregnancy rarely occurs under the full picture of AN, but conception can occur during the first ovulatory cycles of treatment, which is accompanied by a normalization of body weight. The effects of pregnancy on the eating disorder are diverse, and it can lead to both an intensification and a mitigation of symptoms. If the symptoms of AN persist or worsen during pregnancy, physical and psychological complications are more frequent.

Pregnancy complications in anorexia nervosa

- Insufficient weight gain of the woman during pregnancy
- More frequent anemia in pregnant women
- Increased occurrence of hyperemesis gravidarum
- Intrauterine growth retardation in the fetus (small for gestational age)
- Increased risk of microcephaly
- Increased abortion and malformation rate
- Increased risk of preterm birth
- Increase in the frequency of surgical deliveries
- Poorer condition of the newborn (lower APGAR score)
- Increased risk of peripartum bleeding
- Increased risk of premature placental detachment
- Higher perinatal morbidity and mortality
- Higher risk of postpartum depression in the mother
- More frequent breastfeeding problems

► **Hyperemesis Gravidarum** is defined as persistent, non-self-induced vomiting occurring more than 5 times per day during pregnancy, which endangers the fluid and food intake of the affected person and leads to a weight loss of more than 5%. The incidence is 0.5–2%. The etiology is still largely unclear; physical adaptation processes to pregnancy and psychological factors are discussed. The disease can be associated with metabolic disorders, dehydration, and electrolyte imbalance and can be life-threatening. Early detection and treatment, which must be inpatient in severe cases, are therefore of particular importance.

If the mother's malnutrition leads to a nutritional deficit in the fetus, the newborns are too small

or – in relation to their gestational age – underweight. The internationally used medical term for this is "small for gestational age (SGA)." An association between insufficient weight gain of the mother and low birth weight of the baby is considered proven. SGA children can show developmental difficulties over a long period of time. Mantel et al. (2020) showed that patients with active AN had a twofold increased risk of preterm birth and SGA and a threefold increased risk for the development of microcephaly.

Studies have shown that the perinatal mortality rate of children of mothers with AN is 6 times higher compared to the rate in the general population. Regarding preterm birth and miscarriage risk, a twofold increased risk was observed. In a Swedish study of 49 women with a history of anorexic and bulimic eating disorders who were followed during their first pregnancy, these women were significantly more likely to develop hyperemesis gravidarum than healthy pregnant women (Kouba et al. 2005). The pregnant women with eating disorders often suffered from anemia and frequently did not achieve the recommended weight gain of 11.5–16 kg during pregnancy, especially in cases of previous or current AN. The babies of mothers with AN had a significantly lower birth weight than the children of healthy mothers. Both in AN and BN, the newborns had a smaller head circumference.

► **Important** Pregnant patients with AN should be treated in an inpatient psychotherapeutic setting following any treatment for somatic complications during the therapy phase for weight restoration and the reestablishment of appropriate eating behavior. Facilities close to home with proven experience in treating eating disorders should be preferred. For weight rehabilitation, a therapy contract should be concluded with the stipulation of a minimum weekly weight gain. The required additional weight gain during pregnancy must be taken into account.

35.3.2 Bulimia nervosa

The incidence rate of pregnancy in women with BN is over 1%. Underweight and amenorrhea are less common in this group of patients; thus, fertility disorders occur less frequently. 80–90% of women with BN regularly induce vomiting, which can lead to frequent, rapid, and severe fluctuations in blood glucose levels. Glucose metabolism disorders, in turn, can have a detrimental effect on fetal development. Pregnant women with a history of AN or BN were found to be more likely to have gestational diabetes mellitus (GDM). GDM is associated with an increased rate of preterm birth, an increased risk of the mother developing postpartum depression, and postnatal adjustment disorders in the child in cases of diabetic fetopathy. Studies also showed an increased rate of fetal malformations in cases of BN. This is attributed, on the one hand, to the frequent abuse of laxatives and diuretics and, on the other hand, to the increased occurrence of alcohol and drug abuse in this group of patients. Weight development during pregnancy in BN showed greater fluctuations and ranged from excessive to normal to insufficient weight gain. In many patients, bulimic symptoms decreased during pregnancy and in the first period after birth, as those affected paid attention to a healthy diet for the baby's sake. However, the physical and psychological stresses of pregnancy can also lead to a worsening of the disorder. Changes in appetite and satiety, as well as the body due to weight gain and the growth of the abdomen and breasts, can be particularly burdensome for women with eating disorders. In addition, during pregnancy, first-time mothers often experience an emotional confrontation with the upcoming assumption of the maternal role. After giving birth, a relapse into bulimic symptoms often occurs. Studies show increased rates of spontaneous abortions, lower birth weights of newborns, and more frequent cesarean section deliveries in women with BN compared to healthy women. The risk of postpartum depression is also significantly increased.

35.4 Conclusion and Recommendations

If a patient with a known eating disorder vomits frequently during pregnancy, this can sometimes make it difficult to differentiate diagnostically whether it is a case of hyperemesis gravidarum (pregnancy vomiting), an increase in eating disorder symptoms, or a mixed picture. Although nausea and vomiting in the context of hyperemesis gravidarum can persist until birth, the maximum severity of symptoms usually occurs in the 8th–12th week of pregnancy, which may be related to the β -hCG level in the blood. Insufficient or excessive weight gain, especially in the 2nd trimester, hyperemesis gravidarum, and a history of eating disorders can be signs of AN or BN. Hyperemesis gravidarum is about 10 times more frequent in women with eating disorders compared to healthy women. A Swedish study (Mantel et al. 2020) also showed higher blood pressure values in patients with active eating disorders compared to healthy patients or patients with remitted eating disorders. During regular prenatal check-ups, signs of eating disorders should be asked about and considered. Due to the negative effects of malnutrition and deficiency on pregnancy, women with eating disorders are advised to plan their pregnancy in such a way that remission or at least partial remission of the disorder is present, especially since pregnancy and the associated changes in body image, family, and everyday structures can further destabilize psychologically vulnerable patients. In general, pregnancies in women with eating disorders should be considered high-risk pregnancies.

► **Important** Patients must be closely monitored both during and after pregnancy in terms of gynecological and psychosomatic-psychotherapeutic care to ensure the physical and emotional well-being of both mother and child. The postnatal midwife should definitely be informed about the mother's eating disorder and be involved in the care.

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Eating Disorders and Diabetes Mellitus

36

Stephan Herpertz

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According to the current Diabetes Atlas of the International Diabetes Federation (IDF) from 2017, Germany ranks second in Europe and ninth internationally, with 7.5 million people suffering from diabetes mellitus (DM). 95% of those affected suffer from type 2 DM, which mainly occurs in the second half of life and is associated with overweight or obesity. DM often reduces the quality of life of those affected and shortens life expectancy by about ten years. The development of microvascular, but especially macrovascular sequelae, such as heart attack and stroke, are responsible for the significantly shortened life expectancy.

While type 1 DM, characterized by the destruction of the β -cells of the pancreas and the consequent absolute insulin deficiency, shows a peak manifestation mainly in puberty and early adolescence, type 2 DM as a result of insulin resistance, primarily in overweight and obese individuals, represents a disease of middle age or the second half of life. Due to the significantly increasing number of obese children, insulin resistance is also increasingly observed in this age group.

The course of the disease is significantly influenced by the lifestyle and disease behavior of the patients. Treatment management requires lifelong planning and control not only of food intake but also of lifestyle. The treatment requires a high degree of motivation and self-management on the part of those affected, who have to integrate a very complex therapy into their lives and accept many restrictions in everyday life. In addition, there is the need for multiple daily blood glucose self-checks, at least for patients with type 1 DM (intensified insulin therapy).

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36.1 Eating disorders and type 1 diabetes

Compared to metabolically healthy people, problematic eating behavior and eating disorders are more common in young women with type 1 DM (Young et al. 2013), although, considering the significantly lower prevalence of anorexia nervosa (AN), more profound statements can only be made about bulimic eating disorders. With regard to the peak of the disease, the coincidence of AN and bulimia nervosa (BN) with type 1 DM is striking.

Patients with DM usually carry out their therapy independently in everyday life. Thus, the lifelong confrontation with food, weight regulation, and physical activity, which is necessary to achieve near-normal metabolic control, can ultimately pave the way for the development of an eating disorder.

In almost all patients with type 1 DM, the eating disorder begins after the manifestation of DM (Herpertz et al. 1998). After diagnosis, many patients regain weight due to rehydration and anabolic metabolism, sometimes reaching a higher weight than before the manifestation of DM. A study of 32 young patients immediately after the diagnosis of DM and again one year later showed an increase in eating disorder symptoms. The weight gain averaged almost 7 kg. The weight of all patients was above their desired weight. Interestingly, most patients had developed a disturbed body schema, which is considered one of the core symptoms of eating disorders (Steel et al. 1990).

36.2 Diabetes Mellitus and Eating Disorders, a Coincidental Coincidence?

Estimating the prevalence of type 1 DM and comorbid eating disorders is particularly difficult for two reasons. On the one hand, the

terminology of the disorders is inconsistent, and on the other hand, and more significantly, different measurement instruments and classification systems are used. It is important to distinguish between diabetes-specific and generic screening instruments to detect disturbed eating behavior or an eating disorder. Generic instruments have the advantage of comparability with the general population, but they do not take into account, for example, insulin purging (see below)—with the risk of underestimating prevalence. Not least due to the avoidance of hyper- or hypoglycemic states, the thoughts and feelings of people with DM often revolve around topics such as nutrition, physical activity, and weight, without being an expression of problematic eating behavior or an eating disorder, which carries the risk of overly high prevalence estimates. Thus, a systematic review and meta-analysis by Young et al. (2013), also taking into account the diagnostic peculiarities, concluded that problematic eating behavior or an eating disorder is more frequently observed in adolescents with DM than in metabolically healthy individuals. In a longitudinal study, Colton et al. (2015) examined 126 girls with type 1 DM aged around 12 years over a period of 14 years. At the end of the study, more than 32% of the patients met all criteria for an eating disorder (2 AN, 1 BN, 20 unspecified eating disorders), and an additional 8.5% showed disturbed eating behavior. 27% of the study participants reported insulin purging as a means of weight control.

► **Important** A higher prevalence of eating disorders and disturbed eating behavior is observed in girls and young women with DM compared to metabolically healthy women, with the majority being unspecified eating disorders.

More than 80% of all people with type 2 DM are overweight or obese. To overcome insulin resistance in type 2 DM, weight reduction and

appropriate dietary behavior are recommended. The observation that long-lasting dietary behavior in the sense of restrained eating can lead to loss of control in food intake (“binge eating”) and ultimately to BN or binge eating disorder (BED), and the fact that only about 15% of all people are able to maintain their reduced weight permanently, suggests a possible connection between type 2 DM and eating disorders, especially BED.

► **Important** In contrast to type 1 DM, which usually precedes the eating disorder, in half of patients with type 2 DM, the onset of the eating disorder is observed before the diagnosis of DM.

In the absence of controlled studies, the question of an incidental prevalence of eating disorders in people with type 2 DM, particularly BED, cannot be answered. Prevalence estimates of BED in the general population are 1.6% for women and 0.8% for men (12-month prevalence) (Fichter 2019). In contrast, in a small sample of 45 patients with type 2 DM, Crow et al. (2001) observed BED in eleven patients (25.6%). In a larger multicenter study of 845 patients with type 2 DM, Allison et al. (2007) found a significantly lower prevalence of 1.4%. Interestingly, 3.8% met the preliminary criteria for night-eating syndrome (consumption of >75% of daily calories after dinner, at least three nocturnal awakening phases with imperative food intake).

Even though the monocausal thinking that BED is the cause of overweight and obesity has had to be revised, obese people with BED still have a higher weight compared to obese people without eating disorders. Therefore, a diagnosis of BED in people with type 2 DM aggravates the course of weight and insulin resistance. In a systematic review/meta-analysis, Nieto-Martinez et al. (2017) demonstrated an increased risk for the development of type 2 DM in cross-sectional studies, while the relationship was less clear in cohort studies.

36.3 Insulin Dose and Weight Regulation (“Insulin Purgging”)

“Vomiting through the kidney” (“insulin purging”) refers to the deliberate reduction of insulin dose, particularly in the evening, for the purpose of weight reduction.

The prevalence of deliberate insulin reduction seems to increase with age. “Insulin purging” was observed in only 2% of children and adolescents aged 9–14 years, while the prevalence increased to 14% in female teenagers and to 34% in adult women (Colton et al. 2015). Interestingly, among girls and young women with DM, “insulin purging” can be observed not only in those with eating disorders but also in those without (De Paoli and Rogers 2018). Possible causes might be disease denial, which is not uncommon at this age, fear of hypoglycemia, or injection (needle) phobias.

► **Important** In particular, in young women with type 1 DM, “insulin purging” is less an expression of inadequate compliance than of an eating disorder or other psychological problems or disorders with far-reaching consequences for adequate treatment.

In regard to the **pathogenesis** of comorbid eating disorders in type 1 and type 2 DM, the following relationships can be discussed:

- The eating disorder or a disturbed eating behavior represents the individual response to the stress of a chronic illness with inappropriate coping strategies. In particular, depressive symptoms and feelings of inadequacy have been described in young women with eating disorders.
- The eating disorder represents the final stage of a psychological stress situation or disorder that could be compensated for before the diagnosis of DM but is exacerbated by the burden of the disease.

- The significant weight gain after the diagnosis (rehydration, anabolic metabolism) aggravates the age-inherent unstable self-esteem and reinforces restrictive eating behavior.
- By deliberately reducing the insulin dose and subsequent glucosuria, a drastic weight loss can be induced (“insulin purging”).
- Especially in view of the age of onset of juvenile DM and the eating disorders AN and BN, the importance of familial factors must be emphasized. It is likely that the diagnosis of DM in a child or adolescent changes the family structure (dynamics) and, for example, strengthens control mechanisms within a family and contributes to a lack of autonomy development and dependence, which is characteristic of many patients with an eating disorder.
- People with insulin-dependent type 2 DM generally have a higher weight than metabolically healthy individuals, to which the anabolic effect of insulin contributes. Flexible eating behavior for weight stabilization, as in healthy individuals, can never completely rule out the risk of hypoglycemia even with variable handling of the insulin dose.
- From psychobiological research, the regulatory significance of certain neurotransmitters for eating behavior is known. For example, serotonin has a satiating function. Tryptophan as a serotonin precursor is subject to a competitive transport mechanism at the blood-brain barrier with branched-chain amino acids, whose serum concentration depends on insulin secretion. Insulin deficiency thus leads to a reduction in centrally available tryptophan and serotonin, which in turn can result in a decreased satiety behavior.

36.4 Course of Eating Disorders in People with Diabetes Mellitus

Numerous cross-sectional studies have shown that both disturbed eating behavior and eating disorders result in a significant deterioration of

metabolic control and more frequently lead to diabetic complications. Even disturbed eating behavior that does not meet all the criteria of an eating disorder, such as insulin purging, massive dieting behavior, or self-induced vomiting is often associated with inadequate metabolic control and a high risk for the development of a diabetic complication. In an 11-year follow-up study, it was shown that insulin purging in people with type 1 DM was associated with a significantly increased mortality (Goebel-Fabbri et al. 2008; Goebel-Fabbri 2020).

36.5 Diagnosis and Treatment of Patients with Diabetes Mellitus and Eating Disorders

In view of the significant health risk associated with comorbidity of eating disorders and DM, routine screening for eating disorders or disturbed eating behavior in adolescent girls and young women with DM as a designated risk population is currently recommended. The clarification of an eating disorder also seems useful in patients with insufficient metabolic control without evidence of a somatic cause, e.g., autonomic neuropathy.

In a systematic review/meta-analysis, Clery et al. (2017) examined the efficacy of therapeutic interventions in patients with type 1 DM and comorbid eating disorder with regard to eating disorder symptoms and metabolic control. Based on six studies that met the inclusion criteria of the review and three studies that met the criteria of the meta-analysis, the authors calculated a small effect size (0.21). A significant improvement in the metabolic control of the intervention group compared to the control group could not be observed. Some, but not all studies showed an improvement in eating disorder symptoms. Only a multimodal inpatient treatment, consisting of cognitive behavioral therapy, psychoeducation, and family therapy, proved to be the most effective treatment method (Takii et al. 2003). Psychoeducational treatment approaches were found to be insufficient (Olmsted et al.

2002; Petrak and Herpertz 2019). In addition to an inpatient treatment setting, a higher therapy dose also seems to be necessary (Pinhas-Hamiel et al. 2015). There is now sufficient evidence for involving the family in the treatment of patients with eating disorders (AWMF 2019; <https://www.awmf.org/leitlinien/detail/ll/051-026.html>).

► **Important** For the success of psychotherapy, understanding the patient's life situation in general and the patient with DM in particular is necessary. This includes knowledge about diabetes, its therapy management, and its possible connections with the eating behavior/eating disorder (e.g., hypoglycemia, physical activity, etc.).

Patients with eating disorders and type 2 DM are predominantly overweight or obese and usually suffer from BED, so considerations for all three disease entities must be incorporated into the treatment. Therefore, a multimodal treatment concept is useful, the integral components of which are psychotherapy and weight management. In patients with BED, the initial priority is the normalization of eating behavior over a more restrictive diet to counteract the vicious cycle of diets (control behavior) and loss of control ("binge eating").

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Part VI

Treatment of Eating Disorders



Prevention of Eating Disorders

37

Andreas Karwautz, Gudrun Wagner and Michael Zeiler

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37.1 Types of Prevention

The common classification of prevention differentiates between primary, secondary, and tertiary prevention. Primary prevention aims to prevent the development of eating disorders and new cases, to prevent risk factors, and to promote protective factors. Primary prevention measures are directed at healthy individuals without eating disorder symptoms. The goal of secondary prevention is early detection and intervention to prevent the progression of the disorder and the development of a full syndrome disorder. Secondary prevention measures target existing

risk factors and aim to reduce them. Tertiary prevention aims to prevent the deterioration of a full-syndrome disorder. It includes measures for rehabilitation and relapse prevention. Another type of classification distinguishes between the terms universal, selective, and indicated prevention. While the term universal prevention refers to measures for the entire population, selective prevention programs focus on asymptomatic risk populations. Indicated prevention programs target high-risk groups that exhibit subclinical symptoms or clear risk factors.

37.2 The “Diet Culture”

Being thin, especially for girls and women, is a significant component of attractiveness in today’s society. This fact is reflected in dieting among girls and young women: before puberty, about 50% of adolescents show a preference for a thinner body ideal , and despite normal weight, almost 30% wish to be thinner. Depending on the study, it is reported that 25–63% of

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adolescents aged 13 and older have experience with dieting. The BELLA study in Germany and the MHAT study in Austria report that about one-third of girls and 15% of boys show an increased risk of developing an eating disorder. As body fat increases during puberty, dissatisfaction with one's weight and shape and the risk of disturbed eating behavior tend to rise. It must also be assumed that the exchange of images promoting a thin body ideal, excessive and unhealthy fitness and nutrition tips via social media channels (Instagram, Snapchat, Facebook, Tumblr) promotes the development of eating disorder symptoms. A recently published study demonstrated a relationship between the frequency of social media use and pathological eating behavior, maladaptive cognitions, and body image problems (Wilksch et al. 2020).

37.3 Target Areas for Primary Prevention of Eating Disorders

Strategies to convey preventive sociocultural messages through media consist of promoting the acceptance of a wider range of different body shapes. The main message should not be that “thinness” is generally bad, but that a wider range of body shapes is desirable. Individuality and self-acceptance—as opposed to conformity to a thin ideal—should be emphasized. Such goals were partially addressed in 2006 through the development of guidelines by the “Academy for Eating Disorders” for modeling agencies and the fashion industry (<https://www.aedweb.org/aedold/getinvolved/advocacy/position-statements/fashion-industry-guidelines>). Initiatives such as the increasing use of “curvy models” and the legally mandated requirement to label Photoshop-altered representations of models in some countries are examples of how eating disorder prevention can also be advanced at

the societal level. Further guidelines, especially regarding the dissemination of eating disorder-promoting content via social media channels, would be desirable. A second, reactive approach aims at critically examining messages disseminated through fashion magazines or social media. These can be addressed, for example, by health promotion programs in schools. Reviews on the prevention of eating disorders have criticized the exclusive focus of existing prevention programs on the individual level, as it represents adaptive behavior to harmful environmental conditions.

- **Important** Interaction with media as an external influencing factor and personal vulnerability as an internal factor are important target areas for primary prevention.

The **salutogenic model** of primary prevention focuses on general health promotion, which should be anchored in educational policy and the school system. Primary prevention in this sense includes strengthening personal resources, such as self-esteem, assertiveness, coping strategies, stress management, puberty, and development-related stressors.

- **Important** Instead of conducting one-day information events on eating disorders in schools, it is recommended to offer longer-term intervention programs for parents, teachers, and students that aim to strengthen personal resources and thus reduce the risk of eating disorders and other mental illnesses.

Behavioral change is usually based on a cumulative effect of increased awareness, better understanding, beliefs, attitudes, and self-efficacy. Health-promoting measures should include the points summarized in the following overview.

Health-promoting measures

- Increase access to one's own feelings
- Promote healthy stress management and coping strategies
- Increase self-esteem and self-confidence
- Create a balance between autonomy and dependence on family members and the peer group
- Express one's own needs and feelings
- Reduce ambition and perfectionism
- Increase positive body experience
- Build self-esteem through factors other than weight and physical appearance
- Convey a critical view of superficial sociocultural ideals
- Teach balanced nutrition and exercise behavior

Physical changes during puberty, which are also associated with an increase in body fat in girls, can lead to body dissatisfaction and consequently to dieting behavior. Therefore, conveying information about the normality of these physical changes should be another target area in the primary prevention of eating disorders. Providing information on "healthy eating" by experts is problematic because it can lead to an excessive preoccupation with food, which is a known risk factor for eating disorders. Instead, the importance of a balanced diet should be emphasized, which also allows for flexibility and excludes a "ban" on unhealthy foods. In secondary prevention, information about eating disorders for teachers and health professionals is a prerequisite for recognizing risk behaviors in a timely manner and enabling early interventions.

37.4 Efficacy of Prevention

Stice et al. (2007) and Le et al. (2017) summarized the results of 51 and 112 prevention programs, respectively, in meta-analyses. It was found that selective programs for risk groups yielded larger intervention effects than universal

programs. Larger effects were also observed in older adolescents compared to younger ones and in interactive vs. didactic programs conducted by external eating disorder experts compared to teachers. Universal prevention programs were particularly effective when they aimed to increase media literacy. In selective prevention studies, the largest effects were found in programs based on cognitive-behavioral therapy and the theory of cognitive dissonance. Pickhardt et al. (2019) provide a good overview of a total of 22 German-language prevention programs for eating disorders, with only half of these programs being scientifically evaluated. Most of these programs were implemented either in the school context or as pure online programs and mainly focused on psychoeducational approaches, increasing media literacy, and promoting a healthy body image.

37.4.1 Efficacy of Primary Prevention

Most primary prevention measures take place for children and younger adolescents in primary and middle school age up to 14 years, with the school setting playing a major role in the implementation of such prevention programs. To a large extent, the content of universal prevention programs aims to counteract an overvaluation of appearance and thinness ideals and negative body evaluation, as well as to strengthen positive self-esteem and general coping strategies. Another goal is the critical examination of media messages and information about how individuals are influenced by advertising and culture. In the review by Le et al. (2017), only programs that aimed to increase media literacy proved to be effective in reducing weight and shape concerns and internalizing the thinness ideal, with effect sizes in the low to moderate range. Minimal effects of universal prevention programs on increasing self-esteem and body satisfaction were also reported by Chua et al. (2019), with higher effects for girls than for boys.

Piran (2005) also points out that primary prevention programs often achieve changes in

knowledge about healthy nutrition and exercise, but these often do not result in a change in attitude and behavior.

- **Important** The mode of intervention delivery seems to play a crucial role: Interactive formats have more positive effects on attitude and behavior changes than purely didactic formats.

It must be noted that long-term effects of prevention programs have hardly been studied so far. An exception is the study by Adametz et al. (2017), which examined the sustainability of the German-language universal eating disorder prevention program "PriMa". 7–8 years after participating in this program, no sustainable effects on disturbed eating behavior could be detected, but body-related self-esteem was still significantly higher than in the control group.

It is critical to note that most programs focus exclusively on promoting individual skills of children, and only a few programs (additionally) include the social environment such as peer norms, parents, and teachers.

From the public health perspective, coordinated preventive interventions at the macro level in social policy, the meso level, e.g., in schools, and at the individual level are necessary.

McVey et al. (2009) developed a psychoeducational intervention for elementary school teachers that aimed to increase knowledge about the development of eating disorders and provided a practical guidance on promoting a healthy body image in the classroom context. Participation in this program increased both knowledge about unhealthy dieting and eating disorders and teachers' confidence in counteracting an unhealthy body image in the classroom.

- **Important** Programs that include systemic interventions, such as changes in peer norms regarding, e.g., weight-related teasing or educational work with teachers in the field of eating disorders, have proven to be effective.

Conclusion

For primary prevention in children and younger adolescents, only minor successes have been achieved so far. Results of previous research emphasize the importance of interventions at both the individual and setting levels, taking into account the interactive delivery of content. In particular, studies on the sustainability of these interventions are also lacking.

37.4.2 Efficacy of Secondary Prevention

The target group of most existing studies on secondary preventive programs is older adolescents and young adults, particularly college students with weight and body image concerns, individual symptoms of eating disorders, and overweight. Target areas for these programs are the reduction of body image problems, drive for thinness, binge-eating behavior, restrictive eating behavior, and negative affect.

The conducted prevention programs are based on different theoretical approaches such as cognitive-behavioral therapy, cognitive dissonance theory, psychoeducational elements, and mindfulness.

In general, significantly higher effects can be observed for selective and indicated prevention programs than for universal prevention programs. Various review articles in this field suggest that the short-term effect of such programs is at least in the low to moderate range. Some studies also indicate that the effectiveness lasts at least up to a 1-year follow-up. Effects were found particularly in terms of improving body image, reducing drive for thinness, and bulimic symptoms. The greatest evidence currently exists for programs based on cognitive-behavioral therapy and cognitive dissonance theory.

The reasons for the better results of secondary compared to primary prevention may lie in the higher motivation and burden of individuals who are interested in such programs. In

addition, the recruitment of study participants for selective and indicated programs is usually more targeted, while universal programs, which are often implemented in schools, involve all children and adolescents—regardless of their risk level and motivation. Other reasons could lie in the fact that the individual approach of secondary prevention is more effective for older adolescents and young adults, who have better critical thinking skills, compared to younger individuals, who are more attached to their social environment.

In addition to the effects that seem promising for secondary prevention programs, other factors are crucial for the success of an intervention at the public health level, which have not been sufficiently considered in previous research (Zeiler et al. 2021). According to the RE-AIM model (Glasgow et al. 2019), the following points should be considered when evaluating prevention programs.

RE-AIM factors for the evaluation of prevention programs

1. Reach: How well can the target group be reached?
2. Adoption: How willing are organizations (e.g., schools, universities) to offer prevention programs?
3. Efficacy: How effective are prevention programs? How well are such programs accepted by the target group (adherence, satisfaction)?
4. Implementation: How well can prevention programs be implemented in the respective setting as intended? To what extent are adaptations needed?
5. Maintenance: How sustainable are preventions at both the individual and organizational levels?

37.4.3 The Use of New Technologies in Primary, Secondary, and Tertiary Prevention

The advantages of new technologies in prevention lie in the broader accessibility to individuals with an increased risk for a specific disorder. Interactive content can be flexibly targeted to the users' needs and utilized independently of time and location. Thus, online programs enable the combination of universal and indicated approaches, which is particularly relevant for use in the school setting. Based on the results of a preliminary screening, students can, for example, receive those program elements that are useful based on their individual risk status.

In the German-speaking area, two internet-based prevention programs for eating disorders have been primarily offered and evaluated in recent years. Student Bodies™ is a cognitive-behavioral prevention program for eating disorders developed in the USA and translated and adapted for German-speaking countries. Various versions of this program have been developed for use in universal, selective, and indicated prevention in female adolescents and young adults. Previous studies have shown small to moderate improvements regarding negative body image and drive for thinness. The development of a full-syndrome disorder was prevented in groups with an increased risk for eating disorders. Another Internet-based program aimed at reducing eating problems and improving body image, designed for adolescents and young adults in Germany, is called "ProYouth". Previous studies have shown that participation in the program can reduce the incidence of eating disorders and increase the use of further professional support. This program has been further adapted and integrated into the ProHead platform (www.pro-head.de).

In the USA, an integrative model for the identification, prevention, and treatment of students with eating problems was developed in the higher education sector (Fitzsimmons-Craft et al. 2019). Using an online screening algorithm, each individual receives the appropriate intervention program. Students with a low risk for an eating disorder and those with overweight receive the “*StayingFit™*” program, those with high risk receive the “*Student Bodies-Targeted™*” program, and those with subclinical and clinical eating disorders receive the therapist-supported self-help program “*Student Bodies-Eating Disorders™*”. Patients for whom these programs do not lead to sufficient success, as well as patients with AN, receive evidence-based face-to-face psychotherapy. In this way, all individuals receive the care that is needed in a resource-optimized manner. Accompanying political measures to promote a positive body image and healthy lifestyle, as well as the destigmatization of eating disorders and obesity, are intended to lead to better health and quality of life for students in general. A similar approach is pursued in Germany through the “*Everybody*” program (Nacke et al. 2019), which represents an adaptation of “*StudentBodies™*” and is being evaluated within the framework of the EU project “*ICARE*” (www.icare-online.eu).

In addition to computer-based programs, the first smartphone applications for the prevention of eating disorders have also been developed in recent years. Such apps primarily serve to monitor eating habits, emotions, behaviors, and thoughts. Other apps focus on promoting a healthy body image. An example is the app-based intervention BodiMojo (Rogers et al. 2018). The goals of this app are to increase self-esteem, mindfulness, healthy eating and exercise behaviors, as well as to improve emotion regulation.

In the field of tertiary prevention, Fichter et al. (2012) evaluated a virtual intervention program for patients with AN (VIA) in a randomized controlled trial, which was used for relapse prevention after inpatient treatment. Compared to conventional follow-up treatment, patients who had been treated with VIA achieved greater weight gain as well as a greater reduction of bulimic

symptoms and social insecurities after nine months. Participation in the entire program (nine modules) was identified as an important success factor. Internet-based programs have also been used for aftercare and relapse prevention in former inpatients with bulimia nervosa to further reduce binge eating and compensatory behaviors. In a randomized controlled trial, moderate effects of the online program were found in terms of reducing self-induced vomiting (Jacobi et al. 2017).

However, possible disadvantages and challenges of Internet-based programs must also be considered. First and foremost, the high dropout rate or low adherence, especially for unguided programs, should be mentioned. Increasingly, data protection aspects have also come into focus, which are demanded by users of such interventions, not least due to the EU General Data Protection Regulation. There are currently no mandatory quality criteria for e-health interventions. Initial approaches and suggestions can be found in Klein et al. (2018). Furthermore, challenges in implementation, e.g., in the school setting, must also be considered.

Conclusion

For the future, systemic changes are required in the field of primary prevention in addition to individual approaches, which necessitate longer follow-up periods. In view of general health promotion in adolescence, programs should be developed on a broader level that target universal protective and risk factors in adolescence and thus also cover other areas such as emotional problems, stress coping, and obesity. The use of new technologies in the prevention of eating disorders has gained significant importance, and largely comparable effects with conventional face-to-face programs have been observed, although these are in the low to moderate range. Resource-optimizing integrative models for the identification, prevention, and treatment of risk and patient groups are promising. A comprehensive dissemination of such approaches, especially in German-speaking countries, has yet to take place.

37.4.4 Joint Prevention Programs for Eating Disorders and Obesity

An integrated prevention approach for obesity and eating disorders is indicated considering that overweight and unhealthy compensatory weight-reducing measures (such as fasting, skipping meals, smoking, vomiting, laxative or diuretic abuse, taking appetite suppressants or food substitutes) often occur simultaneously, and considering symptom shifts from e.g., obesity to bulimia nervosa (40% of women with BN were overweight in childhood) (Fairburn et al. 1997). In addition, practical considerations in the implementation of intervention programs and time constraints in schools also point to the usefulness of health-related integrated prevention programs for obesity and eating disorders.

Nevertheless, the aims of prevention programs targeting obesity and eating disorders appear to be partly contradictory: behaviors that are an integral part of weight reduction programs, such as tracking of nutritional intake, reduction of caloric intake, and increase in physical activity, are considered pathological in the eating disorder field. Despite the apparent contradictions in treatment, there are a number of common goals, such as the intake of regular meals (to avoid binge eating), paying attention to body signals such as hunger and satiety, avoiding overeating due to “emotional hunger” or external cues, enjoying physical activity (preventing too much and too little exercise), and promoting general coping strategies for stress and negative emotions. It should be considered whether the importance of paying attention to body signals, such as hunger and satiety, should be emphasized (as is the case in the eating disorder field) or rather portion sizes (as in the obesity field).

Neumark-Sztainer (2009) recommends considering the following five points in joint prevention programs for obesity and eating disorders in adolescents. These are based on various research studies that examined societal,

personal, and behavioral factors of nutrition and weight-related issues in adolescents:

- Educate adolescents about the dangers of diets and unhealthy weight control measures. Alternative behaviors should be promoted. This includes, for example, regular consumption of fruits and vegetables, paying attention to portion sizes as well as hunger and satiety, and engaging in more physical activity.
- Promote a positive body image and avoid dissatisfaction with one's own body as motivation for change.
- Encourage more frequent, and more enjoyable, family meals.
- Avoid comments on weight and shape within the family: This includes comments on one's own weight and diets, discussions about the weight of others, encouraging children to diet or lose weight, or teasing them because of their weight.
- Address negative experiences that overweight adolescents have had due to their overweight: e.g., weight-related bullying or exclusion from certain activities due to weight.

A recently published study also suggests that prevention approaches for both overweight and underweight adolescents focusing on improving mood, reducing stress, and building positive coping strategies for dealing with negative emotions are promising (Zeiler et al. 2021). The combined eating disorder and obesity prevention program “Healthy Teens @ School” is currently being implemented in schools in Austria and Spain, targeting 14- to 19-year-old students and designed as an online program (Jones Bell et al. 2019). It represents a further development of the StayingFit™ program developed at Stanford University in the USA and pursues a comprehensive prevention approach: promoting balanced nutrition and exercise behavior is just as much in focus as building a healthy body image and promoting healthy coping strategies for dealing with stress and negative emotions. Different program elements for overweight and normal-weight

students allow for simultaneous use as a universal and selective prevention program.

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Treatment of Eating Disorders in Childhood and Adolescence

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The number of controlled studies investigating the treatment of childhood and adolescent anorexia nervosa (AN) and bulimia nervosa (BN) has increased in recent years. The improvement of treatment—especially that of weight rehabilitation—has led to a reduction in morbidity and mortality in adolescent AN, although the outcome of childhood AN seems to be worse than that of adolescent AN (Dobrescu et al. 2019; Eddy et al. 2017; Herpertz-Dahlmann et al. 2018). Transparency and honesty are of great importance in the treatment of patients with AN. In the case of inpatient treatment, these young patients often experience external pressure, particularly from family members, and deny the need for hospitalization. While adult patients often develop insight into the need

for treatment during the first weeks, this is less common in adolescents (Guarda et al. 2007). A preliminary explanation is therefore recommended before inpatient admission, in which the patient is informed about the necessity and conditions of inpatient treatment. In many cases, a “viewing appointment” of the ward or day patient department is also helpful. The treatment facility should be suitable for children or adolescents and include staff trained for this age group as well as the possibility of schooling. In case of a life-threatening condition due to a lack of insight, involuntary treatment taking into account the legal requirements must be considered for adolescents; if involuntary treatment is necessary beyond the 18th birthday, a guardian appointment according to the German civil code may be useful (Herpertz-Dahlmann and de Zwaan 2015). However, with good preparation and clarification, involuntary treatment is rarely required in adolescence.

The treatment of eating disorders in childhood and adolescence is multimodal and essentially consists of four components.

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Treatment of eating disorders in childhood and adolescence

- Somatic rehabilitation and nutritional therapy
- Individual psychotherapeutic treatment
- Involvement of the family
- Treatment of comorbidity and, if necessary, medication (primarily for BN)

38.1 Somatic rehabilitation and nutritional therapy

At the beginning of treatment of AN and BN, the nutritional history and documentation of weight loss are important, with the rate of weight loss (how many kg in which time?) also being important. The faster and higher the weight loss, the more severe are the somatic consequences. The nutritionist (or therapist) documents the daily food intake and eating habits on the ward. In contrast to BN, patients with AN should not keep a food diary, as this can support the compulsive-perfectionistic traits of the patient and encourage calorie counting. Outpatients with BN should keep a food diary in which they record the food and quantities consumed over a period of 1-2 weeks, possibly also the time and situational characteristics of binge eating and self-induced vomiting. Based on the nutrition protocol and/or observation, a meal plan is created that includes 5–6 meals (the lower the body weight, the more frequent the meals). While diet products have no place in the meal plan, so-called forbidden (e.g., high-calorie or sweet) foods should be integrated in order to reduce the likelihood of binge eating, especially in patients with BN. In an inpatient setting, a so-called “model meal” is sometimes recommended, in which the patient eats the meal with an experienced supervisor to relearn normal eating behavior. In the case of BN, the link between restrictive eating and binge eating, as well as the necessity of snacks to prevent feelings of hunger, must be explained to the patient.

Almost all guidelines define the target weight as the weight at which menstruation resumes. This recommendation cannot be implemented for premenarchal patients. In postmenarchal patients, there is often a longer period between weight stabilization and the return of menstruation. Patients with premenarchal onset of the disorder, with discharge before achieving the target weight, as well as those with a higher pre-morbid BMI and longer inpatient treatment have a higher risk of prolonged amenorrhea (Dempfle et al. 2013).

► **Important:** The German S3 guideline (Herpertz et al. 2019) recommends the 25th age-specific BMI percentile as the target weight, as menstruation resumes in many adolescent patients when this weight is achieved (Dempfle et al. 2013); the 10th age percentile is considered the minimum weight.

Our experience has shown that it is not always useful to discuss the target weight with the patient at the beginning of treatment, as achieving this weight may seem like an insurmountable obstacle to the patient. Instead, the patient and therapist set initial weight stages on a “weight ladder”, in which certain weight marks or an improvement in eating behavior are linked to “reinforcers”, e.g., participation in outdoor activities, sports, attending the clinic school, weekend visits at home, etc. In this age group, the weight curve must be adjusted to the age curve. Sometimes, radiological determination of bone age is useful to detect a starvation-induced growth retardation.

The guidelines provide for a weekly weight gain of 500–1000 g in an inpatient setting and about 300 g per week for outpatients. In cases of severe eating problems, temporary nasogastric tube feeding may be useful. In child and adolescent patients, attention should be paid to the possible occurrence of refeeding syndrome (Chap. 27). However, recent studies have shown that the risk of refeeding syndrome in non-severely starved patients is extremely low (Garber et al. 2016) and a higher weight gain at

the beginning of treatment is rather prognostically favorable (Nazar et al. 2017). Furthermore, the patient should have sufficient time to come to terms with her changed body shape.

The **nutritional counseling** is provided individually and in groups. It has been shown that adolescent patients are well informed about the calorie content of individual foods, but not about the composition of a healthy diet. For this reason, we educate our patients about both necessary food components (quantitative and qualitative) and physical and psychological consequences of starvation.

38.2 Individual Psychotherapeutic Treatment

Individual psychotherapy for adolescent AN and BN is usually based on a cognitive-behavioral disorder model.

As a first step, following the idea of U. Schmidt and J. Treasure (Schmidt et al. 2002), we encourage the patient to write two letters to the eating disorder.

- In the first letter, the patient can list the advantages she/he sees in the eating disorder; it begins with: “Dearest Anorexia/Bulimia, you are my best friend because ...”
- In the second letter, the disadvantages of the disorder are listed; it has the salutation: “Bad Anorexia/Bulimia, you are my worst enemy because ...”

This approach helps to establish an initial connection with the patient, as the eating disorder is not only sanctioned, as the patient already experienced from her family, but the positives important to her are also heard. In further therapeutic steps, the patient learns to examine her fixed thought patterns regarding body shape and weight (being competent, “being interesting” is equated with “being thin” etc.). Deeply rooted are ideas of one’s own inability (“I am worthless”). It often takes many sessions for the patient to consider which of her qualities she

likes about herself and which others find appealing. A group therapeutic setting is helpful here, in which the other participants can provide feedback on what they appreciate about the patient. When she feels better, friends of the patient are sometimes invited to joint discussions to enable a confrontation with reality. In the context of such group discussions, the patient learns that critical statements from her or other participants do not lead to the feared breakdown of a relationship she fears. In a further step, the adolescent considers how she can express her need for attention and affection, which is often difficult in anorexia nervosa. In younger patients, there is often a pronounced sibling rivalry and a desire for parental attention, combined with the concern that normal weight will also result in a loss of parental attention. Here, the patient must learn to assert her concerns by formulating her own ideas, persisting in enforcing her own wishes, and approaching others.

In addition to cognitive-behavioral strategies, supportive elements play a particularly important role in the treatment of adolescents and children. In line with a study by McIntosh et al. (2005) on “specialist supportive clinical management”, which also included 17-year-olds, the patient is encouraged to not give up prematurely and to stick to her goal of overcoming the disease. This aspect becomes more prominent the younger the patient is, but also with the onset of chronicity of the disorder. Children with AN often experience their illness as an “evil power” to which they are helplessly exposed. They have poor introspective ability and are unable to develop an individual concept for the development and management of their disorder. Here, externalizing the disease (“witch”, “evil power”, see above) helps. Moreover, many of hospitalized young patients suffer from severe homesickness. New treatment settings such as day patient treatment or home treatment are often helpful for these patients. Here, the therapist should take on an empathetic role and strengthen the patient in her willingness and ability to recover. Sometimes, daily conversations are necessary to encourage the often very burdened and depressed patient.

38.3 Involvement of the Family

In the following, both psychoeducational groups for parents and family based interventions in the narrower sense are presented. Therapists should be aware that many parents feel guilty for their daughter's illness, invest a large proportion of their own time in caring for their daughter, and are often completely exhausted as a result (Raenker et al. 2013).

38.3.1 Group Psychoeducation for Parents

Participation in a group for parents of patients with eating disorders (e.g., Holtkamp et al. 2005; Nicholls and Yi 2012) is experienced as helpful by many caregivers in all treatment settings (outpatient, day-care and inpatient).

► **Important** The development of psychoeducational projects was prompted by the realization that many parents, especially mothers, experience their daughters' eating disorders as their fault. A "rationalization" of the clinical picture, e.g., by understanding the medical consequences of the starvation process, can alleviate feelings of failure and resignation among family members.

The everyday life of a family, including that of siblings, is significantly affected by a child's eating disorder. Shared meals are disrupted by intense conflicts, parents develop "detective" strategies to find evidence of their daughter's vomiting or abusing laxatives, and siblings no longer receive the necessary attention from their parents. A high level of critical comments from family members (the concept of expressed emotions) is associated with a worse outcome of the eating disorder.

As part of the psychoeducational group, parents should learn to detach themselves from their "causative role," better understand their daughter's behavior, and take on co-therapeutic tasks. Furthermore, the treatment concept of the

ward or therapists should be made transparent to the family. In 5–6 sessions, the necessary knowledge is imparted to 5–6 sets of parents. Among other things, they receive information sheets summarizing the contents of the individual treatment components.

Group Psychoeducation for Parental Education on Eating Disorders—Program of Sessions

• 1st session

- Definitions and epidemiology of eating disorders
- Symptoms/current state of research
 - Key symptoms and behaviors
 - Mental and physical consequences of semi-starvation
 - Acute and long-term medical complications
 - Effects on the environment
- Causes/current state of research

• 2nd session

- Pathways to treatment (why—when—what?)—the Aachen model
- Presentation of the four pillars of eating disorder-specific therapy and their components
- Treatment settings (outpatient/inpatient/day patient/home treatment)
- Prerequisites for a treatment alliance

• 3rd session

- Nutritional therapy
 - Rationale behind and forms of refeeding and nutritional therapy components
 - Why does the patient need to practice eating again?
 - Why can't the patient decide on her own food choices once she has achieved the target weight?
 - What constitutes a healthy diet? (Yes, sweets, too...)
 - What do meal plans look like?
 - What are the parents' responsibilities?

• 4th session

- Treatment steps to prepare for discharge
 - Relapse prevention
 - Readmission agreement
- Actors and their tasks in outpatient follow-up treatment
 - Doctor (child and adolescent psychiatrist, pediatrician, gynecologist)
 - Psychotherapist
 - Youth welfare
 - Parents/legal guardians
- Clarification of open questions

38.3.2 Family-Based Intervention

Family-based therapy is the only form of psychotherapy for adolescent AN or BN for which controlled studies are available. Most are based on the concept of the Maudsley Hospital in London (FBT, family-based treatment). The starting point was the study by Russell et al. (1987), including a 5-year follow-up, which showed that family-oriented treatment for young, non-chronically ill patients with AN was more effective in terms of body weight, resumption of menstruation, and psychosexual functions than individual therapy. This form of therapy was further developed mainly in the USA and is now carried out in various modifications and settings. Its main goals are weight rehabilitation and the reintegration of adolescents into age-appropriate development and “participation” in social life. It consists of three consecutive phases: In the first phase, parents take responsibility for food intake and weight gain. In the second phase, with a lower session frequency, parents learn to delegate more responsibility to the adolescent and to make the AN-centered actions (regulation of food intake, sports activities, etc.) more flexible. The third phase begins when the adolescent has achieved a

healthy weight and the increasing autonomy of the daughter is at the center of the therapy (Cooper et al. 2019). FBT can be conducted in separate sessions for the adolescent and the parents as well as in the form of joint conversations. The duration of the treatment also seems to have no significant influence on the recovery success. Recently, “multi-family therapy” has been carried out in comparison to single-family therapy with good results (Eisler et al. 2016). However, there are hardly any comparisons between FBT and other forms of therapy, and such comparisons are urgently needed to determine whether FBT is superior to other psychotherapeutic interventions and which patient benefits most from which method.

► **Important** Children under 14 years of age seem to benefit from family based measures in a similar way as adolescents.

38.3.2.1 Conclusion

Family-based intervention is superior to individual therapy in adolescent AN. Which form of family-oriented intervention is applied seems to play only a secondary role. However, it must be noted that almost all of the patients in the aforementioned Anglo-American studies with outpatient settings had a significantly higher weight at the beginning of treatment than those treated in Germany in an inpatient setting (Lock et al. 2010).

For adolescent BN, there are also more recent controlled studies on the inclusion of the family. In a study by Le Grange et al. (2015), FBT was compared with cognitive behavioral therapy adapted for adolescents (CBT-A). At the end of therapy and after six months, a greater symptom reduction was observed in the FBT group, which was no longer detectable after twelve months. However, the study had a high dropout rate.

In another study, two family-based treatments, FBT and systemic therapy, were compared in adolescents with BN. Neither was superior to the other, but FBT was more cost-effective (Agras et al. 2014).

- **Important** Interventions involving the family also show high efficiency in adolescent BN; however, further studies comparing different therapy types are needed before definitive statements can be made.

38.4 Treatment of Comorbidity and Medication

- **Important** Due to the high risk of anxiety disorders in patients with eating disorders, social competence training as part of inpatient treatment has proven helpful.

38.4.1 Anxiety Disorders

Since the risk of anxiety disorders in adolescent eating disorders is high cross-sectionally and longitudinally, we conduct social competence training for patients who show symptoms of a social phobia, but only after achieving the 10th BMI age percentile in patients with AN.

38.4.2 Social Phobia

The **social competence training** for the treatment of comorbid social phobia in AN and BN refers to both food-dependent and food-independent situations, i.e., both restaurant and cafeteria visits and eating with peers as well as bus travel, opening a bank account, etc. We consider the treatment of social phobia to be very important, as a lack of autonomy of the patient may promote a relapse into the sickrole.

38.4.3 Obsessive-Compulsive Disorder and Depression

A comorbid obsessive-compulsive disorder also requires treatment. In the case of AN, it

is recommended to first achieve a “healthier” body weight, e.g., the 10th BMI age percentile. The method of choice is exposure with response prevention, possibly also metacognitive therapy, and in more severe cases, the use of selective serotonin reuptake inhibitors (SSRI) after weight rehabilitation. SSRIs are not effective in the stage of starvation. This also applies to the treatment of depression.

38.4.4 Pharmacological Treatment

38.4.4.1 Anorexia Nervosa

Currently, no medication is approved in Europe or the USA for the treatment of adolescent AN (Couturier et al. 2019).

Antidepressants Neither tricyclic antidepressants nor lithium showed an effect in adolescent patients with AN. More recent studies, which also included adolescent patients, did not find a relapse prevention effect. SSRIs also showed no significant effect on eating disorder symptoms, but may be indicated for the treatment of persistent depression after weight rehabilitation.

Antipsychotics Conventional antipsychotics show no significant effect in the treatment of AN. Recent meta-analyses in adolescent patients with AN found no superior effect of atypical antipsychotics as an adjunct to psychotherapy compared to placebo. In a retrospective study with the partial D₂ agonist aripiprazole based on medical records, a higher weight gain was observed in treated adolescents compared to untreated adolescents with AN (Frank et al. 2017). This study requires replication with a randomized controlled design. In adults, a slightly higher but significant weight gain was found with olanzapine without serious side effects (Attia et al. 2019). A corresponding study for adolescent patients is not available. However, the sedative effect of olanzapine may sometimes be helpful in the treatment of

pronounced physical hyperactivity at the beginning of treatment.

► **Important** So far, there is insufficient evidence for the effectiveness of pharmacological treatment in children and adolescents with AN.

Osteoporosis Prevention Due to the high prevalence of osteoporosis in acutely ill and weight-rehabilitated AN patients, a transdermal administration of 17 β -estradiol, supplemented by cyclic administration of progesterone, was successfully tested in a randomized controlled trial in adolescent patients. The bone density of the spine and hip increased significantly compared to the placebo group (Misra et al. 2011). The recommendation for transdermal administration of estrogen in adolescent patients with long-standing AN has been included in the German S3 guideline as well as a reference in the NICE guidelines (2017). In 13- to 14-year-old patients, transdermal estradiol administration is given in increasing doses, while in older female adolescents, continuous transdermal treatment (patch 2 \times 100 μ g per week, dosing gel 1.5 mg/d or spray 1.5–3.0 mg/d) with cyclic progesterone application is used. Further studies on osteoporosis prevention in these young patients are urgently needed. (Note from the author: In Germany, instead of medroxyprogesterone acetate [MPA], hydrogestrone [20 mg/day for 14 days], progesterone [200–300 mg for 14 days], or chlormadinone [2 mg for 14 days] is used for endometrial transformation. This does not have to be done in a 4-week rhythm to avoid giving the patient the impression of a “normal menstruation” (personal communication from Prof. Dr. J. Neulen, Gynecological Endocrinology, University Hospital Aachen).

38.4.4.2 Bulimia Nervosa Pharmacological Treatment

► **Important** In BN, SSRIs have been shown to be effective in reducing binge eating in adolescent patients, even though the evidence is not strong (Couturier et al. 2019).

The dosage of SSRIs is administered as in adults in a daily amount that corresponds approximately to the dose used in the treatment of obsessive-compulsive disorders (e.g., 60–80 mg fluoxetine or 100–150 mg fluvoxamine).

Conclusion

There is an urgent need for further efforts to find effective treatment methods and more progressive settings for child and adolescent eating disorders. The high rate of rehospitalizations hinders the personal, social, and professional development of adolescents and, in turn, increases the likelihood of relapse in a vicious circle.

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Alternatives to Inpatient Treatment of Anorexia Nervosa in Childhood and Adolescence—Day Patient Treatment and Home Treatment

39

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39.1 Disadvantages of inpatient treatment for children and adolescents

In Germany and other European countries, inpatient treatment for children and adolescents, as well as adults with anorexia nervosa (AN), has continuously increased (Stat. Bundesamt 2019; e.g., Cruz et al. 2018), although there are significant doubts that inpatient therapy is superior to other forms of treatment. In a European follow-up study spanning more than six years with adolescent patients, 50% had to receive inpatient treatment a second time (Steinhausen et al. 2009); in a more recent Australian study, more than a third

were readmitted within one year, regardless of the duration of the first inpatient stay (Madden et al. 2015). In addition, many adolescents and especially children experience inpatient admission as coercive and suffer from severe homesickness.

For numerous young people with AN, their history provides indications of social phobia or anxious-avoidant personality traits (Chap. 2; Cardi et al. 2018). With this in mind, there is a risk that the age-appropriate socio-emotional development of these adolescents will be impaired by long inpatient stays. The cost of inpatient treatment is very high. A calculation of the direct and indirect treatment costs for AN over three months showed that approximately 60% of these costs were caused by inpatient therapy (Stuhldreher et al. 2015).

In contrast to earlier views that considered separation from parents and children as an essential treatment element for AN, it is now believed that involving parents (or caregivers) makes an important contribution to the success of treatment. The family-based therapy (FBT) developed primarily at the Maudsley Hospital in London has contributed significantly to this.

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All known European guidelines, including the German S3 guideline, recommend intensive integration of parents into the treatment of AN (Herpertz et al. 2019; NICE Guidelines 2017). Nevertheless, parents and patients complain that the transition from inpatient treatment to home is too difficult and that they feel insufficiently supported.

It was therefore our goal to develop alternative treatment strategies that allow for greater involvement of the patient's social environment. In a first step, a day clinic program for children and adolescents was developed; the second step involves an intensive home-based treatment program in the patient's home environment (Home treatment, HoT).

39.2 Day Patient Treatment

39.2.1 Practical Implementation

In the majority of day clinics (DC), the treatment of AN is carried out five days a week from morning (8:00 or 9:00 am) until afternoon (4:00 or 5:00 pm). In some DCs, the day patient treatment is only conducted in the mornings, afternoons, or on individual days. We have found that patients with an eating disorder do not benefit sufficiently from a general DC for mental disorders, but rather should remain in the ward for eating disorders, preferably under the care of the same therapist, following inpatient treatment. This also motivates other inpatients, who learn from the example of their fellow patients and benefit from the "everyday contacts" with the day patient treatment patients.

Certain prerequisites must be met for admission to the DC (overview). This primarily includes the patient no longer being physically endangered by their behavior, i.e., no pronounced laxative abuse or frequent vomiting is present. In addition to the patient themselves, their family must also be motivated for DC treatment, as the latter must ensure adequate care (and nutrition) in the evenings and on weekends. It is advisable to prepare for discharge to the DC through joint meals in the clinic ("family

meals") as well as weekend visits with overnight stays. The weekly weight gain in the DC should be at least 300 g (compared to 500 g for inpatient treatment) (see also Herpertz et al. 2019).

Requirements for day patient treatment

- Somatic stability of the patient
- No severe psychological comorbidity or suicidality
- Independent nutrition possible (no nasogastric tube feeding required, exceptions possible)
- Sufficient family resources
- Distance between clinic and place of residence ≤ 1 h
- Motivation of patient and family

To improve communication between staff and caregivers, a report book or daily (data-protected) email contacts are recommended, in which parents explain their observations or problems with their child with an eating disorder.

The patient is encouraged to renew their pre-inpatient contacts with peers and (sports) clubs. School attendance is resumed with an increasingly growing number of hours; this is a very important step, as many patients fear the "confrontation" with teachers and classmates and dread the demands and questions associated with long school absences ("Where have you been for so long? Have you gained weight? You look good."). In addition, they find it difficult to have a meal with others at school. If the parents agree, a phone call or personal conversation between the therapist and the class teacher or head of year is recommended before returning to school. The necessary meals at school can be discussed with the nutritionist in advance.

In general, however, the patient participates in the entire therapy program of the ward, as described in Chap. xx, and in addition, parent or family meetings take place very regularly. Similar to inpatient treatment, the patient is discharged to outpatient treatment after maintaining their target weight for a defined period and normalizing their eating behavior.

39.2.2 Efficacy of Day Patient Treatment

Several uncontrolled studies concluded, based on a comparison of findings before and after day patient treatment, that adolescent patients with AN benefit from day patient treatment (Serrano-Troncoso et al. 2020; Simic et al. 2018). In a review on day patient treatment and therapeutic residential groups (“residential treatment”), it was shown that the majority of studies describe an improvement in eating disorders at discharge and possibly at a later follow-up examination (Friedman et al. 2016).

In our own randomized controlled trial, we conducted a comparison between inpatient treatment ($n = 85$) and day patient treatment ($n = 87$). After three weeks of inpatient treatment, patients were randomized either to continue inpatient treatment or to receive day patient treatment. At the one-year follow-up examination, no significant difference in body mass index (BMI) was found between the two treatment settings. However, after day patient treatment, patients showed better mental health and better psychosexual development with lower treatment costs (Herpertz-Dahlmann et al. 2014). In the follow-up examination two and a half years after admission, in which 80% of the inpatient and 86% of the day clinic patients participated, the BMI in the day patient group was significantly higher and the number of inpatient readmissions significantly lower (Herpertz-Dahlmann and Dempfle 2016). This suggests that day patient treatment is an effective and safe form of treatment, likely associated with lower costs and lower relapse rates than inpatient treatment.

39.2.3 Multi-Family Therapy

In addition to day patient treatment for the individual, in which the caregivers are involved in the form of parent or family sessions, there is also a day patient treatment that takes place over a year on various dates, in which several families with a daughter/son with AN are treated as a closed group after an initial appointment for a total of

15 days. The authors of a study on this therapy believe that parents gain more confidence in caring for their child, and patients realize the better understanding of their parents. Both contribute to the efficacy of this treatment, according to a German pilot study (Steinberg et al. 2019). In the study by Eisler et al. (2016), single-family therapy based on FBT was compared with multi-family therapy. In this case, the families are together for four consecutive days and then again for six days over a period of nine weeks. At discharge, 60% in single-family therapy had achieved an improvement in symptoms, compared to 75% in the multi-family group. After 18 months, the difference between the two groups was no longer significant; 78% of the multi-family group still showed good recovery. However, by this time, more than a quarter of the participants had already left the study (Eisler et al. 2016).

39.3 Home Treatment

39.3.1 Advantages of Home Treatment (HoT)

Although the above-described day patient treatment was associated with better recovery than inpatient treatment, almost a third of patients in day patient treatment had to be readmitted to inpatient care within a 2.5-year observation period (Herpertz-Dahlmann and Dempfle 2016). Even with the outpatient FBT recommended in many guidelines for children and adolescents, relapse rates are high. In a randomized study comparing FBT with individual therapy (adolescent-focused therapy, AFT), only 40% of patients had achieved a stable weight after four years (Le Grange et al. 2014). As mentioned above, the transition from inpatient or day patient treatment, with a structured nutrition and therapy regime, to everyday home life is experienced as very difficult. Patients and parents desire more support for the family itself, but also for peers and other caregivers (Mitrofan et al. 2019).

The so-called home treatment (HoT) is a treatment setting that has already been applied to other mental disorders and was recommended by the

WHO in 2005 as an advanced treatment method (WHO 2005, p. 87). Experiences so far are positive in all age groups regarding rehospitalization rates and treatment costs, but there are hardly any studies comparing HoT with other settings or including the perspective of the person being treated (Sjølie et al. 2010). For most patients, it is used for crisis intervention, but not for prevention. Moreover, there are hardly any studies that have investigated the feasibility of HoT for AN. In the works of Boege et al. (2015, 2020), patients with eating disorders were only sporadically part of the treatment clientele; an eating disorder-specific HoT setting was not described.

The British eating disorder researchers Schmidt and Treasure (2006) developed a multifactorial etiological model for AN, in which, in addition to disposition, cognitive and socio-emotional factors, interpersonal factors play a significant role. This includes that caregivers unintentionally support the development and maintenance of AN (e.g., by purchasing low-calorie foods to avoid conflicts, increased attention to the child when reducing food intake, supporting social withdrawal through greater parental affection, etc.). Furthermore, a not insignificant proportion of family members themselves have mental disorders, including eating disorders, which require special support. Especially in early stages of the disorder, HoT can modify disorder-enhancing behaviors in caregivers and provide security (Fig. 39.1).

More recent studies, especially imaging studies, show that habituation processes (habits) also play a major role in maintaining AN. Eating, exercise, and behavioral rituals, which are primarily established at home, become independent of a primary associated reinforcement (e.g., praise for supposedly more attractive appearance or healthy eating) and become self-perpetuating (Uniacke et al. 2018). After an individually varying period, the rituals become part of everyday life, and it takes great strength for patients to break these habits.

An early interruption of rituals by a trained team can break this “vicious circle.” Since it is suspected that chronic symptoms, including irreversible neuronal changes, occur as early as three

years after the onset of the disorder (Treasure et al. 2015), early intensive intervention, e.g., in the form of HoT, makes sense as secondary prevention.

39.3.2 Framework and Funding of HoT

Unfortunately, HoT has not yet been established everywhere as a service covered by statutory health insurance. The law on the “Further development of care and remuneration for psychiatric and psychosomatic services” enables hospital providers to offer treatment at home equivalent to inpatient treatment (StÄB) as an alternative to inpatient treatment (Boege et al. 2020). Unfortunately, apart from the studies by Boege et al., there are hardly any comparisons of the effects of inpatient treatment and home treatment. In particular, disorder-specific comparisons between different settings are lacking. At the University Hospital Aachen (UKA) and the LVR University Hospital Essen, special agreements were made with statutory and private health insurance companies for HoT. HoT proved to be *more cost-effective* for health insurance companies, which participated jointly and uniformly in funding. A comparison of the pure treatment costs between inpatient treatment standard and HoT at our department resulted in a saving of about one third per patient. The necessary prerequisites are shown in the overview.

Requirements for participation in HoT

- The presence of a typical or atypical AN based on ICD-11 or DSM-5
- Minimum age 12 years, maximum age 18 years
- First or second admission due to AN (uncertain whether HoT is suitable for chronically ill patients)
- Patient lives with at least one parent/caregiver
- Place of residence no more than 1 hour away from the clinic
- Consent of caregivers and patient

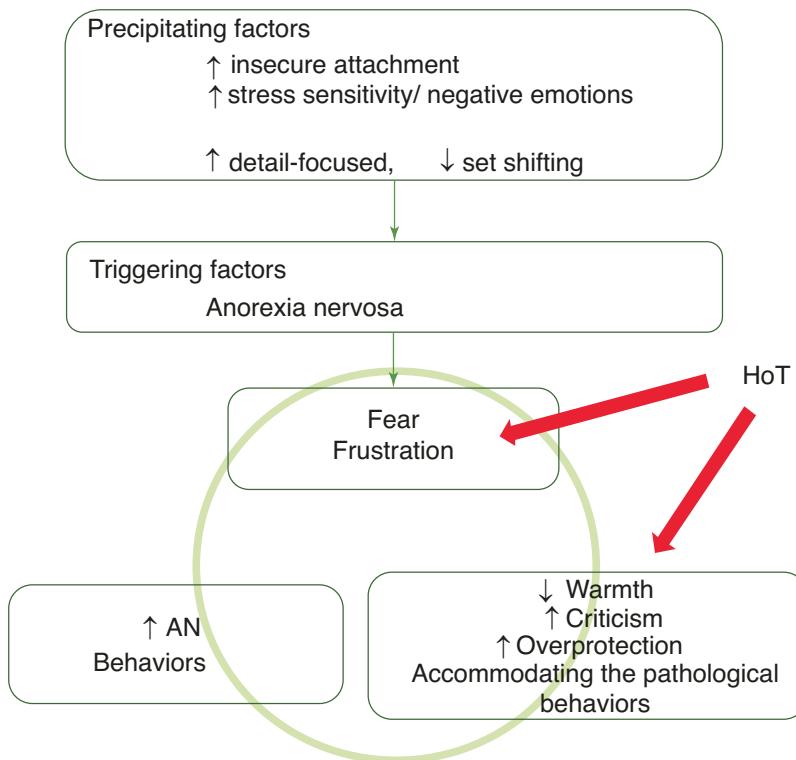


Fig. 39.1 Etiological model of anorexia nervosa according to Schmidt and Treasure (2006) and the effects of home treatment

Patients with severe comorbid disorders such as severe self-harming behavior or other primary mental illnesses such as psychoses, organic brain diseases or addiction disorders, severe somatic diseases, low intelligence or insufficient knowledge of the German language must be excluded from HoT.

The offer to participate in HoT is made at the time of inpatient admission; inpatient treatment is carried out over 4-8 weeks for physical stabilization and restoration of independent nutrition. At the end of the eighth treatment week, the latest hospital discharge and the start of HoT take place. Parents and patients are prepared for HoT from the beginning of inpatient treatment, i.e., family meals are quickly held, and somewhat later, weekend visits and overnight stays at home take place. Even nutrition through nasogastric tube feeding during the maximum eight-week inpatient period is not a contraindication for HoT. However, parents are required to participate

in the psychoeducational group for parents of eating disorder patients (Chap. 14). In addition, regular individual parent or family meetings take place. Before admission to HoT, patients must be somatically and psychologically stabilized to the extent that they can eat independently, show no pronounced vomiting or laxative abuse, and have satisfactory weight gain (but no defined minimum weight). Of course, lack of adherence and suicidality are also exclusion criteria.

39.3.3 Practical Implementation of HoT

Before the treatment at home begins, the target weight (generally around the 25th–30th BMI percentile or the weight at which menstruation ceased) is determined. During the HoT treatment, the patient is weighed at least once a week by the HoT team on calibrated scales.

The multidisciplinary team consists of an experienced nurse, a nutritionist, an occupational therapist, a physician, and the psychotherapist who has already treated the patient on the ward (psychologist or physician). In the first month, the patient/family is visited three to four times a week, in the second month three times, in the third month twice, and in the fourth (and final) month once. In addition, the patient must attend a group therapy session for adolescents with eating disorders once a week. Appointments are scheduled in advance for one week at a time. A member of the multidisciplinary team can be reached during working hours via a special mobile phone ("hotline"). In urgent cases, the on-call physician can be contacted after working hours.

The frequency with which each profession visits the family depends on individual needs. The parents must agree before the treatment that they will be present for at least at one session per week. Team visits led by a child and adolescent psychiatrist experienced in the therapy of eating disorders take place twice a week.

During the first two months, the focus of treatment is on educating and supporting the parents, as well as providing direct support to the patient; in the 3rd and 4th months, more emphasis is placed on rebuilding social relationships (e.g., participation in sports or other clubs, activities with friends) and promoting the patient's independence.

39.3.4 Initial Results of HoT

In a pilot study of 22 patients with a follow-up examination one year after admission, we were able to demonstrate that most patients reached their target weight, which remained stable at follow-up. Three patients had to be readmitted for a few days during the intervention due to family conflicts or insufficient weight gain. In one patient, the treatment was terminated prematurely and inpatient treatment had to be resumed. During the one-year observation period after

discharge, two patients (9.5%) were readmitted to the hospital (Herpertz-Dahlmann et al. 2021).

No serious "side effects" were observed. The weight after one year was still somewhat higher than in the study on day patient treatment (see above). Eating disorder symptoms and general psychopathology decreased significantly. We assessed the burden and involvement of caregivers using questionnaires, which decreased over time until the follow-up examination. This change was most evident between inpatient admission and the end of HoT. Quality of life and treatment satisfaction were also rated highly at the end of treatment and after one year. The total treatment costs of the initial inpatient treatment and later HoT were significantly lower than the (mostly inpatient) treatment of anorexia nervosa on a national average (Jaite et al. 2019).

The members of the multidisciplinary team were highly motivated in this new treatment approach; however, they had also actively sought to participate in this project. After an initial training period, they experienced the contacts with the patient and the family as more intense and satisfying than in the inpatient or day patient treatment setting (Herpertz-Dahlmann et al. 2021).

Conclusion

There is no clear evidence as to which treatment setting has the highest effect for adolescent AN (Hay et al. 2019). Both DC and HoT represent promising alternatives to inpatient treatment, and in previous research were associated with high treatment satisfaction among patients and caregivers. Possibly, these offers will make it easier for future adolescents with AN to seek treatment earlier and for a sufficient length of time. The costs are lower than for inpatient treatment. Of course, DC and HoT are not suitable for all patients with AN. In any case, larger randomized trials are needed to compare the effects and the course of recovery over a longer period of time in different settings.

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Family-Based Therapy

40

Silke Naab

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40.1 Introduction

Family therapy for eating disorders, particularly anorexia nervosa (AN), has been conducted for almost half a century. The interventions were embedded in various family therapy schools. Notable are Minuchin's structural approach (Minuchin et al. 1975), strategic family therapy (Madanes 1981), the systemic approach of the Milan School (Palazzoli 1974) and more recent narrative applications (Epston et al. 1995), family therapy for anorexia nervosa (FT-AN) (Eisler et al. 2016a), systemic family therapy (SFT) (Agras et al. 2014), multi-family group therapy (Eisler 2005, 2016b) and parent-focused family therapy (e.g., separate family therapy and parent-focused therapy [PFT]) (Eisler et al. 2000;

Le Grange et al. 1992, 2016), and the treatment form of home treatment (Herpertz-Dahlmann et al. 2014). The family therapy approach sees parents as a central influencing factor, which is why they should be involved in the treatment (Murray and Le Grange 2014).

Various international guidelines for the treatment of eating disorders, including the S3 guideline for “Diagnosis and Therapy of Eating Disorders,” recommend specialized family therapy for eating disorders as a first-line treatment for adolescent patients with AN and BN (Hilbert et al. 2017; Herpertz et al. 2011).

The best-studied family therapy is “family-based treatment” (FBT). FBT is a further development of the so-called Maudsley method, which was developed in the 1980s as an integration of a variety of family therapy methods at the Maudsley Hospital in London (Dare 1985). It was systematically elaborated and adapted by James Lock and colleagues and manualized as family-based treatment (FBT) in 2001 (2nd edition: 2013).

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40.2 Description of Family-Based Treatment

► **Important** Family-based treatment (FBT) for adolescent patients with eating disorders (Lock et al. 2001; Lock and Le Grange 2013) is a manualized outpatient procedure that initially aims at restoring weight under parental guidance at home (focus in Phase 1 of the 3-phase treatment).

FBT also aims to promote the healthy development of adolescents, without dysfunctional thoughts and behaviors disrupting and interrupting these healthy processes. In this sense, the entire course of treatment takes into account the ongoing effects of hunger, cognitions, emotions, and behaviors on adolescent development. These are integrated into the treatment as potential disorder-maintaining factors. Essential aspects also include considering adolescence in the context of family and community and the importance of learning in the home environment (Lock and Nicholls 2020). One of the goals of FBT is also to prevent the need for inpatient admission.

FBT has also been adapted and manualized for patients with bulimia nervosa (BN) (Le Grange and Lock 2007). In comparison to FBT for AN, the primary goal to be achieved by involving parents is not the restoration of weight, but the establishment of a stable eating structure.

The following presents the therapy concept (overview) and treatment phases of FBT (Table 40.1) for patients with AN.

Therapeutic concept of family-based therapy (FBT) for anorexia nervosa according to Lock and Le Grange (2013) Outpatient Setting

- 10-20 treatment sessions (1 hour each) in 6–12 months (on average about 9 months and 15 sessions [Lock et al. 2005])
- Parents as a central resource in therapy
- Three treatment phases:

- Phase I (sessions 1–10): Weight restoration
- Phase II (sessions 11–16): Returning responsibility for eating behavior to the adolescents
- Phase III (sessions 17–20): Building a healthy adolescent identity and ending therapy
- Therapy sessions take place weekly during Phase 1, twice a week during Phase 2, and monthly during Phase 3.

40.3 Efficacy of Family-Based Therapy

The efficacy of family-based therapy has been investigated in five randomized controlled trials. It is thus the best-studied therapeutic approach for adolescents with AN and currently has the highest level of evidence. The studies to date report remission rates between 21.2% and 49% (Agras et al. 2014; Le Grange et al. 2016; Lock et al. 2005, 2010; Madden et al. 2015; Stefini et al. 2017).

For adolescents with BN, only two randomized controlled trials are available, with remission rates of 29–49%. These suggest the efficacy of FBT for this patient group as well (Le Grange et al. 2007, 2015).

An assessment of the remission rates of FBT in patients with AN compared to the guideline procedures cognitive behavioral therapy (CBT) and psychodynamic therapy (PT) is currently not possible, as there is no worldwide evaluation of the efficacy of outpatient CBT or PT in adolescents with anorexia nervosa within the framework of a randomized controlled study (RCT).

► **Important** Overall, it can be assumed that FBT is at least as effective as other therapeutic approaches. However, no statement can be made as to whether FBT is superior to guideline procedures and also in the long term, as there are currently no or too few studies available.

Table 40.1 Treatment phases, goals, and interventions of family-based therapy for anorexia nervosa (Lock and Le Grange 2013)

Treatment phases	Main goals	Interventions
Phase 1, Session 1 Restoration of weight	<ul style="list-style-type: none"> Involvement of the family in therapy History-taking: Influence of AN on the family Information about the family (coalitions, authority structure, conflicts) 	<ol style="list-style-type: none"> Weighing the patient Greeting the family History-taking of each family member Separation of the disorder from the patient Emphasizing the severity of the disorder and the difficulties in recovery Assigning parents the task of increasing weight Preparation of the family meal for the next session and ending the session
Phase 1, Session 2	<ul style="list-style-type: none"> Analyze family structure and possible impact on the ability of parents to help their child gain weight and eat healthily Parents should be given the opportunity to experience that they can successfully help their child eat normally and gain weight Observe strengths and weaknesses of the family, especially during meals 	<ol style="list-style-type: none"> Weighing the patient History-taking, observation of family patterns during preparation and serving of food, discussions about food, especially regarding the patient Support parents in convincing their child to eat more than they are willing to, or find out how they can best contribute to normalizing eating behavior and promoting weight gain Engage siblings for support outside of meal times Ending the session
Phase 1, Sessions 3–10	<ul style="list-style-type: none"> Focus family on the eating disorder Support parents in managing their daughter's eating habits Mobilize siblings to support the patient 	<ol style="list-style-type: none"> Weighing the patient at the beginning of each session Focusing the therapeutic conversation on the design of nutrition and eating behavior as well as reducing concerns Discussion and support of parental efforts to promote weight rehabilitation Discussion and support of the family in evaluating the efforts of siblings to help their affected sister Modifying criticism from parents and siblings Distinguishing between the adolescent patient, her interests, and AN
Phase 2 Returning responsibility for eating behavior to the adolescent	<ul style="list-style-type: none"> Maintaining parental management of eating disorder symptoms until the patient can demonstrate that she is able to eat well and gain weight independently Returning control of food and weight to the adolescent Analyzing the relationship between the patient's developmental issues and anorexia nervosa 	<ol style="list-style-type: none"> Weighing the patient Supporting parents in coping with eating disorder symptoms until the adolescent is able to eat well independently Supporting parents and patient in negotiating the return of control over eating disorder symptoms to the patient Encouraging the family to discuss the connection between problems and the development of AN Continuing to modify parental and sibling criticism of the patient, returning control over eating to the patient Supporting siblings in assisting their ill sister Distinguishing between the adolescent patient and her interests and the interests of AN Reflecting on progress with the family

(continued)

Treatment phases	Main goals	Interventions
Phase 3 Adolescent issues and termination of therapy	<ul style="list-style-type: none"> • Establishing that the relationship between the adolescent and her parents no longer requires the symptoms as a form of communication • Reviewing the adolescent's issues with the family and developing problem-solving strategies • Termination of therapy 	<ol style="list-style-type: none"> 1. Reviewing the adolescent's issues with her family and developing problem-solving strategies 2. Involving the family in the “review” of the issues 3. Reviewing how much the parents do as a couple 4. Exploring adolescent issues 5. Preparing for future problems 6. Summarizing the session 7. Ending the treatment

According to expert opinion, it can be assumed that various approaches are effective and that there is no evidence yet as to whether one approach is superior to another (Herpertz-Dahlmann 2017; Zeeck et al. 2018).

40.3.1 FBT in the German Guidelines for Diagnosis and Treatment of Eating Disorders

The evidence for family-based therapies in general is rated in the German guidelines for the diagnosis and treatment of eating disorders with evidence level Ib (for children and adolescents) for AN and evidence level IIb for BN (AWMF 2019).

40.3.2 Who benefits most from FBT?

Various studies on the application of family-based therapy examined moderators that have an influence on therapy outcomes. In Table 40.2, positive moderators for the enrollment of FBT in patients with AN and BN are listed.

Despite the evidence for the effectiveness of FBT in adolescents with eating disorders, there are currently no data on the application of this therapy approach in adolescents with eating disorders in Germany (Schlegl et al. 2020). However, it can be assumed that this method is rarely used in Germany, as there is a lack of certified FBT therapists. This may be due to the fact that family therapies are generally not or only rarely covered by health insurance companies. Another reason could be the lack of availability of training and supervision opportunities regarding this therapy approach.

40.4 Current Developments

An adaptation of FBT for patients with AN aged 16–25 years (FBT-TAY) was carried out by Le Grange's working group in a pilot study (Dimitropoulos et al. 2018). Feasibility and

Table 40.2 Positive moderators of FBT in patients with AN and BN (according to Schlegl et al. 2020)

Anorexia nervosa	Bulimia nervosa
Higher eating disorder-related compulsion (Le Grange et al. 2016; Le Grange et al. 2012)	Younger age (Ciao et al. 2015)
Shorter duration of illness (Le Grange et al. 2016)	More pronounced purging behavior (Ciao et al. 2015)
Higher severity of eating disorder symptoms (Le Grange et al. 2012)	Lower severity of eating disorder symptoms (Le Grange et al. 2008)
Bulimic subtype (Le Grange et al. 2012)	Lower scores on the Conflict subscale of the Family Environment Scale (Le Grange et al. 2015)
Less general compulsive symptomatology (Agras et al. 2014)	
Mothers with no or low depressive symptoms (Forsberg et al. 2017)	

acceptance among patients and therapists were demonstrated, as well as an improvement in symptoms and weight through the application of FBT in young adults with AN.

So far, there are only a few studies on the application of FBT in an inpatient setting. According to Spettigue and colleagues (2019), a specialized inpatient therapy program for adolescents with AN using an adapted form of FBT also leads to a positive short-term improvement in the medical and psychological condition of the patients (weight gain and reduction of anxiety, depression, eating disorder symptoms).

In view of the ongoing COVID-19 pandemic with correspondingly difficult access to standard psychotherapy, the working group of James Lock (Matheson et al. 2020) points to the necessity of using video-based therapy methods for the treatment of patients with eating disorders. So far, these therapy forms have not been sufficiently researched in adolescents with eating disorders, and there is only one case series on video-based FBT (Anderson et al. 2017), but no RCTs in children and adolescents. It is therefore largely unknown whether the results of psychotherapy for eating disorders in children and adolescents are comparable to the results of standard face-to-face treatment.

40.5 Limitations of the Application of Family-Based Therapy

Treatment with FBT involves a number of challenges. There are no direct comparisons of FBT with other psychotherapeutic treatment forms for patients with eating disorders in combination with nutritional management and the goal of weight rehabilitation.

Current research findings indicate that FBT works well for about two thirds of parents and adolescents who accept the treatment, with less than 40% of patients achieving full remission.

FBT cannot be used for adolescents whose parents are not available or do not accept a family-based treatment model.

For patients and parents who participate in the treatment, there may still be difficulties in implementing the treatment, as FBT is intended to actively involve all family members. Parents may need to take time off work, siblings need to adapt to the therapy plan, and the family must travel to the respective therapy center.

In cases where FBT cannot be well applied in adolescents, is contraindicated, or is not accepted, cognitive behavioral therapy for eating disorders (CBT-E) is recommended (NICE

guidelines 2017). Results of a study by Dalle Grave and colleagues (2019) show comparable treatment outcomes with CBT-E as with FBT.

40.6 Conclusion for Practice

Family-based therapy (FBT) is a manualized form of family therapy and is currently the best-studied treatment approach for adolescent patients with AN. The effectiveness of FBT has been evaluated by several RCTs, and FBT currently has the highest level of evidence. For patients with BN, there are initial indications that FBT may be superior to individual therapy in terms of effectiveness. FBT is particularly suitable for patients under 18 years of age with a disorder duration of up to three years with low or moderate weight loss, who live with their family and share meals together.

The application of FBT takes place in specialized treatment facilities, and access to this outpatient therapy form is still limited.

In addition to FBT, CBT-E is also well-researched and has proven effective in the treatment of adolescent patients with eating disorders. So far, there is no evidence that a specific family therapy approach in the treatment of patients with eating disorders is superior to others.

Due to the nature of FBT – with strong involvement and responsibility of parents at the beginning of therapy – this treatment form is well-suited to the needs of younger adolescent patients (Loeb et al. 2012). In contrast, CBT-E may have a better effect on older adolescent patients, as it addresses disorder-maintaining factors that are particularly effective in this age period (Fairburn et al. 2003).

When applying various family therapy approaches, the following factors should be considered: the acceptance of treatment by patients and parents, the needs of adolescents according to their age and maturity, the feasibility from the family's perspective, and the short- and long-term effectiveness. Both clinical experience and scientific research will lead to further development of family therapy treatment for patients with eating disorders.

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Psychodynamic Therapy

41

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41.1 Foundations

Psychodynamic diagnostics and therapy are based on a psychodynamic personality theory, including personality development and a related

theory of illness. As outlined in Chap. 11, the psychodynamic theoretical approach thus goes beyond the purely phenomenological description of mental disorders on which current classification systems of mental illnesses are based.

The perspective of personality, and an essential consideration of this perspective in the definition of treatment goals and intervention techniques, are of central importance in psychodynamic therapy. Especially in the therapy of eating disorders, this view is consequential and not at all self-evident: For example, how should the “severity” of an eating disorder and then, subsequently, the treatment success be determined: Is a patient with BN who vomits more frequently “sicker” than a patient with a lower frequency of vomiting?

From a psychodynamic perspective, in addition to symptomatic improvement, the aim is always to work on personality-inherent intrapsychic conflicts, including conflictual relationship issues resulting from them. Symptom behavior can vary considerably in the short term and is not suitable for sole assessment. Conversely, there is a justifiable critical objection that

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emphasizing the importance of working on personality must not lead to ignoring the eating symptoms - as could happen in the past - since it makes the primary contact with the patient more difficult and is associated with less successful therapy outcomes.

The elaboration of the subjective, biographical "meaning" of symptoms is thus a central concern of psychodynamic therapy. The indicative character of the symptom, the (mostly unconscious) psychological, biographical, and social contexts that make the symptom intrapsychically the "better alternative" in all of its contradictory, absurd and self-harming aspects compared to the unpleasant feelings that would occur without the symptom behavior, point the way to therapeutic treatment options.

Psychodynamic therapy is therefore about working out an individually valid "hermeneutics" of the symptomatology, and this becomes possible in the relational space between patient and therapist. Here, old, hurtful relationship traces can be deciphered, and new, corrective emotional experiences can be made. The lively therapeutic relationship becomes the *conditio sine qua non*, the developmental space for the therapeutic process.

► **Important** Psychodynamic therapy always aims for both symptomatic improvement and the processing of personality-inherent intrapsychic conflicts.

Even though certain developmental issues, such as autonomy development, occupy a large space in psychodynamic therapies for patients with eating disorders, there is no convincing evidence of the specificity of personality constellations that necessarily lead to the development of eating disorders. In this respect, eating disorders do not differ from other psychosomatic disorders (Herzog et al. 1997).

It should also be emphasized that the needs of psychosomatic patients rarely align with the possibilities and limitations of therapy schools (Friederich et al. 2007). If the importance of the personality perspective has been highlighted for psychodynamic treatment, this does not exclude

the consideration of other relevant perspectives: Somatic starvation consequences, maladaptive family patterns, or symptom loops that arise from eating disorder-specific symptoms or self-harming behavior and maintain themselves (addictively) are examples of such perspectives that may and must sometimes be in the foreground and require a disorder-specific supplement to general psychodynamic techniques (Dare et al. 2001).

41.2 Focal Psychodynamic Psychotherapy

For pragmatic reasons, evaluations of psychodynamic psychotherapies for eating disorders have predominantly taken place in focal therapy concepts. The Operationalized Psychodynamic Diagnosis (OPD) in its manualized form OPD-2 (Working Group OPD 2006) serves as a basis for focus formation with its axes

- Experience of illness and treatment prerequisites,
- Relationship,
- Conflict,
- Structure.

To form a focus, a detailed diagnostic OPD interview is required. Foci are those features of the OPD findings that contribute to causing and maintaining the disorder and therefore play a determining role in the psychodynamics of the clinical picture. This is associated with the assumption that something must change with regard to these foci if substantial therapeutic progress is to be achieved.

Particular attention should be paid to foci of the relationship and structure axes. The goal is to identify unfavorable relationship patterns and impairments of the structural level and to take them into account in therapy planning (Friederich et al. 2014, 2019). Rudolf (2006) elaborated on the need to consider a typology of structural disorders in psychodynamic therapy planning. This approach is valid for all eating disorders. The structural level is classified into six stages.

Typology of Structural Disorders

- Stage 1: well integrated, neurotic conflict
- Stage 2: well to moderately integrated, neurotic conflict with structural failures, e.g., somatoform disorders
- Stage 3: moderately integrated, coping with structural disorder through character defense, e.g., narcissistic personality disorder
- Stage 4: moderately to poorly integrated, coping with structural disorder through symptomatic behavior, e.g., gambling addiction
- Stage 5: poorly integrated, e.g., borderline personality disorder
- Stage 6: disintegrated, e.g., dissocial personality disorder

For the disorders and subsequently for therapy planning, this means that structural disorders become increasingly important as the stages progress, and classical neurotic conflicts become less important. For example, patients with restrictive-type AN would often be classified at stage 3, patients with BN and personality disorder at stages 4-5. Therapy planning takes into account the structural disorder component.

41.3 Disorder-Specific Modifications of Psychodynamic Therapy

41.3.1 Anorexia Nervosa

The empirical evidence for the effectiveness of psychotherapy for AN has grown significantly in recent years. Several high-quality outpatient studies are available (Brockmeyer et al. 2018; Zeeck et al. 2019).

Initial evidence for the effectiveness of psychodynamic therapy approaches can be found in older randomized controlled trials with initially small case numbers (Zeeck et al. 2019). In the

largest outpatient psychotherapy study for AN to date (ANTOP), psychodynamic psychotherapy did not differ from cognitive behavioral therapy and the control group in the primary outcome (BMI). However, in the secondary outcome (remission rate), psychodynamic psychotherapy was superior to the other two groups (Zipfel et al. 2014).

In the ANTOP study, a therapy manual for outpatient focal psychodynamic psychotherapy was used, which was designed for the outpatient treatment of adult AN patients with a BMI of 15 kg/m² or higher (Friederich et al. 2014).

In the treatment of AN, the need for a clearly defined framework for outpatient therapies has been repeatedly emphasized: Medical monitoring and setting aspects such as session frequency, weight control, weight limits, and orienting family discussions require explicit agreement (Friederich et al. 2014).

Schors and Huber (2003) formulated pointedly, and from a psychodynamic perspective unusually symptom-oriented, that: “The normalization of eating behavior is not everything, but without it, everything is nothing.”

The generally moderately integrated structural level also requires disorder-specific additions to standard psychodynamic therapy (Leichsenring et al. 2004; Herzog et al. 2003). If the control of eating behavior and the ability to starve are the “solution” to intrapsychic problems caused by early childhood experiences of helplessness reactivated in puberty, then the denial characteristic of the disorder in patients is only logical. A pronounced passive-abstinent intervention style quickly leads to therapy discontinuation: The patient must first be won over for therapy. It is advisable, at least in the initial phase of therapy, to “court” the patient by repeatedly and concretely naming the current relational-dynamic consequences of the anorectic behavior related to food intake, thus making the “mafia-like” closedness of the “system of anorexia” palpable. The “anorectic lifestyle” leads to the avoidance of age-appropriate activities and isolation. Schneider (2003) took up Boris’s concept of the “desirelessness” of

patients with AN (Boris 1984) and derived from it the necessity of a **two-phase therapy**. In this approach, the classic conflict-oriented procedure becomes possible only after an initial approach phase in which the patient establishes a relationship with the therapist.

While earlier etiological psychodynamic concepts were predominantly drive-theoretical positions, today object-theoretical hypotheses are in the foreground: Against the background of early experiences of perceived lack of reliability of important attachment figures and the resulting helplessness, a central focus is often seen in the **struggle for autonomy**. Age-specific developmental steps in detaching from the family of origin trigger high levels of insecurity. To avoid new overwhelming experiences, the control of hunger and weight successfully practiced in AN can become a “safe” mechanism of self-assertion.

Through the anorectic and socially **distant relationship formation**, patients with AN avoid coming into contact with emotions and affect (Ward et al. 2000). Furthermore, the perception of feelings and affect is limited by the underweight (“anorexia as an anesthetic”). Against this background, working on affective-emotional experiences in the middle therapy phase is of central importance. Initial studies confirm that working on affective-emotional experiences is associated with better therapy outcomes (Friederich et al. 2019).

41.3.2 Bulimia Nervosa

Outpatient psychodynamic treatments have proven to be effective in the therapy of BN (Zeeck et al. 2019). Also in BN, there are indications that a focus on eating disorder symptoms and a more active therapeutic stance are associated with a more favorable treatment outcome. The constant refocusing on the symptoms is necessary throughout the entire therapy and is inevitable in a time-limited therapy.

Patients with BN typically suffer from an **identity conflict**, characterized by a conflictual

tension between an ideal self, which strives for activity, slimness, an attractive external appearance, and self-control, and a flawed self, characterized by greed, binge eating, and vomiting. The central affect of BN—**shame**—arises when the patient does not achieve the ideal state they are striving for. Affected individuals typically report self-related feelings of shame such as self-hatred and self-disgust. The confrontation with the incompatible self-parts and the associated experience of shame are shifted onto the body or individual body parts. Through the **displacement onto the body**, the conflict and shame become more controllable and limited. The binge-purge symptoms represent a dysfunctional regulation to ward off these inner tensions (Reich et al. 2014).

The treatment focus lies on clarifying the covert or insufficiently conscious emotions that trigger the binge eating, which are related to dysfunctional relationship, transference, conflict, and defense patterns as well as structural problems. Due to the addictive nature of the symptomatology and the initial denial of the illness, the first phase of therapy aims to win the patient over for treatment. The further treatment focus lies on relationship dynamic aspects of the symptomatology and the associated life-determining conflicts and structural impairments.

The group of patients with BN is very heterogeneous in terms of their psychodiagnostic classification (e.g., structural level): The spectrum ranges from mild, transient disorders with low psychopathology, to overregulated impulse control with occasional impulse breakthroughs, to the most severe personality disorders with significantly impaired impulse control, in which the bulimic symptomatology is only one symptom among many others (e.g., substance abuse, self-harm, post-traumatic stress disorder).

Even though the full picture of a borderline personality (low integrated structural level according to OPD - level 5) is present in less than 20% of patients, the structural level in patients with BN is often to be assessed as moderate to low. Rudolf (2006) spoke in this context of coping with structural disorders through

symptomatic behavior. In treatment, the focus is on a therapeutic stance that promotes the development of structural abilities (e.g., interactive abilities, impulse control, etc.).

If the eating symptomatology has become self-perpetuating in an addictive manner, “contracts” can help regain control over eating behavior. Multimodal therapy approaches - outpatient, e.g., as a psychodynamic group with upstream individual symptom control or as part of inpatient psychotherapy - represent further alternatives here.

41.4 Binge Eating Disorder

For the psychodynamic psychotherapy of binge eating disorder, currently only clinical studies for a psychodynamic-interpersonal oriented treatment in group format are available (Zeeck et al. 2019). The treatment program by Tasca (Tasca et al. 2006) proved to be effective compared to an untreated waitlist group. The treatment approach assumes that primarily negative feelings, which arise in the context of conflictual relationship constellations, trigger the recurring binge-eating episodes. In the context of group therapy sessions, the maladaptive relationship patterns are reactivated and processed. Further psychodynamic psychotherapy studies are urgently needed to improve the evidence base.

The indication for psychodynamic therapy is given if self-help measures or symptom-oriented short-term therapies are not effective.

Psychotherapeutic measures generally have only a limited effect on weight reduction. This is particularly true in the long term (Herpertz et al. 2019).

A combined therapy based on the “pillars” of **nutrition**, **exercise** and **psychotherapy** is recommended. Here, a group therapy with psychodynamic elements can be used as the psychotherapeutic pillar (Friederich et al. 2007).

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Cognitive Behavioral Therapy

42

Tanja Legenbauer

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In the last decade, research findings on the treatment of eating disorders have increased significantly. The clinical effectiveness of various psychotherapeutic methods has been examined in several meta-analyses. The results show that cognitive behavioral therapy (CBT) continues to be the treatment of choice for eating disorders in adulthood; in addition to its successful use in treating bulimia nervosa (BN) and binge eating disorder (BED), studies also show success in treating anorexia nervosa (AN). Furthermore, there is increasing evidence that CBT can also be successfully used to treat adolescents with eating disorders. These empirical findings form the basis of the guideline recommendations for the treatment of eating disorders.

Guidelines are now available from almost all European countries, as well as the USA, Australia, Canada, and New Zealand. Since the so-called NICE guidelines (NICE: National Institute for Clinical Excellence 2020) were developed by British experts in 2004, the American guidelines (American Psychiatric Association 2006) followed in 2006, and the German S3 guidelines for the diagnosis and treatment of eating disorders in 2010 (Herpertz et al. 2011). In 2017, a total of 33 guidelines were identified in a review (Hilbert and colleagues 2017). The guidelines are continuously updated. Currently, there is a revised version of the NICE guidelines from 2017. The German AWMF-S3 guideline was updated in 2018 and its English translation was published. Canadian guidelines for the treatment of children and adolescents with eating disorders have also been available since 2020. The German S3 guideline is also available in a patient version.

Although it is very encouraging that treatment guidelines are being developed to standardize and improve treatment quality, it is

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critical to note that not all guidelines are evidence-based. In addition, there are significant differences in clinical consensus recommendations across all guidelines. Cross-country coordination and standardization could help further improve quality standards.

► **Important** Cognitive behavioral therapy remains the method of choice in the treatment of eating disorders, particularly bulimia nervosa and binge eating disorder. It also appears to be effective in treating anorexia nervosa and eating disorders in children and adolescents.

42.1 General Approach and Standard Elements in the Treatment of Eating Disorders

Regardless of the type of eating disorder and the specific approach, the following general **therapy guidelines apply**:

- Individuals with eating disorders should receive therapy as early as possible from facilities and professionals specializing in eating disorders. The treatment should include disorder-specific elements.
- Healthcare professionals should recognize that those affected by eating disorders are often ambivalent about therapy (shoulder-to-shoulder, not head-to-head) and that the recovery process usually takes many months, if not years.
- Psychoeducational measures should be offered.

Cognitive-behavioral therapy in the treatment of eating disorders includes analyses of individual behavior and conditions. Based on these, particularly problematic areas are identified and a concrete therapy plan is created. Therapeutic work is done in small steps and through behavioral experiments, which help to transfer the developed solutions into everyday life. In general, the most important principle in the treatment of eating disorders is the focus on two goals, namely

- the short-term improvement of eating behavior or the achievement of weight restoration, and
- the long-term treatment of problem areas associated with the disturbed eating behavior, for example through cognitive techniques or skills training, to increase social competence and emotion regulation.

This equally addresses both physiological and psychological problems associated with the eating disorder. The basis of most cognitive-behavioral treatment programs is the transdiagnostic view of eating disorders, first introduced by Fairburn et al. 2003 and since then used as a fundamental model for modifying existing treatments. The transdiagnostic model assumes that all forms of eating disorders have a common core pathology in the form of an excessive preoccupation with food, shape, and weight. This is where cognitive-behavioral interventions come in, focusing on symptoms depending on the disorder, such as underweight, binge eating and/or vomiting. The individual treatment components are derived from this disorder model.

The treatment of eating disorders can take place in both individual and group settings, with empirical data showing no clear superiority of one of these methods. Patients with eating disorders do not necessarily have to be treated as inpatients. Recent studies suggest that at least in adolescence, day care treatment for AN is not inferior to inpatient treatment in terms of weight gain (Herpertz-Dahlmann et al. 2014). For BN, there are no significant differences between the settings, regardless of age (Zeeck et al. 2009).

Inpatient treatment is mainly recommended if any of the following is present:

- severe physical impairment (e.g., in AN BMI < 15 kg/m² or in children and adolescents with AN a weight below the 3rd BMI age percentile) or very chaotic eating behavior in BN
- very rapid or persistent weight loss (e.g., >20% over 6 months)
- lack of success in outpatient treatment

Moreover, the presence of pronounced somatic and psychiatric comorbidity as well as the lack of social support or intact social networks should be taken into account when considering inpatient treatment.

In addition to information on diagnostics and choice of settings, the guidelines of various countries usually contain treatment goals for individual eating disorder diagnostic groups. Specifically, in reference to the core symptoms of eating disorders, the American Psychiatric Association Eating Disorder Workgroup (2006) lists eight goals for the treatment of AN.

Goals for the treatment of AN (APA 2006)

1. Weight restoration
2. Treatment of physical sequelae
3. Enhancement of treatment motivation
4. Psychoeducation regarding nutrition and eating behavior
5. Modification of dysfunctional thoughts, feelings, and attitudes related to the eating disorder
6. Treatment of associated comorbid psychiatric problems such as depressive moods, impulse control disorders, low self-esteem, etc.
7. Support for the family or, if necessary, family therapy
8. Relapse prevention

In addition to the points mentioned above, the German guideline emphasises that social integration is of great importance in the treatment of AN, as often, missed developmental steps have to be made up for. Also not explicitly mentioned is the treatment of body image. A negative body image contributes to the development and maintenance of eating disorders and is considered a negative predictor if it persists despite treatment. In recent years, the treatment of body image disturbance has become a central component of AN treatment.

In contrast to the treatment goals mentioned above for AN, the treatment of BN includes, as the first goal, the reduction of binge eating and compensatory behaviors. According to the German guideline, addressing the importance of body weight for self-evaluation and thus the treatment of body image disturbances in BN is also an important treatment goal. The remaining goals are identical to the treatment of AN, although there are differences in content, e.g. in the teaching of information on eating behavior and in relapse prevention. Explicitly, the German guideline also mentions the treatment of self-esteem problems, perfectionism, impulsivity, and problems in emotion regulation as essential in the treatment of BN. In the case of BED, the treatment goals largely correspond to the aims outlined above. It should be noted that in BED with comorbid obesity, unlike in AN and BN, the goal of weight reduction can also be supported, and the interventions on eating behavior must be adjusted accordingly. In the following, the components of cognitive-behavioral therapy for AN, BN, and BED to achieve the therapy goals are described in more detail.

42.2 Normalization of Eating Behavior

Both for weight gain and for the reduction of binge eating and vomiting, a normalization of eating behavior is essential and therefore important for both AN and binge eating-related eating disorders such as BN and BED. The normalization of eating behavior is intended to amend the physiological and psychological consequences of severe underweight and the strongly restrained eating behavior between binge episodes, primarily occurring in patients with BN, and to establish a biological-physiological balance. By using therapeutic strategies to normalize eating behavior, a balanced and regular nutrition in everyday life should be established. This includes not only an adequate calorie intake but also an adequate nutrient composition

of the selected foods and a sensible temporal distribution of meals throughout the day. With regard to BED, it should be noted that the establishment of a healthy, balanced, and pleasure-oriented eating behavior should prevent the occurrence of binge eating and maintain the current weight.

The **normalization of eating behavior** is achieved through various therapeutic means:

- Self-observation, for example using food diaries,
- Psychoeducation on topics such as physiological and psychological consequences of malnutrition/diets,
- Introduction of structured eating days to practice normal eating behaviour.

Overall, the various interventions aim to reduce cognitive control over food intake and establish a natural sense of hunger and satiety. In addition to the mentioned therapy techniques, food or stress exposures with response prevention are also carried out. In the case of BED, stimulus exposure with response prevention is also used, among other things, to practice the ability to discriminate between hunger and satiety. Additionally, pleasure- and mindfulness-oriented exercises can be carried out to increase the patients' enjoyment.

42.2.1 Cognitive Treatment Elements

Automatic Thoughts A core element of CBT for eating disorders is the identification and modification of automatic thoughts regarding food, weight, and shape.

Core Beliefs There is evidence from research that, in addition to automatic thoughts, enduring and action-guiding core beliefs are important, although these do not necessarily have to be associated with eating disorder-specific areas. On the contrary, these seem to encompass rather general principles and rules that develop from learning experiences throughout life.

Biased Information Processing A third aspect of cognitive work concerns biased information processing, such as schema-consistent processing of threatening stimuli or selective attention control.

All three areas of cognitive disturbances should be addressed and worked on in treatment. Cognitive bias modification methods can be used to change automated selective or dysfunctional attention control. However, it should be noted that the evidence for these methods in eating disorders is still limited.

► **Important** The various cognitive aspects in patients with eating disorders are addressed using Socratic dialogue, pro-and-con exercises, cost-benefit analyses, and other general cognitive techniques.

42.2.2 Specific Aspects in the Treatment of Anorexia Nervosa

42.2.2.1 Weight Restoration

Due to the often medically alarming underweight, weight restoration is the most important short-term goal in the treatment of AN, whereas this is not mandatory in the treatment of BN, as the body weight of patients with BN is usually within the normal range. In cases of severe underweight or serious medical complications, weight restoration should be done in an **inpatient** setting. Rarely, invasive methods such as tube feeding are used in cases where there is a particular risk.

Depending on the setting, the weekly weight gain to be achieved varies: While weight gains of 500 g to 1000 g/week can be achieved in an inpatient treatment, according to the German guideline, only a weight gain of 200–500 g/week should be aimed for in outpatient treatment. However, this seems difficult in reality. As shown in a recent meta-analysis, the average weight gains achieved in outpatient settings are 105 g/week for adults and 192 g/week for adolescents (Zeeck et al. 2018).

To gain 100 g/day in weight, approximately 800–1200 kcal must be consumed in addition to the energy expenditure. In practice, a calorie intake of 1000–1600 kcal/day is often started and the daily calorie intake is increased in several intervals, for example by 250 kcal/day, during the course of treatment, depending on the achieved weight gain. The administration of high-calorie liquid nutrition in addition to regular meals seems to lead to faster weight gain in the inpatient setting, particularly in severely underweight patients. Overall, the current data show that treatments with initially higher energy intake lead to overall better treatment courses and do not—as previously assumed—result in complications, such as refeeding syndrome, more frequently than by chance.

► **Important** Adjusting calorie intake to performance output and activity level of the patients is essential to ensure the desired weight gain.

Cognitive-behavioral programs use specific **reinforcement programs** to achieve weight restoration. In the inpatient setting, various individually agreed reinforcements for weight gain and normalization of eating behavior are systematically used in addition to nursing support and high-calorie food. The operant programs usually include an initial phase of self-responsibility, in which the patient should achieve weight gain independently after admission. If this is not successful, external control programs are introduced. These often include specific rules on eating behavior, participation in therapy offerings and leisure activities, and receiving visitors, in addition to signing a weight gain contract and agreeing on a target weight to be achieved. For adults, the target weight should correspond to a BMI of at least 18.5 kg/m^2 , while for children and adolescents, a target weight around the 25th BMI age percentile is recommended.

More modern programs keep the degree of external control as low as possible to meet the autonomy needs of the patients and reduce the risk of possible relapse after the program ends.

Clear agreements on the approach in treatment are useful to ensure treatment adherence.

► **Important** The autonomy needs of the patients must be taken into account in order to achieve lasting treatment success.

Implementing such operant programs is often easier in the inpatient setting, as there are fewer direct opportunities for the therapist to influence treatment in an outpatient setting. Nevertheless, weight gain contracts or the administration of high-calorie supplementary nutrition can also be useful in the outpatient setting. Enhanced cognitive-behavioral therapy (E-CBT) for AN in the outpatient setting, on the other hand, focuses on intrinsic motivation for weight gain. It aims to motivate patients to gain weight solely through education and cautious discussion of weight without a contract. If sufficient weight gain is not achieved within 4–5 months (approx. 20 sessions), a therapy contract may also be considered in E-CBT. Regardless of whether a contract is concluded, the purpose of the interventions should be transparent to the patient in order to ensure compliance.

► **Important** Weight loss or stagnation is usually an indication of a lack of motivation or ambivalence and should always be addressed with the patient, regardless of the setting.

42.2.2 Motivation

Above all, the mostly ambivalent therapy motivation poses a major challenge in the treatment of AN. Many patients do not enter therapy on their own initiative, but are urged to do so by family members. Even in patients who come to treatment out of their own motivation, the low weight is rarely the primary treatment concern, but rather the emotional and physical problems caused by the eating disorder, such as reduced performance or the narrowing of thinking to food, figure, and weight. Newer programs therefore usually include a module

to increase motivation at the beginning of treatment, although it should be noted that motivation also plays an important role in the further course of treatment. The motivational strategies should include, in addition to psychoeducational elements, for instance on the consequences of the eating disorder, the confrontation with the short- and long-term positive and negative consequences of the eating disorder (Legenbauer and Vocks 2014).

► **Important** Due to the ambivalence towards the primary therapy goal—weight gain—motivational strategies seem to be of particular importance in the treatment of AN.

42.2.3 SpecificAspects in the Treatment of Binge Eating-Related Eating Disorders

42.2.3.1 Emotion Regulation and Impulsivity

Many studies show an association between negative affect and the occurrence of binge eating. Furthermore, patients with binge eating-related disorders (BN, BED, binge-eating/purging type of AN) seem to have a rather increased reward sensitivity and often show decreased inhibitory control at the same time. In combination, these processes support the establishment of an automated unfavorable eating behavior (Legenbauer and Preuss 2019). Accordingly, factors such as stress and negative events play a significant role in the development and maintenance of binge eating. Developing the ability to regulate emotions and postpone or suppress urgent impulses, such as the urge to eat, is thus a central therapeutic goal in the treatment of binge eating-related eating disorders.

There are nowadays various manuals that focus on building emotion regulation skills in eating disorders. Therapeutic elements include sensitization to emotional states, such as perceiving, recognizing, classifying, and differentiating feelings, as well as coping with or

modifying them. In addition to direct interventions to improve emotion regulation, improving stress management, increasing stress tolerance, and building interpersonal skills are also pursued. Mindfulness-based techniques are often taught in this context (Sipos and Schweiger 2016).

To improve impulse control, computer-based training interventions have been developed, through which patients with binge eating can practice improving food-related inhibitory control. Initial results seem promising, but transferring them to everyday care has hardly been achieved so far. It makes sense to address the different components simultaneously, i.e., treatment should strengthen emotion regulation while improving inhibitory control and teaching techniques for delayed gratification (e.g., Preuss et al. 2018).

Food exposure is a possible therapeutic tool to integrate the various components and strengthen patients' self-efficacy regarding eating. The rationale of food exposure is based on extinguishing conditioned stimulus-response associations. The craving-triggering food is examined, touched, etc., under the guidance of the therapist. Ratings are given for the extent of the craving, and the exposure is only terminated when habituation has been achieved and the craving has significantly decreased (e.g., by 50% of the initial value). Newer methods of food exposure involve the violation of expectations in the exposure (e.g., Schyns et al. 2018). The studies have primarily been conducted in adults with BED and obesity. However, a transfer to classical eating disorders seems possible.

► **Important** In particular, modules such as perception of feelings and building stress tolerance, as well as learning mindfulness, have proven promising for improving emotion regulation in binge eating-related disorders. Additionally, underlying components of inhibitory control and reward sensitivity should be addressed. This can be done through computer-supported training or food exposure, if necessary.

42.2.4 Third-Wave Cognitive Behavioral Therapy Methods in the Treatment of Eating Disorders

Within the framework of the third wave of behavior therapy, cognitive behavioral therapy has integrated elements such as mindfulness and acceptance towards inner experiences, and contextual and experiential aspects have been emphasized more strongly (Heidenreich et al. 2007). Among the methods that have developed eating disorder-specific interventions within the third wave of behavior therapy or have been studied in the context of eating disorder treatment are, for example, dialectical behavior therapy (DBT), acceptance and commitment therapy (ACT), schema therapy, mindfulness-based interventions, and compassion-focused therapy (CFT).

42.2.4.1 DBT

DBT was originally developed for the treatment of borderline personality disorders, but in recent years has increasingly been used in the treatment of BN and BED. In particular, the skills training has been adapted for the treatment of BN and BED to achieve improvements in the regulation of stress and emotion. Mindfulness exercises, sensitization to emotional states, and building stress tolerance are the main focus. DBT is probably the best-studied therapy form of the third wave and is considered a promising add-on therapy module for reducing binge eating and eating disorder pathology. In the prevention area, DBT modules seem to show the greatest effects in selective prevention measures for reducing conspicuous eating behavior compared to other third-wave methods. So far, high-quality, randomized controlled trials regarding the treatment of AN are lacking.

42.2.4.2 ACT

ACT includes six treatment steps aimed at achieving greater psychological flexibility and contextual control. These are:

- Acceptance
- Cognitive Defusion
- Mindfulness
- Self-as-Context
- Formulating Personal Values
- Committed Action

Eating disorder-specific modifications exist for both children and adolescents as well as adults. Initial studies in inpatient settings with adult patients with BN and AN, as well as in outpatient settings with children and adolescents, show greater improvements in eating disorder pathology, the occurrence of binge eating, etc., when ACT elements are integrated into standard treatment. However, ACT alone is not superior to CBT treatment and is currently considered more as an alternative or complementary treatment element.

42.2.4.3 Schema Therapy

Schema therapy was developed especially for patients with therapy-resistant mental disorders. It combines methods of cognitive behavioral therapy with experiential and action-oriented approaches such as imagery and chair work. In addition, the conscious design of the therapeutic relationship (e.g., through “reparenting”) is a central element. The goal of schema therapy is to identify unfavorable experiential and behavioral patterns that have developed historically, to relate them to symptoms, and to change them in such a way that better behavior regulation and satisfaction of needs are achieved. There are now manuals available that describe the integration of schema therapeutic work in patients with eating disorders (e.g., Archonti et al. 2016). However, the empirical evidence for the effectiveness of schema therapy for eating disorders is still quite limited.

42.2.4.4 Mindfulness-Based Therapy

Mindfulness-based psychotherapy was primarily developed for the treatment of depressive disorders (mindfulness-based cognitive therapy for depression, MBCT). The focus is not on

changing cognitive content, but on developing an accepting and open attitude towards dysfunctional beliefs. Mindfulness is conveyed in various ways, on the one hand through so-called formal mindfulness exercises such as meditations, body scans, yoga, etc., and on the other hand through informal exercises to transfer a mindful attitude into everyday life (Heidenreich et al. 2007). Meanwhile, there are many disorder-specific modifications, including for patients with eating disorders. Overall, the results are promising here as well, but the mechanisms are unclear, and the superiority of mindfulness-based approaches over CBT has not yet been demonstrated. However, it seems that patients who meditate more frequently also show stronger reductions in the frequency of binge eating and loss of control over eating. Only a few studies have applied mindfulness-based approaches to the treatment of AN.

42.2.4.5 CFT

CFT is certainly one of the most recent developments of the third wave. It was developed by Paul Gilbert in 2006 together with colleagues and is based on neurophysiological, evolutionary biological, and social-cognitive models, and integrates Christian and Buddhist values and attitudes into psychotherapeutic work. Compassion has emerged as a therapeutic factor in various studies and is associated with anxiety, depression, and stress. Overall, the stronger the compassion and self-compassion are, the less pronounced the psychopathology. It is assumed that compassion strengthens an accepting attitude towards painful experiences and facilitates the adequate regulation of negative experiences. CFT therefore focuses on building self-compassion and compassion and uses methods such as mentalizing, mindfulness, exposure, imagery, and guided discovery (Gilbert and Plata 2013). There are initial studies that used CFT for BED, in which CFT successfully led to a reduction in eating disorder symptoms, but was not superior to the active control condition. The improvement in eating disorder symptoms was significantly associated with an increase in compassion, a reduction in fear of compassion, and a reduction in shame.

► **Important** Third-wave behavioral therapy approaches are considered promising. Currently, the empirical evidence is not sufficient for clear recommendations. The best studied is the use of DBT modules such as skills training for binge eating-related disorders like BN and BED.

42.2.5 Effectiveness of Cognitive Behavioral Therapy in the Treatment of Eating Disorders

Although studies on the treatment of AN have been conducted continuously in recent years, there is still a lack of high-quality randomized controlled trials and replications of existing results by independent working groups. Based on the current empirical data, it can be concluded that there is no superiority of CBT compared to other therapeutic approaches for AN in adulthood. In childhood and adolescence, family-based therapy seems to be particularly successful, but in the long term, individual therapeutic measures also appear to be similarly successful. With regard to weight gain, CBT for AN is superior to non-specific treatment strategies, such as nutritional counseling alone. A major challenge for clinicians is the high dropout rates of sometimes over 40%, which still limit the ability to make definitive statements on the effectiveness of CBT.

In contrast, the short- and long-term successes of modified CBT treatment offers for BN and BED can be considered good. In particular, the core features of BN can be reduced in the long term. This applies especially to the reduction of binge eating and vomiting as well as changes in diet behavior. After treatment, binge eating symptom scores can be achieved that correspond to a healthy comparison population. Effects for other eating disorder symptoms, on the other hand, are rather small to medium and therefore clinically less significant. This applies, for example, to cognitive aspects such as dysfunctional beliefs or self-esteem. Similar to AN, the major problems are the dropout rate and the still improvable proportion of patients who show full remission at the end of treatment. For

BED, a meta-analysis showed that the reduction of binge eating and associated dysfunctional beliefs (e.g., preoccupation with food and weight) could be achieved through CBT-based psychotherapies with large clinical effects, whereas BED-specific treatment showed barely any positive influence on comorbid symptoms and weight. However, it should be noted that even with CBT for BED, there are high dropout rates and many patients still report eating disorder symptoms at the end of treatment. Relapse rates after CBT treatment seem to be around 30%.

Several reviews and meta-analyses examined the effectiveness of third-wave approaches in the treatment of eating disorders. Initial results are described as encouraging, but the study findings are very mixed, and only a few randomized controlled trials are available (Pisetsky et al. 2019). A meta-analysis showed that third-wave approaches, particularly in the area of prevention, achieve good results in reducing abnormalities in eating behavior ($g = 0.83$) and body image ($g = 0.35$; Lindardon and colleagues 2019). With regard to the treatment of clinically relevant eating disorders, the evidence does not yet seem to be sufficient.

► **Important** It must be concluded that further optimization of existing approaches and investigation of the mechanisms of action of existing therapy components are still necessary.

42.3 Conclusions

Cognitive behavioral therapy (CBT) is the treatment of choice for bulimia nervosa (BN), with both individual and group therapy settings proving effective. Group therapy strategies are particularly attractive in terms of better cost-effectiveness and provide additional benefits for patients through the interactive aspect of the group setting. Important components of any CBT for eating disorders should include normalization of eating behavior and weight

restoration for anorexia nervosa (AN) or reduction of binge eating and purging for BN, as well as cognitive interventions to reduce dysfunctional core beliefs and automatic thoughts, and techniques for emotion regulation and reduction of impulsivity. Newer methods such as cognitive Bias modification, modified forms of food exposure focusing on expectancy violation, and third-wave approaches represent complementary measures that still require further empirical validation. It remains unclear which patient groups could benefit from which additional/new therapy methods.

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Interpersonal Psychotherapy

43

Anja Hilbert

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43.1 Basics of Interpersonal Psychotherapy for Eating Disorders

Interpersonal psychotherapy (IPT) was developed by Klerman et al. (1984) for outpatient short-term therapy of unipolar depression. After evidence of its efficacy, IPT was adapted for the treatment of other mental disorders, including eating disorders such as bulimia nervosa (BN) and binge-eating disorder (BED). Initial adaptation results are available for anorexia nervosa (AN).

The concept of IPT is based on disorder theories and empirical research findings, which

suggest that mental disorders are caused and maintained by interpersonal problems.

43.1.1 Theoretical and Empirical Foundations of IPT

Theoretically, the interpersonal approach is based on the “interpersonal school.” Influential were the psychobiological concept of psychiatry by psychiatrist Meyer and the interpersonal theory of psychiatry by neo-Freudian Sullivan, who considered interpersonal problems central to the development and treatment of mental disorders. Beyond the theoretical foundation, IPT was guided by empirical findings on psychosocial risk factors of mental disorders, including critical life events, such as

- loss experiences,
- interpersonal conflicts,
- changes in living conditions,
- lack of social support.

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The theoretical and empirical foundations can be condensed into two clinically relevant basic assumptions of IPT for eating disorders.

Basic Assumptions of IPT for Eating Disorders

- Interpersonal problems are significantly involved in the development and maintenance of eating disorders.
- A resolution of the interpersonal problems that are currently relevant to the disorder leads to an improvement in eating disorder symptoms.

43.2 Eating Disorder Treatment through IPT

IPT for eating disorders is an outpatient short-term therapy with approximately 16–20 sessions. It focuses on the treatment of currently relevant interpersonal problems. An updated treatment manual by Weissman et al. (2000, 2009) is available. The essential modification in the adaptation of IPT for eating disorders by Fairburn involves considering the eating disorder symptoms (rather than depressive symptoms) in the interpersonal context in which they have developed and are maintained.

Initially, IPT was developed as individual therapy, but it is also available in a group format. In all phases of IPT, the therapeutic techniques of exploration, clarification, promotion of

emotional expression, communication analysis, and behavior modification are particularly used. The therapeutic relationship is collaborative, and the therapist acts as the patient's "advocate." The therapist adopts an appreciative, supportive, and optimistic attitude towards the patient. The treatment by IPT includes the following **three treatment phases** (Table 43.1).

43.2.1 Initial Phase

The initial phase of IPT serves to identify interpersonal problems and symptom management. Against the background of clinical-psychological and medical diagnostics, the therapist explains the eating disorder diagnosis to the patient. They convey disorder and treatment knowledge and describe the therapy concept and approach of IPT. In addition, the therapist assigns the patient the sick role. The latter is intended to relieve the patient and signal the importance of working on the disorder. A central element of the initial phase is the relationship analysis ("interpersonal inventory"). The goal of this unstructured interview-based relationship analysis is to identify the problem areas associated with the development and maintenance of the disorder. Both past and present relationships are considered in terms of their influence on the symptoms. In addition to exploring the expectations of the patient and the other person/partner regarding their relationship, the evaluation of the relationship and possible desires for change on the part of the patient are also taken into account.

Table 43.1 Overview of interpersonal psychotherapy for eating disorders

Phase	Duration	Therapeutic Goals
Initial Phase	3–5 sessions	Identification of the problem
		Symptom management
Middle Phase	10–12 sessions	Work on the currently relevant interpersonal problem area(s)
Final Phase	3–5 sessions	Consolidation of achievements
		Preparation for further independent work on interpersonal problems

In IPT, **four core areas** of interpersonal problems are distinguished:

- Grief in the sense of complicated grief, due to the loss of a person
- Interpersonal role conflicts, resulting from different expectations of a relationship
- Role changes, leading to difficulties with a changed life status
- Interpersonal deficits, leading to social isolation or chronically unsatisfying relationships

Subsequently, in collaboration with the patient, one or more problem area(s) are selected that primarily determine(s) the current symptomatology. The therapist and patient agree on **specific treatment goals**. The agreements for further work during therapy are recorded in a treatment contract.

43.2.2 Middle Phase

The core of IPT is the middle phase. In this phase, strategies for solving the identified interpersonal problem(s) are developed and implemented. Important **strategies** for treating all problem areas include summarizing the symptomatology and placing it in an interpersonal context, developing and establishing specific behavioral strategies for the identified problem area(s) with the patient, encouraging work on treatment goals, and promoting the expression of negative emotions in the identified problem area(s).

43.2.3 Final Phase

The final phase aims to consolidate the progress achieved and identify areas for further work on interpersonal problems. The end of treatment is addressed and processed as a farewell or grief process. The patient is encouraged to perceive and verbalize their feelings about the end of therapy. In addition, the progress made is considered and acknowledged to promote a sense of competence and self-efficacy. Towards the end

of therapy, the patient is guided to identify early signs of relapse and derive coping measures in case of a recurrence of symptoms. A specific plan for further work after the end of treatment is developed.

43.3 Scientific Foundation of IPT

43.3.1 IPT for Bulimia nervosa

According to randomized clinical trials, IPT is substantially and sustainably efficacious in patients with BN. Compared to cognitive-behavioral therapy (CBT), it is less effective at the end of treatment, while there are no differences in long-term efficacy between the two therapy forms. In the long term, about 40% of patients are fully remitted. Compared to a reduced behavioral therapy treatment, IPT is superior in both short and long term. IPT leads to significant improvements in eating disorder-specific psychopathology, including binge eating, purging behavior, restrained eating, and shape and weight concerns, as well as general psychopathology and interpersonal problems, with low dropout rates. Analyses of therapy course suggest that IPT and CBT work through different mechanisms of action. Crucial for the greater efficacy of CBT at the end of treatment is that CBT achieves a stronger reduction of restrained eating than IPT in the first four weeks of treatment. Consistent with this result, a combination with a symptom-oriented, cognitive-behavioral approach seems to lead to an increase in IPT effectiveness. Predictors of better therapy response are a stronger reduction of purging behavior within the first four treatment weeks and – before treatment begins – a higher body mass index and less severe eating disorder and general psychopathological symptoms.

Evidence-based guideline for IPT of BN In the German evidence-based S3 guideline “Diagnosis and therapy of eating disorders” for the treatment of BN, IPT is recommended as an

alternative treatment to CBT if it is not available, proves ineffective, or is not desired (B). However, it should be noted that IPT is not yet approved as a guideline psychotherapy in Germany.

43.3.2 IPT for Binge-Eating Disorder

Randomized clinical trials show that IPT also leads to substantial and long-lasting improvements in symptoms for patients with BED. Compared to CBT, IPT is equally effective in the short and long term as CBT and more effective than behavioral, i.e. multimodal weight loss treatment. In the long term, about 60% of patients are fully remitted. IPT leads to a reduction in eating disorder-specific and associated general psychopathological symptoms with low dropout rates: binge eating, shape and weight concerns, general psychopathological symptoms, and interpersonal problems are significantly reduced. As with CBT, it has been shown for IPT that successful treatment leads to a significant, albeit small, weight reduction. Less severe binge-eating symptoms before treatment, fewer interpersonal problems, or lower shape and weight concerns are predictors of better treatment success. IPT also shows increased efficacy compared to guided, CBT-based self-help treatment and behavioral weight loss treatment for patients with more severe eating disorder psychopathology and greater self-esteem problems. However, guided CBT self-help treatment proves to be most effective for those with more severe binge eating symptoms.

Evidence-based guideline for IPT of BED In the German evidence-based S3 guideline “Diagnosis and Therapy of Eating Disorders” for the treatment of BED, IPT is recommended as an alternative treatment to CBT (B).

43.3.3 IPT for Anorexia nervosa

Initial results for IPT in patients with AN suggest that supportive clinical management for

normalizing eating behavior and body weight is more effective in the short term than IPT, which does not directly address these symptoms, while no differences are shown in the long term. IPT does not appear to differ in efficacy from CBT. With high dropout rates, a total of 30% of patients showed good or very good improvements after completing therapy. For the remaining patients, no or minor improvements were observed. These preliminary results indicate that a symptom-oriented approach is of central importance in the treatment of AN.

43.4 Summary and Outlook

IPT offers a psychotherapeutic approach with many advantages. These include an empirically based theory formation, a disorder model based on this, a focused therapeutic approach that concentrates on the treatment of current problems, and a pragmatic combination of proven therapeutic strategies from various therapy directions.

Despite the eclectic therapy concept, the acceptance of IPT among patients with BN and BED and their therapists is high. The evidence of IPT's efficacy in these eating disorders is convincing, as IPT represents the main alternative treatment to CBT for BN and BED. Patients who do not benefit from CBT, however, also seem not to benefit from a subsequent IPT. With regard to patients who achieve no or only minor improvements through IPT, the central question is how further increases in efficacy can be achieved in the psychotherapy of BN and BED. This question can be empirically explored by identifying treatment-specific predictors. The differential indication for IPT is still unclear. It is also unclear how IPT works, i.e., whether it actually reduces interpersonal problems or affects eating disorder symptoms through other process characteristics. Clarification of this question also requires a reliable and valid assessment of interpersonal problems.

Evidence of IPT's efficacy in AN is still pending. Despite the initially less promising results, an interpersonal treatment focus in AN is plausible due to the empirically proven disorder

relevance of interpersonal problems. However, a symptom-oriented approach seems indispensable for the treatment of this particular eating disorder. In general, it should be noted that in previous efficacy studies in the eating disorders field, a symptom-oriented approach within IPT was not allowed in order to avoid overlap with comparison conditions such as CBT, although the IPT treatment manual explicitly permits a symptom-oriented approach. A combination with a cognitive-behavioral approach seems to lead to an overall increase in IPT's effectiveness. Clarification of for whom, how, and under what conditions IPT works is not least a prerequisite for further promoting IPT applications in clinical practice. Already at this point in time, the evidence of IPT's efficacy provides the basis for recognition as a guideline psychotherapy, at least for BN and BED. Good trainability of IPT has been demonstrated.

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Cognitive Remediation Therapy

44

Timo Brockmeyer

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44.1 Cognitive Inflexibility and Anorexia Nervosa

In patients with anorexia nervosa (AN), an obsessive preoccupation with nutrition, body shape, and weight, as well as highly ritualized behavior (e.g., extensive chopping of food, calorie counting, measuring body circumference, weighing, compulsive exercising) can often be observed. In other everyday routines, patients with AN are often very rigid and react to changes with anxiety and discomfort (Brockmeyer and Friederich 2015). Such behaviors are often

embedded in obsessive-compulsive personality traits (excessive preoccupation with details and order, perfectionism, rigidity, exaggerated conscientiousness) (Lilenfeld et al. 2006), which are considered a risk factor for AN (Holliday et al. 2005) and have been associated with a worse prognosis (Crane et al. 2007). Neuropsychological tests also reveal, at least on average, reduced cognitive flexibility (set-shifting) and excessive detail focus in patients with AN (Lang et al. 2014; Wu et al. 2014).

44.2 Set-shifting and Central Coherence

Set-shifting describes the ability to adapt quickly to changing environmental demands by flexibly switching between different rules, tasks, and actions (Monsell 2003). Cognitive inflexibility,

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on the other hand, is characterized by rigid and perseverative behavior despite changing environmental conditions. *Central coherence* refers to the ability to overview and integrate complex information, essentially seeing the “bigger picture.” Weak central coherence, by contrast, manifests in a compulsive focus on details, i.e., essentially the problem of “not seeing the forest for the trees” (Happé and Frith 2006).

44.3 Translating Research Findings into a Targeted Intervention

Tchanturia and colleagues translated the findings on weak set-shifting and central coherence in AN into a specific clinical intervention by adapting the so-called *cognitive remediation therapy* (CRT) for AN (Davies and Tchanturia 2005). Originally, CRT was designed for patients with brain lesions (Goldberg 2002) and subsequently successfully applied as an add-on intervention to improve cognitive and social functions in schizophrenia (Wykes et al. 2011).

CRT can be counted among the so-called neurobehavioral therapy approaches (Siegle et al. 2007) and largely corresponds to the idea of a “brain gym” in which certain brain functions are to be trained using cognitive-behavioral exercises. This is intended to alleviate specific symptoms and accompanying manifestations of the disorder directly and to create a neurocognitive basis for a better response to psychotherapeutic interventions. The modified CRT for AN specifically aims to favorably influence the two cognitive control functions of set-shifting and central coherence mentioned above.

Cognitive Remediation Therapy for AN

- ...
- is focused on personality traits and basic cognitive functions, not acute symptoms
- aims to reflect on and lend greater flexibility to rigid thinking styles, information

processing, behavioral routines, and habits

- focuses more on “how” a person thinks and less on “what” they think
- is based on a variety of exercises, usually performed in individual or group therapy under the guidance of a therapist, sometimes also on a computer
- is highly structured, playful, and time-limited (usually 8–10 sessions)

44.4 Overview of the Intervention

The intervention usually consists of 8–10 sessions, with individual therapy sessions typically lasting about 30–50 minutes and group therapy sessions lasting 90–100 minutes. Sessions usually take place weekly, in an inpatient setting sometimes several times per week. The patient and therapist work together on relatively simple, material-based exercises. The patient should have the opportunity to playfully discover potential weaknesses in set-shifting and central coherence and then reflect on their impact on her everyday life. Through continuous practice during treatment, she should improve her abilities in these areas and transfer them to her everyday life through behavioral experiments. Typical eating disorder-specific topics such as nutrition, weight, and body shape are deliberately excluded, which usually contributes to high treatment acceptance.

► **Important** Cognitive remediation therapy is not a standalone treatment option for AN. It can only be used as an add-on treatment component to promote flexible thinking and action.

44.5 Modules of the Intervention

At the beginning of the intervention, a brief introduction is given (for an example of phrasing see Example phrasing for introducing the

intervention). Subsequently, the individual sessions largely follow the same structure, with increasing levels of difficulty in the exercises. A CRT session typically begins with a detailed discussion of the therapeutic homework carried out by the patient since the last session. This is followed by 2–3 new exercises with multiple repetitions. These are often paper- and pencil-based (examples are given below). The observations made during these exercises (e.g., discomfort, tension and restlessness, or difficulties in forced switching between different tasks/rules/requirements and “sticking” to existing rules or requirements) are discussed, reflected upon, and related to difficulties in everyday life (e.g., in a situation where a previously agreed meeting with friends is spontaneously discarded by them in favor of another plan). This is followed by a selection of new therapeutic homework assignments and a corresponding preliminary discussion. In some cases, sessions are also interspersed in which the patients independently (possibly at home or on mobile devices) or under minimal supervision work on computer tasks designed to promote cognitive flexibility and central coherence.

General Recommendations for Implementing the Intervention

- The therapeutic stance should be characterized by cooperation, guided discovery, resource orientation, and empathy
- The activation of intense emotions should be avoided
- Exercises should be presented as opportunities to gain specific experiences, not as performance tests
- Tasks and exercises should be tailored to the individual patient as much as possible

Example Phrasing for Introducing the Intervention

“We all have different styles of thinking, which shape our own unique personalities

and individual behaviors. These thinking styles have nothing to do with education or intelligence, but rather with how certain networks of our brain process incoming information. Such thinking styles usually have both advantages and disadvantages, almost never are they purely negative or hindering or completely positive and helpful. It can be imagined that each thinking style is useful in some situations and more of a hindrance in others. For example, some people find it very easy to switch between different ideas, rules, or tasks. Such people can often manage multiple tasks simultaneously (multitasking) and adapt quickly and easily to changing conditions in everyday life. However, they may not be as strong in conscientiously and carefully working on a specific task and sometimes overlook details. Other people are more inclined to focus strongly on a single topic. These people are probably very good at doing things very conscientiously, accurately, and carefully, and they often discover small things that others overlook. They often find it disturbing when they are interrupted in something, when they have to switch quickly between different tasks, or when plans or routines change. In this training, we will think together about our own thinking. The goal of this training is for you to become aware of the strengths and weaknesses of your own thinking style and to expand your repertoire of thinking and action strategies so that, ideally, you can choose a suitable strategy for different situations.”

44.6 Metacognitive Level

An important component of the intervention is to reflect on one’s own thinking (and behavior). This is very similar to a related treatment approach, *metacognitive training*, which is often used as an add-on intervention in the treatment of schizophrenia (van Oosterhout et al. 2016).

Metacognitive Approach in Cognitive Remediation Therapy: Examples of possible effects of weak cognitive flexibility and central coherence

- Interpersonal problems due to: strong adherence to plans and agreements, rapid frustration with deviations from plans, lack of spontaneity, monotony, “hair-splitting,” unwillingness to delegate tasks to others, rejection or reservation towards new things
- Emotional problems due to: “getting stuck” in or not being able to detach well from negative feelings/moods, not being able to “switch off” well, not being able to evaluate situations well from another perspective

44.7 Example Presentation of the Exercises

In the following, some of the exercises will be presented briefly as examples.

Optical Illusions These are optical illusions or hidden picture puzzles that contain a figure that is usually not recognizable at first glance, or images that convey different image contents from different perspectives due to their special construction. The patients are first asked what they can recognize in the picture. If they only recognize one of the possible images or figures in the overall picture, they are asked if they can see anything else. If necessary, they receive help in recognizing the other image or figure. They are then asked, for example, to point with their finger at individual features or different images or figures (in the relatively well-known face/vase illusion, for example, at the nose and chin of the face and then at the bottom and neck of the vase) and to quickly switch back and forth between the different perspectives.

Stroop Tasks In this type of task, the so-called Stroop effect is used. This is based on a mental

processing conflict that can occur, for example, when words that denote colors (e.g., “yellow”) do not match the color (e.g., blue) in which they are printed. The patients are asked to name various stimuli in turn and, following the therapist’s instructions, to repeatedly change the applicable rule (naming the content meaning of the word ↔ naming the print color).

Geometric Figures Patients can be asked to describe complex geometric figures as simply as possible so that the therapist or another patient can draw them (without seeing the figure). In doing so, patients sometimes tend to over-emphasize individual details of the figures or describe them too precisely, instead of conveying the rough features of the figure to their counterpart in a simple and understandable way. In this task, feedback from the counterpart should be included as much as possible, which should illustrate to the patient that it is difficult or strenuous to follow an overly detailed or fragmented description and is of little help in imagining the figure.

Summarizing Texts and Images This exercise to promote global information processing involves asking the patient to briefly summarize (differently) long and complex texts (e.g., letters or newspaper articles), give them headlines or subtitles, summarize a text in one sentence or even one word. Similarly, patients can be asked to identify the essential elements, messages, or atmosphere of very complex images (e.g., hidden object pictures, paintings by Brueghel or Bosch).

Behavioral experiments in everyday life Exercises for transfer to everyday life represent another important component of the intervention. For this purpose, simple, individually tailored behavioral experiments should be developed together with the patient, with which the patient can challenge her (possibly not yet always conscious) routines and habits in everyday life. To minimize the risk of frustration and failure, it is advisable to start with easy, relatively tolerable routine changes for the patient.

At least initially, it can be helpful for some patients if some examples are provided (see below). These tasks may seem extremely trivial, but they actually represent a challenge for many patients that is large enough to discover and question cognitive inflexibility in everyday life. The aim is not to discover that deviating from a routine or changing a habit is always better than doing something as usual. There are often good reasons why certain routines have become established. Rather, it is about patients playfully trying out what it feels like to do something differently than habit dictates. This is intended to train a certain flexibility in terms of action options and, on the other hand, to help patients learn to deal with aversive emotions triggered by deviation from the familiar (such as insecurity, discomfort, nervousness), to tolerate or accept and process them, in order to be better “equipped” for changes and surprises that inevitably arise in life.

Suggestions for Behavioral Experiments

- Choose a different ringtone or background image for your phone
- Wear your wristwatch on the other hand or upside down (12 pointing downwards)
- Sit somewhere different than usual
- Multitasking during housework or gardening
- Try a new route to work/school/university/home
- Change something small in the room
- Change the order of brushing your teeth (e.g., first top, then bottom)
- Change a product brand (e.g., buy a different toothpaste)
- Leave the room/house untidy when going out
- Watch a new series or movie that you wouldn't normally watch
- Listen to different music than usual

44.8 Evidence

A series of case series and uncontrolled feasibility studies with positive results regarding improvements in cognitive and clinical parameters after the application of CRT in adult and adolescent patients with AN led to the intervention being considered a promising new option in the treatment of AN (Tchanturia et al. 2013, 2017). Meanwhile, there are six published randomized controlled trials on the effectiveness of CRT in AN. In these studies, CRT was compared with standard treatment (treatment as usual), with cognitive behavioral therapy alone (without CRT as add-on), or with a nonspecific cognitive training (which was not focused on set-shifting and central coherence). The evidence for the effectiveness of CRT in improving cognitive functions (primarily set-shifting and central coherence) is heterogeneous. In two smaller pilot studies (Brockmeyer et al. 2014; Lock et al. 2013), some effects (at least with regard to some of the measures used) were found, with one of these studies using an adapted, intensified, and computer-supported version of CRT. In four other studies, three of which had larger sample sizes, no effects were found (Dingemans et al. 2014; Herbrich et al. 2017; Sproch et al. 2019; van Passel et al. 2016). In four of the six randomized controlled trials, potential effects of CRT on clinical parameters (e.g., body mass index) were investigated. In one of these studies, superiority of CRT was found in terms of self-assessed eating disorder symptoms and health-related quality of life, but not in terms of weight gain (Dingemans et al. 2014), whereas in the three other trials, no greater improvements in clinical parameters were found when patients received CRT (Herbrich et al. 2017; Lock et al. 2013; Sproch et al. 2019). It should also be considered that the only study to find superiority of CRT in terms of clinical parameters examined a mixed sample of patients with very different eating disorders,

and there was no equivalence between the treatment arms in terms of treatment dose, as a single standard treatment was compared with a standard treatment plus CRT (Dingemans et al. 2014). In a recently published study with 167 adolescent and adult patients with AN, in which we compared CRT with a variant of art therapy (both as group therapy and as an add-on to inpatient standard treatment), we found no superiority of CRT in terms of changes in body mass index, self-assessed severity of eating disorder symptoms, and health-related quality of life (Brockmeyer et al. 2021). Likewise, the groups did not differ in terms of changes in set-shifting and central coherence, except for a short-term superiority of CRT regarding set-shifting. In light of this evidence, CRT can only be recommended to a very limited extent as an additional treatment component for AN.

44.9 Conclusion for Practice

Cognitive remediation, as a neuroscience-informed treatment module, represents a practicable addition to other psychotherapeutic interventions for AN. The intervention is generally well-received by patients due to its playful, non-confrontational approach and because eating disorder-related topics such as weight and shape are broadly excluded. However, the evidence for the specific effectiveness of CRT in improving cognitive functions, eating disorder symptoms, and quality of life must be considered low. Patients with pronounced difficulties in the areas of set-shifting and central coherence may benefit more from the intervention. However, empirical evidence for this hypothesis is still lacking.

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Treatment of Body Image Disorders

45

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In several prospective studies, the high relevance of a disturbed body image for the development and maintenance of eating disorders has been demonstrated. Furthermore, additional longitudinal studies showed that patients who were able to normalize their eating behavior through therapy but still maintained a negative attitude towards their own physical appearance had a higher risk of relapse. Although these research

findings suggest integrating interventions for targeted improvement of body image into eating disorder treatment, such treatment measures are often not considered or only unsystematically and insufficiently implemented in the therapy of anorexia nervosa (AN) and bulimia nervosa (BN). The following presents various modules for cognitive-behavioral treatment of body image disorders, which were developed based on existing research findings and address the four components of the disturbed body image.

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Components of the disturbed body image

- Perception
- Cognition
- Emotion
- Behavior

Modules of body image therapy

- Development of an individual disorder model
- Modification of dysfunctional body-related cognitions
- Body exposure using mirror and video
- Exposure exercises to reduce body-related avoidance and checking behavior
- Establishment of positive body-related activities

Finally, current research findings on the effectiveness of cognitive-behavioral interventions for improving body image are summarized.

Body image therapy can be conducted in both individual and group settings and represents a supplementary component to regular eating disorder treatment. Due to the body exposure exercises, which are usually performed wearing only underwear or a bikini, it is recommended that body image therapy be conducted by same-sex therapists for the patients.

► Interventions for improving body image represent a complementary component in the cognitive-behavioral treatment of eating disorders. They address the distorted perception of one's own body, negative body-related emotions and cognitions, as well as dysfunctional body-related avoidance and checking behavior.

45.1 Development of a Disturbance Model

In order to convey the treatment rationale to the patients and thereby increase therapy motivation, an **individual disturbance model** regarding the development and maintenance of body image disturbance should be developed together with each patient in a first step, from which the individual treatment components can then be derived. The focus is on the individual body image history, i.e., it should be compiled for each patient which positive (e.g., athletic

achievements) and negative experiences (e.g., bullying) in the various phases of their lives have contributed to the development of their own body image. In this context, the influence of the ideal of extreme slimness, which is omnipresent in Western society and disseminated by the media—especially social media such as Facebook or Instagram—is also reflected. Likewise, the specific body image problem regarding the four components (i.e., perception, cognition, emotion, and behavior) is worked out for each patient. In addition, the factors maintaining the negative body image and thus also the eating disorder (e.g., body-related avoidance behavior) are identified with each patient. It is agreed with the patients that the therapy should focus on these maintaining factors in order to break existing vicious cycles.

45.2 Modification of Dysfunctional Body-Related Cognitions

Numerous studies have shown that patients with eating disorders have a greater **dissatisfaction with their own body** than healthy women, with patients with BN appearing to evaluate their body even more negatively than women with AN. Moreover, it is known that the areas of “shape” and “weight” have a high significance for patients with AN and BN in terms of self-esteem. Therefore, treatment of body image disturbances should actively address the body-related cognitions of the patients. Both negative automatic thoughts that are activated in body image-relevant situations (e.g., “Everyone is looking at me now because I have such a big butt”) and basic assumptions (e.g., “My worth as a person depends on my weight”) are identified using various cognitive-behavioral techniques. Based on this, these cognitions are critically examined for their functionality and reality appropriateness using the method of Socratic Dialogue, which can also be used in the group setting in the form of role plays, and gradually changed, for example, through the use of self-instruction exercises and documentation

techniques. The patients are instructed to systematically integrate the learned techniques into their everyday lives in order to gradually replace the established—mostly negatively distorted or dysfunctional—thinking patterns with more reality-appropriate and functional cognitions.

45.3 Body Exposure via Mirror and Video

Body exposure exercises are a central component of body image therapy. Under therapeutic guidance, patients systematically deal with their own body.

45.3.1 Goals

Body exposure exercises are intended to achieve various goals, which are listed below and subsequently justified by various research findings.

Objectives of Body Exposure

1. Reduction of negative body-related emotions
2. Overcoming body-related avoidance behavior
3. Correction of the distorted mental representation of one's own body
4. Reduction of the deficit-oriented view of one's own body

Negative Body-Related Emotions The first objective of body exposure is to reduce negative body-related emotions. The basis for this lies in the results of several studies that indicate that patients with eating disorders show pronounced negative affective reactions regarding their own bodies. For example, women with eating disorders experience emotions such as fear, anger, sadness, and disgust to a greater extent when looking at their own bodies than individuals without eating disorders. In the context of body exposure, these negative emotions are activated

and reduced through processes such as habituation during a sufficiently long exposure.

Body-Related Avoidance Behavior To prevent the occurrence of the negative emotions described above, which can arise from dealing with one's own body, many women with eating disorders exhibit pronounced body-related avoidance behavior (Sect. 45.4). In extreme cases, this manifests itself in consistently avoiding one's own physical appearance (e.g., by covering mirrors) or, as far as possible, not touching one's own body. Overcoming this avoidance behavior is therefore the second goal of body exposure exercises.

Distorted Mental Representation of One's Own Body The third goal of body exposure is to correct the distorted mental representation of one's own body. According to the results of numerous studies, women with both AN and BN overestimate their body dimensions. This overestimation is not limited to their own body size but also extends to their movement patterns concerning their own bodies. The overestimation of one's own body dimensions does not seem to be based on a sensory deficit of the patients but is rather to be understood as a cognitive phenomenon that can be explained by information processing theories. Through systematic feedback during body exposure exercises, a correction of the overestimation of one's own body dimensions and movement patterns and thus the establishment of a more realistic mental representation of one's own body should occur.

Deficit-Oriented View of One's Own Body The reduction of the deficit-oriented view of one's own body represents the fourth goal of body exposure exercises. Studies conducted using eye tracking suggest that women and girls with eating disorders particularly focus on the negatively evaluated areas of their own bodies and, conversely, pay less attention to more positively evaluated aspects. One consequence of these findings is that patients should be supported in specifically confronting their own

bodies to increasingly pay attention to the more positively evaluated body regions, thus leading to a more balanced view and a more realistic mental representation of their own bodies.

45.3.2 Procedure

The four mentioned objectives of body exposure require different approaches. For example, overcoming the negative affective reaction to the sight of one's own body and reducing the associated body-related avoidance behavior initially requires the activation of negative emotions. In the context of body exposure exercises, this is achieved by focusing on negatively evaluated or previously avoided body areas. In contrast, the objective of a balanced view of one's own body requires an increased focus on (potentially) positive, but previously less noticed body areas. For this reason, it is recommended to perform these two variants of body exposure—focusing on negative or avoided and focusing on positive, but previously less noticed body areas—one after the other. It has proven useful to start with the focus on negatively evaluated or avoided body areas. Before performing the exercises, the therapist should therefore determine which body areas are rated more positively and which more negatively by the respective patient.

In both variants of the body exposure exercises, the patients systematically look at their body in a full-length mirror, ideally wearing only a bikini. To keep the patient's attention on her own body and prevent (even hidden) avoidance behavior during the exposure exercises, the therapist asks targeted questions (e.g., "Can you describe the shape of your stomach to me?"). These exercises can be supplemented by the instruction to not only look at certain body areas but also to touch them. In addition to mirror exposure, video exposure exercises are also used, allowing patients to deal not only with their body shapes but also with their own movement patterns.

In general, it should be noted that body exposure sessions should be sufficiently long, i.e., not be terminated before a significant decrease

in negative emotions is recorded. Furthermore, the exercises should be repeated regularly to allow habituation processes. Accordingly, it is recommended that the body exposure exercises be continued independently by the patients as part of homework assignments.

45.4 Exposure Exercises for Reducing Body-Related Avoidance and Checking Behavior

The transfer of exposure rationale to everyday life should be carried out within the framework of interventions to overcome body-related avoidance and checking behavior. This area of behavioral manifestation of a disturbed body image has only recently received attention in both research and therapy contexts. Various studies show that women with AN and BN exhibit a higher degree of body-related avoidance and checking behavior than healthy control subjects. The extent of these behaviors positively correlates with the severity of shape and weight concerns. Body-related avoidance behavior manifests itself in the avoidance of situations and contexts in which the patient's own attention or that of others is directed towards the patient's body. Body-related checking behavior includes strategies such as weighing oneself after every meal or measuring specific body areas with a tape measure. Although these behaviors differ phenomenologically, they are similar in terms of their functionality. Both strategies serve the short-term avoidance or reduction of negative body-related emotions. However, studies have also provided initial evidence that body-related checking behavior may temporarily intensify negative emotions. These findings, as well as initial experimental investigations suggesting that these behaviors may contribute to the long-term maintenance of a body image disturbance, suggest that their reduction should be another goal of body image therapy. Specifically, exposure exercises are carried out in the listed contexts.

Exercise Areas for Reducing Body-Related Avoidance and Checking Behavior

- Activities (e.g., undergoing a previously avoided medical examination)
- Locations (e.g., going to the swimming pool)
- Social activities (e.g., dancing)
- Clothing (e.g., wearing tight pants)
- Body care (e.g., applying lotion)
- Body positions (e.g., sitting down without crossing legs)
- Shape and weight control (e.g., refraining from weighing oneself after every meal)
- Reassurance (e.g., not seeking feedback on one's own figure)
- Social comparisons (e.g., not comparing oneself to slim friends)

First, it is necessary to identify the situations and locations in which a person's body-related checking behavior is exhibited. Based on this, the cognitions underlying avoidance and checking behavior should be highlighted and their appropriateness to reality should be examined. In the next step, specific exercise areas are worked out and the exposure exercises are planned in more detail. To prevent the exercises from being discontinued, potential problems that may arise during the exposure exercise are discussed in anticipation. It may be helpful for the therapist to accompany the patient during the first exposure exercises; however, the patient should later continue these exercises independently to facilitate the transfer to everyday life.

45.5 Building Positive Body-Related Activities

There is now initial research evidence for the observation that patients with AN and BN perform fewer positive body-related activities in everyday life than women without eating disorders. For this reason, interventions to build

positive body-related activities should be carried out, based on the exercises to reduce body-related avoidance behavior. The patients should learn to get to know their own body as an instrument with which they can have positive experiences, and not primarily perceive it as a burden. Corresponding exercises can be assigned to three content areas.

Areas for building positive body-related activities

- Health/Fitness (e.g., practicing yoga)
- Sensory experiences (e.g., smelling a perfume)
- Body care/Appearance (e.g., taking a bath with essential oils)

However, many patients with AN and BN exhibit excessive physical activities that can contribute to the maintenance of the eating disorder. Therefore, when planning the reinforcing activities, it is important to ensure that sports activities are only established in a functional (moderate) form for the treatment goals and are not carried out by the patients out of the motivation to burn calories.

45.6 Findings on the Effectiveness of Cognitive-Behavioral Interventions for Improving Body Image

Various studies have demonstrated the effectiveness of comprehensive cognitive-behavioral interventions for body image in patients with AN and BN. In the evaluation study of the body image therapy program presented above, the most significant therapy effects were found in terms of a reduction in body dissatisfaction and concerns about shape and weight, followed by improvements in body-related avoidance and checking behavior. While the assessment of one's own body dimensions did not change significantly towards a more realistic mental representation, the patients' desired "ideal figure"

was no longer considered to be as slim as at the beginning of therapy. Improvements were also observed in the number of binge eating episodes and the extent of striving for thinness, as well as in eating disorder-related measures such as depression and self-esteem. Initial evidence that these intervention effects also manifest in a more ecologically valid context was provided by another study. The emotional and cognitive reaction to looking at one's own body in the mirror after body image therapy was less pronounced than before treatment. Another study compared two variants of body image therapy and showed that the variant in which mirror exposure was performed was superior to a variant without this intervention. Initial indications for neural correlates of the effects of cognitive-behavioral body image therapy are provided by an fMRI study, which demonstrated increased activation of specific brain areas relevant for visual body processing after conducting a manualized body image therapy in patients with eating disorders.

In addition to these studies, which focus on more comprehensive body image treatment programs, several studies have been conducted examining only *one* treatment component—mostly body exposure—in terms of its effectiveness on the four described levels of body image disturbance. In research on the **perceptual component** of a negative body image, some studies have shown a more realistic assessment of one's own body dimensions through body image therapy, while other studies have not described any related effects. Studies on the change in the **affective component** provide promising results and showed that the implementation of body exposure exercises in patients with eating disorders leads to a reduction in negative body-related feelings both during the exposure exercises themselves and between therapy sessions. Furthermore, it was found that there are interindividual differences in the extent of this reduction. For example, a pronounced habitual body-related checking behavior predicted a

smaller reduction in negative emotions during the course of the body exposure session. With regard to the **cognitive component** of body image, numerous studies on women suffering from body dissatisfaction or eating disorders have shown that performing body exposure exercises leads to a reduction in negative body-related thoughts, shape and weight concerns, as well as a general improvement in body satisfaction. Also, regarding the **behavioral component** of body image disturbance, initial studies provide evidence of positive effects of body exposure in the form of a reduction in body-related checking and avoidance behavior, although most of these findings are based on the investigation of non-clinical samples.

A general limitation is that there are only a few randomized controlled studies on body exposure in patient groups so far, so the reported effects should be interpreted with caution. Moreover, there is a lack of studies on the effectiveness of other specific treatment components of body image therapy in relation to the four manifestation levels of disturbed body image.

Conclusion

The presented studies suggest the effectiveness of cognitive-behavioral interventions for body image in patients with eating disorders. However, many aspects have not yet been adequately researched, such as the question of the mechanisms of action of individual therapeutic modules. It is also unclear what factors are responsible for the interindividual differences in response to body image therapy. Since body exposure, in particular, is often perceived as temporarily stressful by patients, identifying predictors of success and failure in body image therapy is important. This would contribute to adapting the therapeutic approach to the needs of different patient groups and further improving the cost-benefit ratio of the interventions.

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Pharmacotherapy of Eating Disorders

46

Martina de Zwaan and Jana Svitek

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46.1 Anorexia Nervosa

46.1.1 Weight Restoration

The evidence for pharmacotherapy of anorexia nervosa (AN) is overall unsatisfactory for both antidepressants and antipsychotics (AWMF 2018). Primary outcome criteria were primarily weight criteria: extent of weight gain, speed of weight gain, duration of treatment until weight restoration, and number of patients who achieved sufficient weight gain. Only a few studies had longer follow-up periods, which are necessary to assess the clinical significance of weight effects

under pharmacotherapy. The available controlled trials on the use of **tricyclic antidepressants (TCA)** showed no significant efficacy on weight gain and depressive mood compared to placebo. **Selective serotonin reuptake inhibitors (SSRIs)** have also proven to be ineffective and are not likely to support weight gain (de Vos et al. 2014). Retrospective studies confirm this negative result for adolescents as well. SSRIs are often used in clinical practice in combination with psychotherapy for patients with AN, as an effect on comorbid disorders such as depression, anxiety, obsessive-compulsive symptoms, or bulimic symptoms is expected. However, it has been reported that antidepressants have little to no effect on comorbid symptoms in many patients in the underweight state. A low efficacy of antidepressants in the state of starvation can be assumed (Jordan et al. 2008). Comorbid disorders can improve solely through weight gain without additional specific therapy, so decisions about adjuvant pharmacotherapy should be made after weight gain. If depressive symptoms persist after sufficient weight rehabilitation, additional treatment with SSRIs should be considered.

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Furthermore, the risk of side effects in anti-depressant pharmacotherapy for AN is increased due to some specific conditions:

- Body weight is lower; distribution volumes are smaller.
- Considering the unregulated eating behavior and recurrent vomiting, oral intake is difficult.
- Cardiac side effects are more threatening due to the already existing cardiac risks.
- Electrolyte disturbances are more common. The risk of overlooking an induced syndrome of inappropriate ADH secretion (SIADH) is therefore higher.

► **Important** There is no evidence for the specific efficacy of antidepressants in AN. If antidepressants are used in the therapy of AN (e.g., for the treatment of depression), attention should be paid to side effects (e.g., cardiac side effects, SIADH).

In recent years, several small controlled trials (RCTs) on the effectiveness of **atypical antipsychotics** in AN have been published, leading to initial meta-analyses (Kishi et al. 2012; Dold et al. 2015). The average effect size for weight gain comparing verum and placebo was only 0.27 and 0.13, respectively. The extent of weight gain is thus surprisingly low. It is discussed whether physiological changes or a “resistance” at the behavioral level could be responsible for this low weight gain. Since the revision of the AWMF guideline (2018), a larger controlled trial with olanzapine has been published (Attia et al. 2019). Olanzapine was compared with placebo in the dose range of 2.5–10 mg over 16 weeks at five centers in the USA. A total of 152 patients were randomized, but only 83 completed the outpatient therapy phase. This high dropout rate was comparable in both groups. The BMI increase was 0.26 kg/m² in the olanzapine group and 0.1 kg/m² in the placebo group. Other psychological symptoms (e.g., compulsion) did not improve in this study.

Despite these not very encouraging results, a study from the USA shows that the prescription of atypical antipsychotics has increased in recent years (Fazeli et al. 2012). This is critical considering the numerous side effects, including a negative impact on bone density. Attention should also be paid to the development of extrapyramidal-motor side effects in atypical antipsychotics, especially since it is not known whether patients with AN may show a higher risk. Possible cardiac side effects of atypical antipsychotics (QTc time prolongation) should be particularly considered in patients with AN of the binge-purge type and require monitoring. Fat and glucose metabolism disorders (insulin resistance) can also occur in underweight patients.

The AWMF-S3 guidelines recommend the use of low-dose neuroleptics in individual cases for severely weight-anxious and food-restricted thinking, pronounced stress states, and uncontrollable urge to move. Drugs with low extrapyramidal impairment should be preferred. The treatment indication is limited to the duration of the aforementioned symptoms (no long-term therapy) and applies only within the framework of an overall treatment plan.

► **Important** Atypical antipsychotics are not suitable for achieving weight gain in AN. There is limited evidence that compulsive symptoms and ruminations can be favorably influenced by olanzapine.

A number of other substances have been tested in controlled and uncontrolled trials (cyproheptadine, clonidine, naltrexone, THC, dronabinol, lithium, D-cycloserine, benzodiazepines, oxytocin, growth hormone, and most recently metreleptin), but a satisfactory effect on weight gain could not be demonstrated. In addition, the use of these substances was accompanied by sometimes significant side effects (THC). Only the substitution of **zinc** proved to be effective in some patients (Birmingham and Gritzner 2006), but has not become established in clinical routine to date. Determination of zinc (and possibly

substitution) may be useful in the presence of typical skin changes as an indication of zinc deficiency.

- ▶ **Important** So far, no psychotropic drug has been approved for the indication of AN, so the use always represents an “off-label use.”
- ▶ **Important** Neuroleptics and antidepressants should not be used to achieve weight gain in AN.

46.1.2 Relapse Prevention

Initial controlled results showed a superiority of **fluoxetine** over placebo as relapse prevention one year after successful inpatient weight restoration. However, in a later larger study in which fluoxetine or placebo was combined with cognitive behavioral therapy (CBT) after weight restoration, the positive results could not be confirmed (Walsh et al. 2006). Overall, antidepressants cannot be recommended for relapse prevention in AN.

46.2 Bulimia Nervosa

46.2.1 Acute Therapy

In contrast to AN, a variety of different medications have been tested in controlled trials for the pharmacological treatment of bulimia nervosa (BN) (Mitchell et al. 2013): **TCAs** (amitriptyline, imipramine, desipramine, nomifensine), nontricyclic antidepressants (mianserin, trazodone, bupropion), **monoamine oxidase-inhibitors** (MAOIs) (phenelzine, isocarboxazid, tranylcypromine, brofaromine, moclobemide), **SSRIs** (fluoxetine, sertraline, fluvoxamine, citalopram), **appetite suppressants** (d-fenfluramine), **tryptophan, antiepileptics** (carbamazepine, phenytoin, topiramate), lithium, ondansetron, and opioid antagonists (naloxone, naltrexone). There are numerous reviews, meta-analyses, and guidelines

on the pharmacological treatment of BN (Svaldi et al. 2019).

Meaningful data are primarily available for substances from the group of antidepressants, with the greatest evidence and low side effect rates for SSRIs (Davis and Attia 2017). Antidepressants not only have a positive effect on binge eating and compensatory behavior, but also reduce eating disorder-specific psychopathological features such as dysfunctional attitudes towards body and weight. In most studies, a decrease in depressive and anxiety symptoms is also observed. Some studies explicitly excluded patients with depressive symptoms, and it appears that the response to antidepressants is independent of mood. A direct anti-bulimic effect of antidepressant substances is therefore assumed. The onset of action of antidepressant medication is often observed after the first week. However, an increase in restrictive eating behavior has also been observed under fluoxetine. This could prove countertherapeutic, as a crucial first step in the therapy of BN is the establishment of regular eating habits and a reduction in fear of weight gain. Restrictive eating behavior, on the other hand, can increase the risk of further binge-eating episodes in a vicious circle (AWMF 2018).

Fluoxetine is the only SSRI approved for the treatment of BN in Germany and many other countries, after two multicenter outpatient studies with large numbers of participants, but only in combination with psychotherapeutic measures. In the treatment of BN, a higher fluoxetine dose of 60 mg/day appears to be more effective than the dose of 20 mg/day recommended for the treatment of depression. It is generally recommended to increase the dose gradually, but there is also good experience with the immediate administration of the full dose of 60 mg/once, in the morning. The results of an open study suggest the efficacy of fluoxetine 60 mg/day in adolescents with BN, but no medication is approved for children and adolescents in this indication, and its use is only possible within the framework of an “individual treatment attempt”

according to § 41 of the Medicines Act. Smaller controlled trials are available for sertraline, citalopram, and fluvoxamine, but it must be critically noted that there is likely a bias in the publication of drug studies for BN. There are at least two unpublished studies of negative, multicenter, and multinational placebo-controlled trials with fluvoxamine that could not demonstrate the superiority of the drug.

In drug therapy, dropout rates can be considerable. Moreover, even with statistically significant superiority, the clinical effect is not substantial for many patients (AWMF 2018). Thus, remission rates after short-term therapy range from 0 to 68%, averaging about 24%. If no qualified psychotherapy is available, fluoxetine can be recommended as initial therapy. Antidepressants may prove helpful for patients with pronounced comorbid symptoms such as depression, anxiety, compulsiveness, and impulse control disorders or for patients who have not or only suboptimally responded to adequate psychotherapy.

► **Important** Psychotherapeutic treatments are more effective for patients with BN than pharmacotherapy alone. CBT and interpersonal psychotherapy (IPT) not only lead to better short-term results (reduction of binge eating by 85% with remission rates around 50%), but also to more stable long-term successes and are therefore considered the first-choice therapy for patients with BN.

More recently, an association between BN and ADHD in childhood and adolescence has been reported. In cases of confirmed comorbidity, treatment with stimulants (methylphenidate) or atomoxetine should be considered. Since appetite reduction occurs especially under methylphenidate, the risk of potential abuse must be monitored (Svedlund et al. 2017).

► **Important** TCAs and MAOIs have rarely been used in patients with BN and cannot be recommended. The toxicity and potential lethality in the case of overdose call

for extreme caution in suicidal patients. With the administration of MAOIs, the risk of hypertensive crises is not negligible in cases of very chaotic eating behavior. Bupropion is contraindicated in BN (and also in AN) due to an increased risk of seizures.

In the large multicenter studies with fluoxetine, sexual side effects (e.g., reduced libido) were common, and with a dose of 60 mg/day, sleep disturbances, nausea, and asthenia occurred in 25–33% of patients.

To achieve an optimal effect, it may be necessary to use different antidepressants sequentially. If there is an inadequate response to drug therapy, it should be checked whether the medication intake is closely related to self-induced vomiting. If serum levels are available for a drug, it can be checked whether an effective level has been reached at all.

In smaller controlled trials, the efficiency of the antiepileptic **topiramate** was demonstrated. Due to the numerous side effects (cognitive disturbances, paresthesias), the medication should only be used for BN if other drug therapy attempts have proven ineffective. The dose increase must be carried out slowly. The weight-reducing effect of topiramate further limits its use in normal and underweight patients.

Special mention should be made of **buproprion**. Although it achieved significantly better results than placebo, it is contraindicated in BN because it led to generalized seizures more frequently than expected.

Lithium is ineffective in the treatment of BN and carries the risk of overdosing due to fluid shifts. In patients with BN and bipolar disorder, the risk of toxicity is increased under lithium therapy. Both lithium and valproic acid can lead to significant weight gain, reducing the acceptance of these medications. An alternative “mood stabilizer” should be considered for comorbid bipolar disorder.

► **Important** Pharmacotherapy should not be offered as the sole treatment for BN.

46.2.2 Maintenance Therapy

The evidence for the use of fluoxetine as a relapse prevention is low, with loss of efficacy during long-term administration and high relapse rates after discontinuation of antidepressants being reported. Although corresponding data are lacking, a therapy duration of 9-12 months is generally recommended if the response is satisfactory. Increasing the dose or administering a second medication may be useful in cases of relapse during maintenance therapy. However, only open studies supporting this are available so far.

Conclusion

In summary, it can be stated that SSRIs, especially fluoxetine, must be considered the first-choice antidepressants due to their acceptance by patients, their favorable side effect profile, and symptom reduction. The effective dose of fluoxetine for BN is in a higher range (60 mg). An effect often occurs quickly, but little is known about the long-term effect. A treatment attempt should be undertaken with a minimum duration of four weeks. If the therapy is successful, a longer treatment duration can be considered. Other medications cannot be recommended for routine use in the treatment of BN at this time.

46.2.3 Combination of Psychotherapy and Medication

Pharmacotherapy does not necessarily have an additive effect to a psychotherapeutic approach in BN (ceiling effect). In some studies, the combination of cognitive-behavioral therapy (CBT) and an antidepressant showed the highest remission rates. In other studies, the additional administration of antidepressant medication to CBT showed only moderate or no additional effects on the reduction of bulimic symptoms. However, a superiority of combination therapy for the reduction of depression and anxiety has been reported. Combination therapy can therefore be

initially recommended, especially when a qualified CBT is offered simultaneously.

46.2.4 Sequential Therapy

Sequential therapy studies investigate the effectiveness of a second-line therapy in non-responders to a first-line therapy. If CBT alone does not lead to a significant symptom reduction after ten sessions, the additional administration of fluoxetine is recommended. Another possible indication may be relapse prevention after the completion of psychotherapy.

Conclusion

In summary, the use of antidepressant medications must be considered as a second-line therapy in the treatment of patients with BN according to current knowledge. It can be recommended to use antidepressants, if necessary, as a component, especially at the beginning of therapy.

46.3 Binge Eating Disorder

Overview

In the therapy of binge eating disorder (BED), several goals can be defined:

- Reduction of the frequency of binge eating episodes
- Reduction of eating disorder-specific psychopathology (e.g., overvaluation of weight and shape)
- Weight loss or prevention of further weight gain
- Improvement of general psychopathology (e.g., depression)
- Improvement of physical health

The therapeutic work on one of the goals should not negatively affect the other areas if possible. It is particularly important to clarify whether

eating behavior and weight should be treated in parallel or consecutively.

46.3.1 Reduction of Binge Eating Episodes

SSRIs and SNRIs are effective in treating BED; however, no medication is currently approved for the treatment of BED in Europe. Medications that have proven effective in the therapy of BN have been consistently used. In particular, **SSRIs** and **SNRIs** can effectively reduce binge eating episodes and comorbid depressive symptoms in short-term therapy. Remission rates are significantly higher than in studies of BN, with the average reduction of binge eating episodes in most studies being well over 60%. The dosages are again at the upper limit of the dosage recommended for the treatment of depression. It should be critically noted that response rates to placebo in the therapy of BED can also be very high and that, although pharmacotherapy proved more effective than placebo, the efficacy in relation to the core symptoms of BED was only slightly above that of a placebo medication (Hilbert et al. 2019). Results of open studies must therefore be evaluated with great caution, especially in the case of BED. Furthermore, the problem of relapses after the end of therapy is also encountered here. Long-term effects of psychotropic drugs in BED are not sufficiently researched; therefore, long-term use of psychotropic drugs for the treatment of BED cannot be recommended. As a rule, the decrease in binge-eating episodes is not accompanied by a significant weight loss, even though most studies find a higher weight reduction with verum than with placebo.

► **Important** It is a clinical reality that weight reduction usually remains the most important goal for these patients.

It is therefore assumed that patients will resume dieting after the end of therapy despite remission of binge eating episodes, thereby increasing their vulnerability to the recurrence of

binge eating episodes. However, we know from psychotherapy studies that complete remission of binge eating episodes is associated with a higher weight reduction.

Topiramate has also shown a positive effect on binge eating episodes and weight, but due to its problematic side effects (see BN), its clinical usefulness is limited.

In the United States, the amphetamine derivative lisdexamfetamine was approved for the treatment of BED (moderate to severe) in January 2015, after several studies with positive results had been published (McElroy et al. 2015; Hudson et al. 2017). The amphetamine derivative lisdexamfetamine is approved in Germany for the treatment of ADHD in children and adults.

Meanwhile, a meta-analysis of four studies is available, showing that lisdexamfetamine (50–70 mg) is superior to placebo in terms of reduction and remission of binge eating episodes as well as weight reduction. However, side effect rates and dropout rates are higher. The risk of cardiovascular side effects and addiction potential must be considered (Fornaro et al. 2016).

► **Important** Currently, no medication is approved for the treatment of BED in Europe. Psychopharmacotherapy using centrally acting stimulants (especially lisdexamfetamine), second-generation antidepressants, and anticonvulsants is effective but also leads to side effects. Therefore, it should only be considered for patients with BED if psychotherapy is rejected or unsuccessful.

46.3.2 Combination of Psychotherapy and Medication

The administration of antidepressant medication in addition to behavioral weight reduction programs or to eating disorder-oriented CBT does not appear to have any additional effect on reducing binge eating episodes, but in some cases, it may increase the extent of weight reduction or the extent of reducing depressive

symptoms. In the combination studies presented, psychotherapeutic interventions were generally superior to medication alone, so for BED, psychotherapy (CBT) must also be considered the first-choice therapy for reducing eating disorder-specific symptoms. Surprisingly, in the two combination studies with fluoxetine, no superiority of the medication over placebo regarding the reduction of binge eating episodes could be determined.

Conclusion

In summary, based on current knowledge, it can be stated that only fluoxetine in combination with psychotherapy is approved for the treatment of BN. No medication is approved for the treatment of AN and BED in Europe. For AN, no medication has proven effective in supporting weight reduction.

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Neuromodulation in Eating Disorders

47

Kathrin Schag

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47.1 Introduction

In this chapter, a brief introduction to various neuromodulation methods and their potential effectiveness in the treatment of eating disorders will be provided, as a significant proportion of patients with eating disorders still cannot sufficiently benefit from existing treatment methods. Neuromodulation methods represent an innovative treatment approach. Currently, promising studies have been published in this regard. It is assumed that in various forms of eating disorders, certain dysregulations in the brain play a role in the development and maintenance of the disorder, which can potentially be positively influenced by neuromodulation. Overall, however, the empirical basis is still thin, so

neuromodulation represents an innovative treatment approach, but by no means an evidence-based intervention for eating disorders. This chapter is based on a recently published narrative overview by Schag and colleagues on the topic of non-invasive brain stimulation in eating disorders (Schag et al. 2020).

47.2 Assumed Mechanisms of Action in the Treatment of Eating Disorders

Regarding neuromodulation, it is generally assumed that central nervous activity can be altered by specific stimulation and thus contribute to changes in a person's experience and behavior. An overview of the individual methods can be found in Fig. 47.1.

In eating disorders, it is assumed that various dysregulations in the brain likely contribute to the development and/or maintenance of eating disorder pathology. It is assumed that patients

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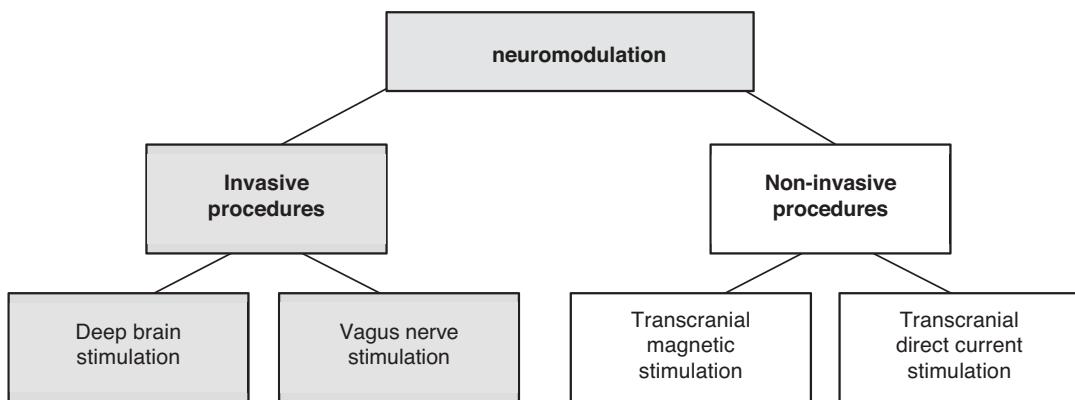


Fig. 47.1 Overview of common neuromodulation techniques

with anorexia nervosa (AN) show increased self-control, i.e., increased prefrontal activity, while patients with binge eating disorder (BED) and bulimia nervosa (BN) show reduced self-control (Schag et al. 2020; Schaumberg et al. 2017). Therefore, in various studies on eating disorders, the prefrontal cortex is specifically stimulated, as it is understood as the center of so-called cognitive control functions and can be directly addressed by neuromodulation (Plewnia et al. 2015; Schag et al. 2020).

47.3 Introduction to Neuromodulation Methods

► **Important** Neuromodulation includes various treatment techniques that can specifically modulate neuronal activity. To influence the brain, either a very weak electrical current or rapidly changing magnetic fields are used (Jauregui-Lobera and Martinez-Quinones 2018; Schag et al. 2020).

In principle, a distinction is made between invasive procedures, which require surgery, and non-invasive procedures, in which the brain is accessed via the skull surface (Schag et al. 2020; Val-Laillet et al. 2015) (see Fig. 47.1). The neuromodulation techniques most frequently

studied in mental disorders so far are deep brain stimulation and vagus nerve stimulation as invasive procedures, as well as transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) as non-invasive procedures (Schag et al. 2020). The decision as to which neuromodulation technique should be applied depends on the disorder, the location or size of the target, and the desired effect. Despite the possibility of reaching subcortical brain areas using invasive techniques, their use in eating disorders is rather rare due to the invasive nature and possible side effects such as pain in the surgical area and wound infections (Tracy and David 2015). Therefore, non-invasive neuromodulation methods have been primarily used in studies in patients with eating disorders (Schag et al. 2020). A more detailed description of non-invasive neuromodulation techniques can be found in the infobox.

Infobox: Non-invasive Neuromodulation Techniques (Schag et al. 2020)

Transcranial Magnetic Stimulation (TMS)

Transcranial magnetic stimulation (TMS) can alter brain activity by attaching a plastic-coated coil with rapidly changing magnetic fields to the skull surface. Repetitive TMS (rTMS), which sends multiple pulses over a short period,

is intended to support sustained changes in dysfunctional activation patterns (McClelland et al. 2013). A distinction is made between low-frequency (<5 Hz) and high-frequency (>5 Hz) rTMS. Low-frequency rTMS inhibits cortical activity, while high-frequency TMS increases cortical activity. In terms of patient safety, TMS is considered safe and has few side effects, although seizures have occurred in individual cases (Val-Laillet et al. 2015). There is strong evidence for the efficacy of TMS in treating depression and moderate evidence for treating hallucinations. Current studies are investigating, among other things, eating disorders, addiction, pain, and self-harming behavior (Tracy and David 2015).

Transcranial Direct Current Stimulation (tDCS)

In tDCS, cortical activity is modulated by a weak direct current (1–2 mA) flowing from an anode electrode to a cathode electrode. Activation usually occurs below the anode, while inhibition of cortical activity occurs below the cathode. Different effects can be achieved in specific regions and between hemispheres through various montages (McClelland et al. 2013). tDCS is considered a safe procedure. Only a few mild and short-term side effects, such as itching at the electrodes and temporary headaches, are known (Tracy and David 2015). tDCS is still less researched than TMS (McClelland et al. 2013); however, it offers promising initial treatment results for depression, stroke, and specific symptoms of schizophrenia (Tracy and David 2015). Of particular interest in tDCS is that stimulation can be combined with disorder-specific training tasks, and brain regions that are active during task processing can be specifically modulated (Plewnia et al. 2015).

47.3.1 Evidence regarding the effectiveness of Non-invasive Neuromodulation in Eating Disorders

So far, only very few studies in patients with eating disorders have investigated the effectiveness of neuromodulation, as neuromodulation is a very young field of research overall. Most studies on eating behavior have examined the influence of eating behavior in healthy or subclinically conspicuous samples (e.g., Hall et al. 2018). The study situation is also very heterogeneous, as very different stimulation techniques and protocols have been used in the study implementation, e.g., regarding the number of sessions, intensity and location of neuromodulation, and duration of individual modulation sessions. In patients with eating disorders, non-invasive methods have mostly been used, which will be the focus in the following. Surprisingly, many review articles have been written on the subject. However, Schag and colleagues (2020) identified only nine original studies regarding the effectiveness of non-invasive neuromodulation in patients with eating disorders. Another study has recently been published (Max et al. 2020). These ten studies can be categorized according to the disorder profile of the sample, the type of stimulation, or the stimulation site. The studies are described below based on the treatment goals pursued. An overview is provided in Table 47.1.

47.3.1.1 Treatment Goal Enhancement of Self-Control

As mentioned at the beginning, most studies on the effectiveness of neuromodulation methods in patients with eating disorders aim to increase self-control abilities, for example, to reduce the desire to eat and ultimately also food intake (Schag et al. 2020). This treatment goal is particularly important for patients with BN or BED, i.e., those affected by binge eating. To increase self-control abilities, the dorsolateral prefrontal cortex (DLPFC) was stimulated in all

Table 47.1 Studies on the effectiveness of neurostimulation methods in patients with eating disorders, sorted by treatment goals

Study	Diagnosis of the sample	Neuromodulation method	Stimulation site	Main results
Treatment goal: enhancement of self-control				
Van den Eynde et al. (2010)	BN	high-frequency rTMS	left DLPFC	Desire to eat and binge eating reduced in rTMS compared to SS
Gay et al. (2016)	BN	high-frequency rTMS	left DLPFC	No reduction in binge eating and vomiting
Guillaume et al. (2018)	BN	high-frequency rTMS	left DLPFC	Impulsivity improved in rTMS condition, no differences compared to SS
Burgess et al. (2016)	BED	tDCS (2 mA)	DLPFC (anodal right, cathodal left)	Desire to eat and food intake reduced in tDCS compared to SS, especially in men
Kekic et al. (2017) [†]	BN	tDCS (2 mA)	DLPFC (anodal left, cathodal right or anodal right, cathodal left)	Desire for binge eating reduced with tDCS compared to SS
Max et al. (2020)	BED	tDCS (1 mA or 2 mA)	DLPFC (anodal right)	Improvement in inhibitory control and reduction of binge eating with 2 mA tDCS
Treatment goal: reduction of self-control				
Van den Eynde et al. (2013) [†]	AN	high-frequency rTMS	left DLPFC	No decrease in desire to eat restrictively or exercise
McClelland et al. (2016)	AN	high-frequency rTMS	left DLPFC	Reduction of AN symptoms with both rTMS and SS, with rTMS tending to be stronger
Costanzo et al. (2018)	AN	tDCS (1 mA)	DLPFC (anodal left, cathodal right)	BMI increase in tDCS arm compared to family-based therapy
Treatment goal: reduction of eating disorder-related cognitions				
Van den Eynde et al. (2013) [†]	AN	high-frequency rTMS	left DLPFC	Feeling of being fat, fullness, and anxiety were reduced
Kekic et al. (2017) [†]	BN	tDCS (2 mA)	DLPFC (anodal left, cathodal right or anodal right, cathodal left)	Eating disorder-related cognitions are reduced with tDCS (anodal right, cathodal left) compared to other conditions
Mattavelli et al. (2019)	Various eating disorders	tDCS (1 mA)	medial prefrontal cortex (anodal), right extrastriate body area (anodal)	With tDCS, especially when stimulating the right extrastriate body area, women with EDs change their attitude towards food more than healthy women

[†] Listed twice due to thematically double assignment; DLPFC: dorsolateral prefrontal cortex; SS: sham stimulation

available studies (see Table 47.1). For example, in the study by van den Eynde and colleagues (2010), 38 patients with BN were stimulated with high-frequency rTMS on the left DLPFC. A so-called sham stimulation (SS) was used as a control condition. In SS, patients were told they would be receiving stimulation but

that the stimulation device would be turned off after a short time. Compared to SS, the desire for food was reduced when evaluating a standardized buffet in the stimulation condition, and the number of binge eating episodes within the next 24 hours also decreased. However, a similar study with 47 women with BN showed no

reduction in the number of binge eating episodes and vomiting after ten stimulation sessions with rTMS (Gay et al. 2016). In a subgroup analysis of this study by Gay et al. (2016), improvements in self-control abilities, so-called inhibitory control, were found in the stimulation condition, although these did not differ significantly from SS (Guillaume et al. 2018). The empirical evidence for rTMS on the left DLPFC is therefore heterogeneous.

Considering the studies using tDCS, a more consistent picture emerges: A study by Burgess and colleagues (2016) in patients with BED investigated the effectivity of tDCS on the DLPFC, with the anode placed on the right hemisphere and the cathode on the left hemisphere. The desire for specific foods and the amount of food intake in a sham taste test at a standardized buffet decreased compared to the SS condition. Another study with tDCS in patients with BN by Kekic and colleagues (2017) yielded similar results. In the randomized controlled trial, a reduced desire for binge eating and an increase in self-control abilities were also observed. This effect was independent of whether the left hemisphere was stimulated anodally and the right cathodally or vice versa. A recently published pilot study with tDCS in patients with BED by Max and colleagues (Max et al. 2020) suggests that the intensity of the stimulation plays a role: Improvements in self-control abilities seem to occur primarily with 2 mA stimulation, but not with 1 mA. Overall, these studies suggest that self-control can be enhanced and the desire for food reduced through neuromodulation.

47.3.1.2 Treatment Goal Reduction of Self-Control

Another, so far less comprehensively investigated approach is the reduction of self-control abilities through neuromodulation methods. The available studies on this subject focus on the reduction of restrictive eating behavior in patients with AN, as this represents the main symptom of the patients (Table 47.1). In these studies, the DLPFC was also targeted to reduce the often-present strictly controlled

overregulation of eating behavior to a normal level and thus promote weight gain.

For example, Van den Eynde et al. (2013) stimulated ten AN patients with high-frequency rTMS in a pilot study. However, there was no reduction in the desire for self-control abilities, restrictive eating, or exercise. A more recent study with a larger sample and a SS as a control condition, however, showed that a session with high-frequency rTMS at least tended to reduce AN symptoms and also improved performance in a decision-making task, which is an indicator of increased cognitive flexibility (McClelland et al. 2016). Costanzo and colleagues (2018) were ultimately able to demonstrate in a current neuromodulation study that regularly performed tDCS in adolescents with AN, in addition to standard treatment, led to a significant increase in body mass index (BMI) compared to standard treatment with additional family therapy. This is a promising result, which, among other things, suggests that the number of stimulation sessions may also play an important role. In this study, 18 sessions were conducted, while in the two previously mentioned studies, only one session was conducted. Overall, the studies indicate that neuromodulation methods also have potential in the treatment of AN.

47.3.1.3 Treatment Goal Reduction of Eating Disorder-Related Cognitions

Eating disorder-related thoughts and feelings about food, body shape, and weight represent both a risk factor and a consequence of eating disorders. Therefore, there are also efforts in this direction to reduce eating disorder-related cognitions by neuromodulation. Two already described studies, in which the DLPFC was stimulated, also addressed this issue (Kekic et al. 2017; Van den Eynde et al. 2013). Van den Eynde and colleagues (2013) found, in their rTMS study with AN patients, that there was no change in self-control abilities. However, the feeling of being fat, the feeling of fullness, and the associated anxiety were reduced after rTMS. Kekic and colleagues (2017) also observed an

improvement in eating disorder-related cognitions in their tDCS study with BN patients. This improvement was only seen with anodal stimulation of the right hemisphere and cathodal stimulation of the left hemisphere, and not in the reverse condition.

Another study, by Mattavelli and colleagues (2019), pursued an interesting approach in which they attempted to change so-called implicit attitudes, i.e., internalized and unconscious attitudes, towards food and body image. In this study, not the DLPFC, but the medial prefrontal cortex or the extrastriate body area were stimulated compared to a SS in women with various eating disorder diagnoses and compared to healthy women. In an implicit association test, which checks implicit attitudes, it was found that after stimulation of the extrastriate body area, patients rated tasty foods more positively and their preferences aligned with those of healthy women. However, body image remained unaffected by both stimulation conditions. Overall, these three studies suggest that neuromodulation of various brain areas can influence eating disorder-related cognitions.

47.4 Conclusion and Outlook

Neuromodulation represents an innovative approach for the treatment of eating disorders and for the treatment of various eating disorder symptoms, particularly self-control abilities, in relation to eating behavior. According to the available evidence, neuromodulation methods have great potential in the treatment of eating disorders. Central symptoms of various eating disorder diagnoses could be altered by neuromodulation, including binge eating (Van den Eynde et al. 2010), eating disorder-related cognitions (Mattavelli et al. 2019), and restrictive eating behavior (McClelland et al. 2016). Stimulation of the DLPFC has shown promise, while stimulation of other brain regions has been less investigated. More consistent results were found for tDCS compared to rTMS.

However, the current state of research does not yet provide a sufficient basis for the implementation of neuromodulation methods in clinical practice. Further studies are needed to clarify which specific type of neuromodulation, with which specific parameters, can help with which eating disorder symptoms. The effect of neuromodulation on body schema disturbance and related body and weight concerns has also been scarcely investigated. A promising approach would be to combine training programs with neuromodulation to directly target the problem behavior (Plewnia et al. 2015). Ultimately, nothing is known about the sustainability of the effects found so far. For these points, further basic research and randomized controlled trials with larger samples and control conditions, as well as standardized treatment protocols, are necessary.

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Inpatient and Day Hospital Treatment for Eating Disorders

Almut Zeeck

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48.1 Significance of Inpatient and Day Hospital Treatment

Eating disorders are often chronic diseases, which require **long-term treatment planning**. In general, outpatient treatment measures are sufficient (Herpertz et al. 2019). This applies especially to the treatment of bulimia nervosa (BN) and binge eating disorder (BED). However, if outpatient treatment is not sufficient due to the severity, chronicity, or complexity of the symptoms (e.g., in cases of comorbidity requiring treatment, suicidality, or medical complications), day hospital or inpatient therapy may be necessary. In the case of anorexia

nervosa (AN), inpatient treatment is most often indicated due to the physical risk and pronounced fear of weight gain, and in some cases, it may be the primary entry point into a longer-term therapy process (Zeeck 2018).

There are hardly any studies comparing treatment settings for patients with comparable symptom severity (Herpertz et al. 2019). In addition, the conditions under which eating disorders are treated in an inpatient setting vary greatly. Concepts and treatment duration are determined less by patient characteristics (e.g., disorder severity) than by organizational, economic, and tradition-related conditions of different countries or hospitals (see, for example, Kordy 2005; Föcker et al. 2017). There are only a few studies on inpatient treatment of BN and BED (Herpertz et al. 2019).

The current situation of inpatient treatment is characterized by increasing economic pressure, which has led to a shortening of treatment durations. However, especially for first-time hospitalizations for AN, it should be ensured

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that patients have sufficient time to reach an adequate weight. This reduces the risk of chronicity and rehospitalizations. Inpatient treatment should not be seen as a “last resort” but rather also as a treatment option that offers specific therapeutic opportunities.

- **Important** Eating disorders are often chronic diseases. Inpatient treatment phases may be necessary, especially for anorexia nervosa.

48.1.1 Overall Treatment Planning

The course of an eating disorder usually spans several years, during which there may be multiple therapy episodes (e.g., outpatient, inpatient, day hosp). The diversity of problem areas (psychological, familial, medical, social) also requires **collaboration among various practitioners**. In clinical practice, the sequence of treatment phases and the number of people involved are often unclear and poorly coordinated. This contrasts with the recommendations of the S3 guideline, which states that the treatment providers involved (psychotherapists, specialist physicians, hospitals, outpatient clinics, nutritionists, counseling centers) should ensure close cooperation and coordination (Herpertz et al. 2019).

The term “overall treatment planning” also implies that the patient’s previous course of illness should be kept in mind and **previous therapy experiences** should be taken into account when deciding on further action. For example, for a patient with chronic BN and borderline personality disorder, a day hospital stay instead of an inpatient stay may be useful, despite severe symptoms, if she was able to reduce her bulimic symptoms well in an inpatient setting multiple times but relapsed shortly after discharge. Day hospital treatment may lead to a slower symptom reduction, but one that has been “tested” in everyday situations. Day hospital treatment would also allow a patient to maintain her social contacts, which is particularly

important in cases of long-term illness and frequent hospital admissions.

Special attention should also be paid to the admission and discharge situations. Prior to admission, the focus is primarily on clarifying treatment motivation, discussing the framework conditions and, if necessary, a treatment agreement, and clarifying the objectives for the upcoming treatment phase. Discharge is associated with a risk of relapse, so anticipating this is important, including targeted preparation for the situation outside the hospital. It should be considered that patients are responsible for all meals after discharge and therapeutic support is reduced from several hours per week to 1–2 hours. Good arrangements with the psychotherapist providing continuing treatment and the primary care physician, as well as clear rules for the possibility of readmission, help ensure the continuity of treatment—as does targeted preparation for the subsequent outpatient situation with practice elements (e.g., regarding grocery shopping and meal preparation) and conversations with primary caregivers for children and adolescents (Herpertz et al. 2019; Herpertz-Dahlmann et al. 2015).

All involved practitioners should have experience in the therapy of eating disorders.

- **Important** Coordination among the involved practitioners and targeted, long-term therapy planning are necessary to enable continuous and coordinated treatment.

48.1.2 Differences Between Inpatient and Day Hospital Programs

The establishment of day hospital programs for patients with eating disorders is a relatively recent development in Germany. Day hospitals can take the form of independent units or integrated concepts that allow for a gradual approach: patients are initially admitted as inpatients and switch to a “partial hospitalization

status” some time before discharge (they spend evenings and weekends at home). While inpatient therapy involves removal from the everyday life context, day hospital treatment involves the daily alternation between intensive treatment in the hospital and return to everyday life (Zeeck et al. 2020).

When comparing inpatient and day hospital settings, each has specific advantages and disadvantages. The advantages of inpatient treatment include the constant availability of people to provide help, the ongoing provision of a daily and mealtime structure, all-day monitoring in case of physical endangerment, and distance from potentially stressful or recovery-hindering relationship contexts at home. The disadvantage of inpatient therapy lies in the artificial situation of the inpatient milieu, which emphasizes caring and protective aspects. Some patients find it difficult to cope with the demands of everyday life after a longer treatment. Especially for young patients, it should be considered that they are removed from school and their circle of friends for several months, thus missing important age-appropriate experiences.

Therapy in a day hospital program emphasizes independence and personal responsibility. Patients are challenged to spend and structure evenings and weekends outside the hospital, which can lead to feelings of overwhelm on the one hand, but also strengthen the perception of having achieved changes on their own. Proximity and distance to others are easier to regulate in a day hospital, which can be particularly beneficial in the treatment of patients with comorbid personality disorders. In the day hospital context, aspects of therapy can be tried out at home on a daily basis. On the other hand, difficulties from everyday situations outside the hospital continuously flow into the therapy (e.g., difficulties with eating, but also problems with family or partner). This can be particularly therapeutically useful when it comes to preparing for the time after the clinic. The disadvantage of day hospital treatment is that patients who tend to be secretive and hide their difficulties can more easily maintain pathological behaviors unnoticed.

48.1.3 Goals

Physical stabilization A primary goal of inpatient and day hospital treatment is initially physical stabilization, which includes adequate weight gain for patients with AN and a reduction of self-induced vomiting or laxative abuse for patients with BN. To achieve this goal, structured work on normalizing eating behavior and food composition, as well as accompanying physical monitoring is required. If severe comorbid disorders are present, a hierarchy of therapy goals may be necessary—and in individual cases, even a postponement of work on eating disorder symptoms (for example, in cases of acute suicidality or severe self-harm).

Motivation An important prerequisite for treatment and at the same time a goal to be pursued is sufficient motivation for a change process. If this is very limited or not present, the treatment should initially focus on the ambivalence of the patients with regard to a change. This can take place within the framework of a motivation phase preceding the inpatient therapy or in the form of an initial motivation period. Fellow patients who already have therapy experience can play an important supportive role here.

Providing support Weight gain or giving up bulimic behavior can be associated with such strong fears and feelings of insecurity that an outpatient setting is not sufficient. In this case, inpatient or day hospital treatment has the function of providing a supportive and secure framework in which the emerging fears can be addressed promptly.

Conflict resolution During inpatient or day hospital treatment, an attempt should be made to create the prerequisites for outpatient follow-up psychotherapy treatment. In addition to physical stabilization and sufficient motivation, this includes identifying central psychological problems and conflicts that play a significant role in the development and maintenance of the disorder (e.g., fears of maturation, problems with

affect regulation, self-esteem conflicts, dysfunctional interaction patterns, dysfunctional coping strategies in the family).

Structuring daily life after discharge For chronically ill and socially very isolated patients, inpatient or day hospital treatment may aim to achieve a higher quality of life by structuring the daily routine and rebuilding social contacts and activities outside the clinic.

Goals of Inpatient or Day Hospital Treatment for Eating Disorders

- Physical stabilization
- Normalization of eating behavior (meal structure, meal composition)
- Development of sufficient motivation
- Identification of central psychological problem areas
- Improvement of concomitant psychological symptoms (e.g., depression, anxiety, self-harm)
- Working on central dysfunctional relationship patterns
- Support with problems in the social environment

48.1.4 Elements of Inpatient and Day Hospital Treatment

Inpatient therapy programs are generally multimodal, allowing for a combination of therapy elements that cannot be offered simultaneously in an outpatient setting. Programs for eating disorders should include the following elements (Herpertz et al. 2019):

- structured, symptom-oriented components (concrete work on eating and, if necessary, exercise behavior, e.g., using food diaries, accompanied eating and cooking [“eating support”]; for AN, the agreement on a target weight and weekly targets for weight gain, regular weighing, graded exercise programs)

- medical treatment and, for AN, regular discussion of the weight curve
- components targeting the psychological difficulties of patients (disorder-oriented individual and group therapy, body therapy, specialized therapies such as art or music therapy)
- sessions with family members (especially for children and adolescents)

In the design of treatment programs, there is a trend away from rigid behavior modification programs towards more flexible approaches that take into account the individual development of each patient. However, the specification of a daily and meal structure and supervision of eating behavior are necessary prerequisites for changing disturbed eating behavior.

Inpatient and day hospital programs for eating disorders in Germany have many similarities, although a distinction must be made between hospital treatment and rehabilitation. Hospital treatment focuses on intensive treatment of symptoms, while rehabilitative treatment focuses on restoring the capacity to work after a longer illness process. The concepts are based on either cognitive-behavioral or psychodynamic orientation. Stand-alone day hospitals for eating disorders are still rare but are gaining importance. On the other hand, “stepped-care” approaches, which allow for a gradual reduction in treatment intensity (inpatient—day clinic—outpatient), have increased significantly. When transitioning from inpatient to day hospital treatment, the treatment team and patient group should ideally not have to change. This is possible if an inpatient treatment unit has “integrated” places for partial hospitalization (see also Zeeck et al. 2020).

Inpatient or day hospital treatment always involves treatment in a group of patients. Patients with eating disorders benefit from the exchange with other affected individuals, and the therapeutic “milieu” of a hospital also allows for important relationship experiences and work on dysfunctional interaction patterns, which are not possible in this form in an outpatient setting.

For young patients with AN who still live in their family of origin, it is essential to involve the family in the therapy in the form of family sessions, unless there are valid reasons against it.

48.2 Anorexia Nervosa

48.2.1 Indication

The indication criteria for inpatient therapy for AN are shown in Table 48.1. The weight (BMI) should not be the sole criterion for indication, but the overall physical condition, social situation, history, and severity of mental impairment should also be taken into account. Furthermore, inpatient treatment should not only be considered as a last step in cases of severe physical instability, as a more complicated treatment course and increased risks during weight gain can be expected in such a situation.

In most cases of AN, an initial inpatient treatment phase is preferable to a day hospital treatment. The question of differential indication—i.e., when inpatient therapy is indicated and when day hospital treatment is indicated—has so far been insufficiently investigated empirically. In most cases where outpatient therapy is not sufficient, inpatient therapy initially seems indicated, providing all-day structure and support—even if only for a few weeks. To prepare for discharge or to shorten inpatient treatment, a subsequent day hospital phase may be useful (see above). Day hospital treatment is recommended when patients are not extremely underweight ($BMI \geq 15 \text{ kg/m}^2$ or $> 3\text{rd}$ BMI age percentile), show good motivation, or when it is possible for children and adolescents to continue therapy with the same treatment team after a short inpatient stabilization phase and to involve parents intensively (Herpertz-Dahlmann et al. 2014). Chronically ill patients, for whom the focus is less on weight gain and more on improving social integration and quality of life, can also benefit from a day hospital episode that continuously incorporates their everyday life into therapy.

48.2.2 Treatment Agreements

Treatment should initially focus strongly on improving the symptoms of disordered eating behavior. Clear agreements between the treatment team and patients have proven effective and are more likely to lead to sufficient weight gain. They should include a target weight and arrangements for weekly weight gains and weighing appointments. Empirical studies suggest that in AN, achieving the highest possible weight ($BMI \geq 18.5 \text{ kg/m}^2$; for children 25th BMI age percentile, but at least the 10th BMI age percentile) and resuming/starting menstruation should be aimed for to reduce the risk of relapse.

The guidelines recommend weight gain targets of 500–1500 g per week.

If patients can experience maintaining the achieved weight for a certain period of time while still in an inpatient setting (“stabilization phase”), this seems to be associated with a lower risk of later relapses and rehospitalizations (Gross et al. 2000).

48.2.3 Characteristic Difficulties

The inpatient treatment of patients with AN leads to characteristic difficulties in the treatment teams. Feelings of frustration, worry, powerlessness, and anger may predominate, leading to the impulse to control a patient and enforce changes. Disagreement within the team about the most appropriate approach can make constructive work more difficult. In this context, the framework of a therapy agreement can provide orientation and relief. Characteristic are regular disputes with patients about eating and weight gain. Regular exchange within the team and supervision are helpful in ensuring a constructive treatment process.

Patients with AN tend to manipulate their weight (drinking fluids, etc.) and to undermine treatment in order to maintain a sense of control

and autonomy. This behavior should ideally not lead to the termination of treatment, but should be examined with the patient in terms of its function. The therapeutic stance should be clear and consistent with regard to therapy goals and overall rules of conduct, but also empathetic and flexible.

Due to the ambivalence of patients regarding treatment, there is a risk of premature treatment terminations and relapses after discharge. Factors associated with an increased risk of dropout include the binge-eating/purging subtype of AN, a pronounced fear of growing up, more severe psychopathology, a personality disorder, greater weight concerns, and a low desired weight (Herpertz et al. 2019). Patients admitted with a BMI < 13 kg/m² have a particularly high risk of chronicity and increased mortality rates. Even among patients who achieved remission during inpatient treatment, relapse rates of approximately 40% are found in the first year after discharge. Here too, the binge-eating/purging subtype has a higher risk (Carter et al. 2012).

Table 48.1 Indication criteria (see AWMF-S3 guideline; Herpertz et al. 2019)

Anorexia nervosa—inpatient treatment	Bulimia nervosa—(partial) inpatient treatment
<ul style="list-style-type: none"> • Rapid or persistent weight loss (>20% over 6 months) • Severe underweight (BMI < 15 kg/m², in children and adolescents below the 3rd age percentile) • Persistent weight loss or a stagnant (under)weight for 3 months despite outpatient or day clinic therapy (in children and adolescents, even earlier) • Social or familial factors that strongly hinder the recovery process (social isolation, problematic family situation, in children and adolescents also: insufficient social support) • Severe mental comorbidity/suicidality • Insufficient outpatient treatment options • Severe bulimic symptoms, massive laxative or diuretic abuse, or excessive exercise that cannot be controlled on an outpatient basis • Physical endangerment or medical complications • Especially in children and adolescents: low illness insight • Overwhelmed in the outpatient setting, if it provides too few structured guidelines (meal structure, amount of food, feedback on eating behavior); in children and adolescents: breakdown of family resources 	<ul style="list-style-type: none"> • Insufficient effectiveness or lack of possibility for outpatient psychotherapy • Severe mental comorbidity (e.g., suicidality, severe self-harm, poorly controlled diabetes mellitus, drug or alcohol dependence) • A strong physical endangerment, eating disorder-related complications of pregnancy, or other severe medical complications • Massive laxative or diuretic abuse • Severe, uncontrolled bulimic symptoms that require closely structured guidelines for change • Circumstances in the patient's environment that hinder a successful psychotherapeutic process

48.3 Bulimia Nervosa

48.3.1 Indication

Most patients with BN can be treated on an outpatient basis. However, more intensive therapy may be appropriate under certain conditions (see Table 48.1). Individual studies have shown the effectiveness of day hospital treatment. A smaller randomized controlled trial comparing inpatient with day hospital treatment showed that both settings were equally effective in the short term. However, patients with BN may benefit more in the long term from a day clinic setting, which better prepares them for the time after discharge due to the daily "practice situation" (Zeeck et al. 2009).

48.3.2 Treatment Agreements

Similar to the treatment of AN, it has proven effective to combine structured

symptom-oriented elements with elements that address patients' psychological difficulties (self-esteem issues, perfectionism, difficulties in affect regulation, interpersonal problems). Patients with BN also have a negative body experience and a pronounced fear of weight gain, especially when normalizing their eating behavior and giving up compensatory behaviors such as vomiting and laxative abuse. A supportive body therapy offer is therefore useful. As part of a multimodal treatment, it is also indicated to identify social difficulties (isolation, indebtedness, difficulties in professional and educational situations) and to offer appropriate support to patients.

48.4 Binge Eating Disorder

48.4.1 Indication

In the case of BED, clinical treatment is rarely indicated. Exceptions are patients with comorbidity requiring treatment, in which a combination of different therapy options is necessary (individual and group therapy, body therapy, medical care) or the symptomatology with binge eating is so severe that external control and structuring are required.

48.4.2 Goals

In the case of BED, the objective of a day hospital or inpatient treatment is to reduce psychological impairment, normalize eating behavior, identify central problem areas (and thus the function of the eating disorder), and address social difficulties. In addition, the goal is a slow but continuous weight reduction. Planning for outpatient follow-up treatment is of great importance to ensure long-term stabilization.

48.5 Conclusion

- Patients with eating disorders should be treated in clinics that offer specialized programs for eating disorders.

- Inpatient treatment phases are primarily needed for anorexia nervosa.
- For bulimia nervosa and binge eating disorder, specialized day hospital or inpatient treatment is only required for severe eating disorder pathology and comorbidity, or if outpatient therapy did not lead to sufficient symptom reduction.
- Day hospital and inpatient treatment programs for patients with eating disorders should include both structured, symptom-oriented treatment elements and those that address further psychological difficulties of the patients.

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Self-Help in Eating Disorders

49

Cornelia Thiels and Martina de Zwaan

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49.1 Why Self-Help?

Self-treatment approaches have been discussed for some time as an alternative to existing psychotherapeutic and pharmacological treatment approaches, including in the context of “stepped-care models” (Mitchell et al. 2011; Ramklin et al. 2012). The majority are based on therapy manuals that contain essential elements of CBT approaches. In therapy research, a stepped-care approach to the treatment of mental

disorders has been advocated in recent years, not least for economic reasons. The first step consists of “low-threshold” therapy approaches. In the literature, terms such as self-help (SH), self-treatment, self-change, or bibliotherapy are used. In the revised S3 guideline (AWMF 2018), “self-management” is used instead of self-help, as the studies included in the meta-analyses are approaches based on structured evaluated programs and thus differ from traditional self-help groups. Self-help manuals have been developed that follow the guidelines of cognitive-behavioral therapy approaches (CBT approaches) and can be carried out independently by those affected with minimal therapeutic guidance (guided, GSH) or without (pure, PSH). Such self-management programs for patients with eating disorders are available in online and offline versions and range from pure self-help using a book (bibliotherapy), an app, or a computer program to programs with occasional therapist

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contact and guided self-help programs. In addition to personal contact, these therapist contacts can take place in an audio and video chat program or in writing in a chat or by email, with the latter allowing asynchronous communication. The supportive brief contacts take less time than psychotherapy sessions, and their content is not psychotherapeutic in the strict sense.

The number of people with eating disorders far exceeds the number of available therapy places. SH can be used to shorten the wait for specialized treatment. The majority of those affected by bulimia nervosa (BN) and binge eating disorder (BED) do not seek professional help but could be reached through SH offers. Another advantage of SH is its availability at any time and in (almost) any place, depending on the SH materials (Beintner and Jacobi 2017). Patients who do not speak the local language well can use SH materials in other languages. It is also worth examining whether SH might be suitable for replacing specific and expensive psychotherapeutic treatments.

Possible advantages and disadvantages of self-help approaches are presented below (Yim and Schmidt 2019).

Advantages of Self-Help

- Therapy without waiting time, possibly bridging treatment during waiting time
- Optimization of treatment access for patients who are underserved for various reasons (e.g., due to local conditions, lack of therapy places, etc.)
- Constant quality of self-help programs that can be easily copied or disseminated
- High acceptance among many patients, respects privacy, less threatening (e.g., shame)
- Reduced stigmatization
- Cost-effective (Lynch et al. 2010)
- Usage independent of time and place (patients can work on material at a convenient learning time and pace)
- Materials can be processed repeatedly
- Self-efficacy is increased
- Guidance by non-specialists possible

Disadvantages of Self-Help

- Motivation problems
- High rejection rates
- High dropout rates
- Adherence not optimal
- Minimal therapeutic support
- Overwhelmed patient, feeling left alone
- Self-efficacy decreases due to lack of success
- Appropriate responses in crisis situations (e.g., suicidality) only possible to a limited extent
- No funding in standard care

49.2 What is Self-Help?

Self-help can be pure (PSH) or guided (GSH). PSH is independent of additional appointments with professional or lay helpers (coach), as offered in GSH.

In the following, the focus is not on SH groups and internet portals that only provide information about eating disorders and the opportunity for affected individuals to exchange with one another, but on SH treatments that are based on a clear disorder and treatment model. This is offered in the form of books, videos, CD-ROMs, or via the internet. Affected individuals receive information about their illness and are taught specific skills for solving and dealing with health problems. Participants in SH treatments follow the advice in the SH material, carry out tasks, and evaluate the success of their efforts.

49.3 Self-Help Guide

The self-help (SH) guide typically includes:

- explanations of the SH material,
- answering questions,
- promoting motivation,
- support and adaptation of the SH program to individual needs.

Furthermore, there is the possibility for

- diagnosis,
- ongoing risk assessment,
- if necessary, referral to other, usually more intensive treatments.

Not only has personal guidance in SH proven effective, but also guidance via telephone or email. Worksheets can be helpful in providing guidance. It may be sufficient to involve relatively inexperienced individuals in the treatment of eating disorders for guidance, as long as they are trained, provided with training and self-evaluation materials, and closely supervised. It has been shown that this “train-the-trainer” implementation strategy can be successful in the therapy of recurrent binge eating (Zandberg and Wilson 2013). There is evidence of an association between the quality of the relationship between the trained coaches and the patients and the success of GSH. Patients generally report positive experiences with their coaches and feel supported by their respect, interest, flexibility, and responsiveness to their needs.

perspective for crisis situations, combined with the question of whom the patient can turn to if she cannot continue with SH or if questions arise.

So far, it is not known whether PSH as a first therapy step can also have negative consequences, such as discouragement in the absence of improvement. However, if the indication for SH is made as support during an unavoidable waiting period for GSH or conventional psychotherapy, this risk is probably lower than if SH is offered as the sole treatment. Other patients experienced GSH as an opportunity to more easily find their way into more intensive treatment. GSH can help shorten and/or focus conventional psychotherapy more on comorbid disorders such as depression. The chance that patients with BN or BED will participate in GSH decreases with increasing waiting time. In a Swedish study, the dropout rate was significantly reduced after reducing the waiting time.

► **Important** For those with high treatment motivation and rather mild symptoms, GSH may be sufficient.

49.4 For Whom Is Self-Help Suitable?

The more motivated and ready for change the patient, the milder the eating disorder, the less comorbidity (including personality disorders), and the more supportive the social environment, the less therapeutic attention is likely to be required. However, even multi-impulsive bulimic patients can benefit significantly from GSH, although they seem to fare worse compared to non-multi-impulsive and less depressed control subjects. Other studies were unable to confirm that different degrees of depression influence the success of PSH or GSH. Realistic expectations, sufficient time for working through self-help materials, and personal appointments with the coach have been shown to be prognostically favorable (Jones et al. 2012).

A prerequisite for the indication of SH is the examination of whether the patient has previous experience with SH treatments and how successful they were. It is important to discuss a

49.5 Anorexia Nervosa

SH for patients with AN has been scarcely investigated (Zeeck et al. 2018). In a German study, an SH manual, combined with weekly telephone guidance over a period of six weeks while waiting for an inpatient therapy place, was well accepted by many patients with the binge-eating/purging subtype of AN. The duration of the subsequent hospital stay was significantly shortened compared to control subjects without an SH manual (Fichter et al. 2008). However, GSH is probably not sufficient as the sole or only therapy for patients with AN, also due to the existing risk of medical complications.

49.6 Bulimia Nervosa

The effectiveness of SH manuals has so far only been empirically verified in isolated cases, such as the manuals by Schmidt et al. (2016)

and Fairburn (2004), which are also available in German. The German S3 guidelines for the diagnosis and therapy of eating disorders (AWMF 2018) highlighted the effects of self-help methods, although they are less pronounced compared to classical psychotherapeutic methods. At the end of the self-help treatment, an average of 17% of patients were symptom-free, with respect to binge eating and vomiting. In comparison to conventional individual and group therapy, symptom reduction occurs more slowly, sometimes even only during the follow-up period. The question of whether non-psychotherapists, such as general practitioners, can lead GSH is controversial, and further studies are needed to make valid statements. Qualitatively and quantitatively adequate guidance, i.e., good training or supervision, improves the success of therapy.

► **Important** For some patients with BN, participation in an evidence-based self-management program can be recommended, which is carried out under therapeutic guidance (“guided self-help”) and is based on elements of cognitive behavioral therapy (Svaldi et al. 2019).

49.7 Binge Eating Disorder

In a recent meta-analysis (Hilbert et al. 2019) on the efficacy of structured, manualized self-help, 15 study conditions with 453 participants were included, of which eight were guided structured self-help treatments, and seven were unguided but structured self-help treatments. In five treatment conditions, group treatments were conducted, and in ten conditions, individual treatments were carried out. The majority of the structured self-help programs were cognitive-behavioral therapy-oriented (seven of eight guided and five of seven unguided treatments). In terms of study quality, the self-help studies predominantly showed a low or unclear risk of bias. The content of structured self-help largely corresponded to that of CBT. Patients usually receive appropriate work materials (e.g.,

in book form), in which information on BED and the individual therapeutic steps for overcoming binge eating are manualized. It should be noted that the self-help interventions included in the analysis are based on scientifically tested psychotherapeutic treatment measures and have been professionally transferred to this treatment format.

► **Important** For structured, manualized self-help, particularly with treatment elements of CBT, there is evidence of efficacy, so it should be recommended for patients with BED. However, compared to psychotherapy, structured, manualized self-help is less effective (de Zwaan et al. 2017).

49.8 Conclusion and Outlook

A classical psychotherapy, usually in individual therapy and less often in group therapy settings, is not reliably available. The current state of research indicates a superiority of self-help (SH) over waiting groups in terms of eating disorder symptoms and other psychological symptoms. Especially guided self-help (GSH) can be a sensible first therapy option for bulimia nervosa (BN) and binge eating disorder (BED) (Traviss-Turner et al. 2017). If necessary, a more intensive conventional psychotherapy can follow.

Self-help offers can contribute to the treatment of eating disorders, both as a standalone treatment option and as part of an overall treatment plan. In some cases, the efficacy of manualized self-help programs may be comparable to that of conventional treatment options. The indication for self-management must be individually assessed for each patient. If the effect is not achieved, more intensive treatment options should be offered early on. Adherence and treatment progress should therefore be regularly monitored.

For mental disorders such as anorexia nervosa (AN) and bulimia nervosa (BN), which predominantly affect young people, books are increasingly being replaced by electronic media.

Therefore, the use of these new media is also suitable for psychotherapeutic purposes, and they are increasingly being used in the context of SH treatments. The use of modern media in the treatment of eating disorders is reported in Chapter 50.

► **Important** Even if it is not certain whether GSH is sufficient as a treatment, it is at least suitable as a first treatment option that can be supplemented if necessary. This can provide more people with access to evidence-based treatments.

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Use of Modern Media in Prevention and Treatment

50

Stephanie Bauer

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50.1 Forms of Digital Interventions

In recent years, there has been an increase in proposals for the use of information and communication technologies (“E-mental health”) in the prevention and treatment of eating disorders. These technology-supported interventions are expected to improve the reach, accessibility, and availability of support services. Furthermore, it is assumed that programs that provide low-threshold access to information and support via the internet are less susceptible to barriers such as uncertainty, shame, and stigmatization, which can hinder the use of professional help, compared to conventional (face-to-face) offers.

Available programs vary significantly in terms of the underlying concepts and the technology used. There are considerable differences

in the intensity of contact between participants and providers. Programs range from pure information offers and fully automated and unguided interventions, which participants work through without any contact with a counselor or therapist, to interventions that provide therapeutic contact via video conferencing and are comparable in therapy dose to conventional treatments.

Another distinguishing feature is the extent to which technology-supported interventions enable individualized, i.e., participant-tailored support. While some programs are completed in the same form by all participants, others involve an exchange between participants and/or regular feedback from a therapist or counselor, enabling a more individualized program use. Monitoring systems can contribute to flexibility and individualization to a particular extent, provided that the collected progress information (e.g., on symptoms and behaviors) is used to adapt the intervention over the course of participation.

The majority of interventions presented so far are based on behavioral therapy concepts and manuals. The structured programs are worked through session by session by the

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participants independently or with accompanying professional guidance. Table 50.1 provides an overview of some modules that are frequently integrated into E-Mental-Health interventions to promote exchange between participants and enable individualized support.

In addition to the aforementioned aspects, from a supply perspective, it is particularly important whether and, if applicable, how a digital intervention is combined with conventional prevention, counseling, and therapy services. While technology-based interventions are often used independently of conventional care (i.e., “stand-alone”), combined approaches involve parallel use (“blended care”) or sequential use (“stepped care”) of the two settings. So-called “blended care” approaches can aim to improve the effectiveness of conventional therapeutic measures by using a digital intervention as an add-on treatment, thereby optimizing therapy. Alternatively, an increase in efficiency can be sought by offering certain therapy content digitally, for example, and thus reducing therapy time in the face-to-face setting and associated costs without compromising therapy outcomes.

However, so far, there are only a few empirical findings on the potential of such “blended care” approaches to improve the treatment of eating disorders.

50.2 Areas of Application for Digital Interventions

50.2.1 Prevention and Early Intervention

In the field of prevention, the use of internet-based interventions is advantageous, as large target populations can be reached from a central location with relatively little effort. This can be achieved, in particular, through a combination of automated components (e.g., psychoeducational materials, exercises, screening and monitoring procedures) on the one hand and personalized components (e.g., moderated discussion forums, therapist-led chat groups) on the other hand.

Promising empirical findings, with small to medium effect sizes, have been reported

Table 50.1 Examples of E-mental health modules

Module	Communication and Interaction	Possible Functions within Technology-Supported Interventions
Discussion forums	Asynchronous communication, i.e., requests and comments (“posts”) are expressed with a time delay.	<ul style="list-style-type: none"> • Exchange between participants • Active engagement with specific discussion topics • Peer-to-peer support • Questions answered by moderators or therapists
Chat	Synchronous communication, i.e., communication partners are simultaneously in a chat room and exchange information in real time.	<p>Group chat:</p> <ul style="list-style-type: none"> • Peer-to-peer support • Professional support and advice in a group setting (by counselors or therapists) <p>Individual chat:</p> <ul style="list-style-type: none"> • Professional support and advice in an individual setting (by counselors or therapists)
Self-monitoring	Participants are regularly (e.g., daily or weekly) prompted to report relevant factors. The query is automated (e.g., via smartphone) using a short questionnaire.	<ul style="list-style-type: none"> • Self-observation and self-management • Automatically informs counselor or therapist about the condition and course of the recorded parameters
Supportive self-monitoring	Participants receive supportive feedback tailored to their entries in self-monitoring	<ul style="list-style-type: none"> • Self-observation and self-management • Continuous low-intensity support • Informs counselor or therapist about the condition and course of the recorded parameters

regarding the efficacy of behavioral therapy interventions (e.g., for the program “Student Bodies”) and dissonance-based approaches, as well as programs aimed at improving media literacy (for an overview, see Wade and Wilksch 2018). The majority of interventions can be categorized as indicated prevention and target young women at increased risk of developing an eating disorder. In contrast, other approaches, such as the “ProYouth” program, aim to address broader target groups and tailor the intervention to the participants’ needs. For example, participants who report risk factors or initial symptoms of an eating disorder in a self-test at the beginning of the program are specifically recommended more intensive support and counseling modules than those who do not report such factors or symptoms. Likewise, the intervention can be flexibly adapted during the course of the program, depending on the participants’ individual development. This promises, among other things, advantages regarding the transition from prevention to early intervention, as participants who report manifest symptoms of an eating disorder can receive more intensive online support in a timely manner and, if necessary, be referred to routine care early on (Kindermann et al. 2017).

In addition to the question of efficacy, the implementation and dissemination of internet-based prevention programs have proven to be major challenges, such that current research is increasingly concerned with the question of how to best reach and motivate the target group to participate, as well as with the impact of different recruitment methods on willingness to participate and program utilization (Moessner et al. 2016; Vollert et al. 2020).

50.2.2 Self-help and Treatment

One difficulty in providing care for individuals with eating disorders is that only a comparatively small proportion seek professional help. In order to expand the reach of evidence-based interventions, the use of guided self-management offers for BN and BED is recommended. Internet-based approaches can

make an important contribution in this regard. The majority of interventions presented so far consist of a combination of structured self-help materials based on behavioral therapy concepts and professional support from a therapist, counselor, or coach. This person accompanies the participation, regularly provides feedback on progress and homework, answers questions, etc. In the literature, these digital interventions are often referred to as “iCBT” programs. The time expenditure associated with these usually stand-alone solutions, on the part of the provider and therapist, varies depending on the program, but is generally significantly lower than that of conventional psychotherapy. Recent studies have demonstrated the potential of various guided internet and smartphone-based self-management programs for reducing eating disorder-related impairment compared to untreated control groups (e.g., Hildebrandt et al. 2020; Linardon et al. 2020; Wagner et al. 2016). Only two studies, however, have addressed the question of whether digital interventions are comparable in efficacy to conventional psychotherapeutic offers for individuals with eating disorders: In Germany, de Zwaan et al. (2017) compared the efficacy of therapist-guided iCBT with outpatient psychotherapy (CBT) for individuals with BED, and in the USA, Zerwas et al. (2017) compared a CBT-oriented group therapy for BN in an internet chat with the conventional implementation of group therapy in a face-to-face setting. In both studies, the conventional therapy was superior at the end of treatment, but not at follow-up. Due to the faster improvement, face-to-face therapy should therefore remain the method of choice. If this is not available or accessible to those affected, digital interventions can obviously be considered as a—slower-acting—therapy option for BN and BED.

50.2.3 Aftercare and Relapse Prevention

Particularly in the first months after the end of treatment, there is a significant risk of relapse, but aftercare or maintenance therapy often

cannot be implemented promptly in everyday care. Digital interventions can improve the continuity of care at this point by, for example, being offered immediately after inpatient treatment and thus supporting patients in the transition from hospital stay to everyday life.

Various technology-supported approaches have been evaluated in the field of aftercare and relapse prevention. In this context, a mobile minimal intervention based on the principle of supportive monitoring and SMS proved to be effective in the post-inpatient care of patients with BN (Bauer et al. 2012). The internet-based program “EDINA” contains additional modules (e.g., therapist-led group chat, moderated forum) beyond this monitoring to enable more intensive support for those affected (Gulec et al. 2014). The CBT-based program “In@” also allows online aftercare for BN through structured sessions, exchange in a discussion forum, and email/chat contacts with an online advisor. However, the efficacy of the intervention compared to a control group could not be confirmed in a large-scale evaluation study (Jacobi et al. 2017). In the area of AN aftercare, on the other hand, significant effects were shown for the behavior therapy-oriented relapse prevention program “VIA”, which, in addition to manualized sessions, also contains interactive components such as forums and therapist-led chat groups (Fichter et al. 2012). Promising results were also reported for the use of a smartphone app (“Recovery Record”) in the context of post-inpatient support for patients with AN. However, evidence of efficacy is still pending (Neumayr et al. 2019).

50.3 Conclusion

Research on digital interventions in the field of prevention and treatment of eating disorders is a comparatively young, albeit rapidly growing field. Several reviews conclude that the results obtained so far are promising and clearly indicate the potential of such interventions to improve the care of affected individuals. However, it should be noted that the findings are

predominantly from relatively small projects, and comparatively few multicenter randomized controlled trials have confirmed the evidence on digital interventions for the treatment of eating disorders (Ahmadiankalati et al. 2020).

Research projects should address a number of other aspects in addition to the question of the **efficacy** of technology-supported interventions. These include, above all, care-related questions regarding their **reach** (e.g., can a larger number of affected individuals be reached through digital offerings? Are these offerings used by people who would otherwise not have access to or seek care?) and their **interaction** with **routine care** (e.g., how can we reach those affected as early as possible and facilitate access to regular care?). In addition, questions regarding **differential effectiveness** need to be clarified (e.g., who benefits [or does not benefit] from these offerings?) as well as the necessary and sufficient use of **therapeutic resources** (e.g., what qualifications are required on the part of the provider? How intensive must the technology-mediated contact be?).

In conclusion, it should be pointed out that appropriate offerings should always be designed depending on the care context, or their development should respond to specific challenges in the respective health system. For example, the aforementioned post-inpatient offerings have particular relevance for the German system, where inpatient treatments are more common than in many other countries and the inadequate continuity of care following hospitalization due to the traditional separation of inpatient and outpatient sectors represents a specific challenge.

Parallel to the increasing use of media in most areas of everyday life, digital interventions or intervention components will undoubtedly increasingly find their way into psychosocial and psychotherapeutic care. A crucial prerequisite for this was created in Germany in 2020 with the Digital Care Act (DVG). The DVG allows doctors and psychotherapists to prescribe certain digital health applications (DiGAs) to their patients, for which evidence of benefit has been provided. It is still unclear whether and how this option will influence care in the field of

eating disorders in the long term, but it is important to scientifically accompany this development in order to make the best possible use of the potential of such offerings for the benefit of those affected.

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Involuntary Treatment in Anorexia Nervosa

51

Andreas Thiel and Thomas Paul

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Anorexia nervosa (AN) is a serious and often chronic mental illness that significantly impairs the quality of life of those affected. Core symptoms of this disorder include, among other symptoms, the fear of weight gain. In severe cases, this fear can impair the patient's ability to make rational decisions. A possible decision to reject treatment or to refuse urgently needed weight gain is therefore not always the result of rational decision-making, but may be a symptom of the eating disorder and thus an expression of the mental illness. In addition to the psychopathological symptoms, the clinical picture is marked by somatic complaints. Depending on the degree of underweight, the reduced general

condition in combination with pneumonia, electrolyte imbalances, cardiac arrhythmias, blood formation disorders, gastrointestinal bleeding, and hepatic or renal dysfunction can lead to serious, and possibly life-threatening, complications. The mortality and risk of suicide in patients with AN are significantly higher compared to the general population.

The **voluntariness** as a prerequisite for therapy is anchored in the constitution through the two basic human rights to freedom and physical integrity. It is also ethically required and therapeutically sensible. However, if the rejecting attitude of a patient with AN poses a direct and immediate danger to their life, the question arises as to a **possible involuntary treatment** in order to enforce weight gain – despite a lack of insight into the illness and motivation for therapy. Therapists are ethically responsible not only for their actions but also for their omissions. Involuntary treatment against the will of the patients may be medically and ethically justified in cases of severe underweight and poor general condition if the patients are unable to adequately

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care for themselves due to their illness and are no longer capable of giving consent. For these situations, German law provides exceptions that legitimize the forced placement and treatment of patients and the associated interventions in their basic rights.

The current German guideline of the Association of the Scientific Medical Societies for the treatment of eating disorders (AWMF 2018) explicitly mentions the possibility or necessity of involuntary treatment under special, life-threatening circumstances. The guideline of the American Psychiatric Association (APA 2006, 2012) and that of the National Institute for Clinical Excellence (NICE 2017) also contain corresponding references, and even the patient guideline of the AWMF (2015) mentions the possibility of involuntary treatment.

► **Important** In the case of anorexia nervosa, involuntary treatment against the patient's will may be medically and ethically necessary under certain circumstances, such as severe underweight, life-threatening somatic complications, or suicidality, and if the patient is unable to give consent due to the illness.

51.1 Forced Treatment Under Guardianship Law

If an adult is unable to manage his or her affairs wholly or partially due to a mental illness or a physical or mental disability, it is possible to appoint a **legal guardian** for him or her. The corresponding legal regulations are also referred to as guardianship law and are part of the German Civil Code (BGB). The appointment of a guardian is made upon the request of the person concerned or by official order. The guardian is appointed only for the specific tasks defined in each individual case. The legal guardian with the appropriate scope of duties can apply to the guardianship court for the placement of a non-consenting ward under § 1906 BGB if there is a risk of self-endangerment due to a mental illness

or if a medical examination or treatment is required. Within the framework of such inpatient treatment, the legal guardian can then consent to an involuntary medical treatment with the appropriate judicial approval under § 1906a BGB.

The appointment of a legal guardian or the application for approval of placement and involuntary treatment under guardianship law should be carefully considered and calmly discussed and prepared with patients and family members. The legal guardianship should be established for a period of at least 3-6 months, as significant and stable improvement can hardly be expected before that. In many cases, maintaining guardianship for a longer period and beyond the end of involuntary treatment will be useful. Involuntary treatments under guardianship law are not only possible in psychiatric clinics but could also be carried out in other clinics and institutions, provided that these institutions are willing to assume the corresponding responsibility.

► **Important** In Germany, involuntary treatment under inpatient conditions can be approved upon the request of the legal guardian under guardianship law (§ 1906 and § 1906a BGB). Information on the practical procedure can be obtained from the responsible guardianship court at the local court, as well as the health department and the social psychiatric service.

51.2 Coercive psychotherapy

Involuntary treatment does not replace psychotherapy, but it does not exclude it either. Responsible involuntary treatment is the beginning or continuation of psychotherapy under particularly difficult conditions. Coercive therapy is also possible. The widespread view that psychotherapy is only possible under absolutely voluntary conditions is incorrect. For example, it is known from the treatment of acutely suicidal patients in life crises or patients with borderline disorders that, after placing a person against their will, a meaningful psychotherapeutic

collaboration can be achieved in many, but not all cases. This also applies to forced treatments of patients with anorexia nervosa (AN). Prerequisites for this are committed staff with in-depth knowledge of the disorder and particularly high psychotherapeutic qualifications.

► **Important** Psychotherapy is also possible and indicated under involuntary treatment.

The lower weight limit for initiating involuntary treatment for AN cannot be precisely determined. The indication should be considered at a $BMI \leq 13 \text{ kg/m}^2$. This value is based on the experience that mortality increases significantly when weight decreases below a BMI of 13 kg/m^2 . However, even at a higher weight, suicidality, electrolyte imbalances, cardiac arrhythmias, and other acute psychological or physical problems may render involuntary treatment necessary in some cases.

51.3 Procedure for Coercive Measures

Coercive measures must be applied carefully and dosed appropriately. Patients who are forcibly treated against their will do not always have to be force-fed through a gastric tube, PEG (percutaneous endoscopic gastrostomy with inserted feeding tube), or venous catheter, and restraining or confining them to a closed ward without exit is not always necessary. The unreflective, excessive, and insufficiently dosed use of coercive measures is a medical error that unnecessarily traumatizes patients. In many cases, the clear statement of the therapist and the legal guardian about the necessity and enforcement of the treatment is sufficient to motivate patients to cooperate adequately, so that the further application of direct force can be avoided or at least severely restricted. The coercive character present in this situation is less injurious than direct use of force. Restraints must be reduced to the absolute minimum necessary and suspended as early as possible; under no circumstances should patients be restrained for extended periods without

compelling reason. A motivated and qualified nursing team can often avoid the use of direct force in force-feeding.

► **Important** Not physical violence, but the interpersonal relationship and the psychotherapeutic climate are the relevant factors for the course of treatment.

The principle of carefully dosing coercion also applies to ensuring food intake. Any necessary force in force-feeding must be increased very cautiously and reduced as quickly as possible; the following steps are conceivable.

Possibilities of force-feeding in AN

- Eating normal food in the presence of and with encouragement from staff
- Drinking special nutritional drinks in the presence of and with encouragement from staff
- Combination of tube feeding and normal food
- Feeding by staff
- Feeding via gastric tube without restraint, during the day or at night
- Feeding via PEG without restraint, during the day or at night
- Combination of several options
- Feeding via gastric tube or PEG with restraint, during the day or at night
- Parenteral nutrition through infusions

From the outset, the goal of psychotherapy is to motivate patients for increasingly independent and balanced food intake even during forced treatment. If this is not successful, various alternatives for food intake can be considered, which can be discussed and tried step by step. Force-feeding via tube, PEG, or venous catheter often leads to patients manipulating the system, which must not be responded to using increased force without due reflection, as this risks an escalation of violence with lasting damage to any trustful cooperation. Patients should be involved in the decision about the form of food

intake in order to avoid unnecessarily restricting their autonomy in an already difficult situation. Any coercion used to ensure nutrition must also be terminated. By the time of discharge, patients must be able to take responsibility for adequate nutrition again.

The topics of food, body shape, and weight often play a dominant role for these patients. However, in psychotherapy, other relevant topics and conflicts must not be forgotten, such as self-esteem issues and achievement orientation, psychosexual fears, or family conflicts. Even during forced treatment, these topics must be given appropriate space in therapy. Patients and staff must always know that achieving a target weight is not an end in itself, but must serve to improve the quality of life. The therapy should follow the motto: "Weight gain is not everything, but without weight gain, everything is nothing."

Medications are of secondary importance for the treatment of AN. Therefore, no general psychopharmacological therapy recommendation can be given for involuntary treatment. Regardless of this, the indication for an anxiolytic treatment with benzodiazepines or for an antidepressant therapy or an antipsychotic treatment attempt must be checked depending on the current psychopathological findings.

51.4 Treatment With Respect

The unstable self-esteem regulation and the conflicts regarding dependency and autonomy are of central importance for these patients. It is particularly difficult not to further damage patients' lack of security and autonomy, but to strengthen it under the unfavorable conditions of involuntary treatment. An absolute prerequisite for this is respectful treatment of the patients. The respect and friendly commitment of the staff protect the dignity and self-esteem of the patients. Treatment with respect also means discussing all essential details of the therapy openly and precisely with the patients, involving them as much as possible in decisions, and opening up opportunities for them to counteract

an increase in coercion and violence or a restriction of their freedom through clear agreements. Conversations with family members are also useful during involuntary treatment in many cases.

► **Important** The goal of involuntary treatment is not a defined weight, but the continuation of treatment without coercion.

Involuntary treatment must not destroy any further therapy motivation. On the contrary: it should support the patients in gaining courage for further therapy without coercion. The time of involuntary treatment aims to help the patients find a new perspective for themselves and to get closer to the distant goal of a largely complete recovery from the eating disorder.

Respect for the patient also requires the staff to accept the limits of therapeutic possibilities. Involuntary treatments are only justified if there is a prospect of sufficient improvement in health and quality of life. There are severe and chronic courses of AN in which those affected obviously do not benefit sufficiently from any therapy or involuntary treatment. In such a palliative situation, the initiation or continuation of involuntary treatment should be waived.

Conclusion

Severe courses of AN with a risk to the patient's life may require involuntary treatment in individual cases. The decision for involuntary treatment can then be a relief for the affected patients and their family if they can temporarily place responsibility in professional hands. The practical implementation of involuntary treatment and forced feeding places high demands on the competence and care of the therapists in order not to disproportionately burden the often inadequately developed motivation of the patients for the necessary psychotherapeutic work. The goal of involuntary treatment is not to achieve a defined weight, but to continue therapy without coercion.

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Treatment of Chronically Ill Patients

52

Thomas Paul and Andreas Thiel

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52.1 Definition of Terms

The term chronification is generally used to describe diseases with long-lasting, mostly incurable conditions. Despite the general knowledge and significance of the high chronification rates in AN and BN, this term is used very differently. Due to the high mortality and the massive negative impact on quality of life, the severe and enduring courses of AN (SEAN) are particularly relevant. The term “severe and enduring” seems more appropriate for describing these courses than the adjective “chronic,” as improvements are generally possible even after many years (Eddy et al. 2017). A generally accepted definition of SEAN is still lacking; the following criteria are usually suggested in

the literature (Broomfield et al. 2017; Hay and Touyz 2018):

- Illness duration over several years, for example at least 3–7 years
- Several therapy attempts without sufficient clinically relevant improvement
- A persistent underweight

Thus, statements about chronified patients usually describe a subset of a relatively large, very heterogeneous overall group for which universally valid treatment guidelines—similar to the Practice Guideline for the Treatment of Patients with Eating Disorders of the APA (2006)—are lacking and which have long been neglected in the literature and research. This is particularly surprising given the fact that this group includes the majority of patients with eating disorders who die from the symptoms in the long term (in the case of AN, 15–20% or 0.5–0.75% per year), experience increased suffering with reduced quality of life, and place a considerable emotional burden on the people involved and on the entire health system, usually financially.

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The average annual treatment costs in German clinics for patients with AN are estimated at around 12,800 euros, with it being noted that about 10–20% of patients with AN are treated in hospitals each year and the average length of stay in clinics is 50 days (Krauth et al. 2002). The German guidelines of the Association of the Scientific Medical Societies for the treatment of eating disorders (AWMF 2018) speak of gaps in care in Germany regarding specific offers for patients with SEAN. The current discussion on SEAN also addresses the question of whether and, if so, how the methods and goals of therapy for these special patients need to be adapted (Kotilahti et al. 2020).

52.2 Initial Situation

While there are more or less clear disease courses with corresponding classification according to disease stages for chronic diseases such as diabetes mellitus, hypertension, or degenerative joint diseases, and specific therapeutic measures can be derived for each of these stages, such descriptions for temporally successive chronic stages for patients with AN and BN are not available. The chronic course of the disorder varies greatly from patient to patient, and general guidelines cannot be established due to individual differences. Thus, practitioners are repeatedly confronted with the question of which treatment measures to take in individual cases. Although there are general criteria for the indication of various treatment settings (APA 2006), these do not correspond to the severity of the chronicity but are based solely on the practitioner's assessment of the patient's symptoms at the time of examination. Despite nearly identical symptoms and the same duration of illness, the same therapeutic measures in the same therapeutic setting can lead to very different outcomes. Unsatisfactory therapy courses can lead to feelings of helplessness, frustration, or anger among therapists. In our opinion, it is very helpful to refer to general basic principles in treatment, which we describe below, in order to help even the “difficult patients” cope

with their illness in the long term and not simply dismiss them as “incurable” or “unmotivated cases.” These principles apply to patients with chronic eating disorders who voluntarily enter treatment. Treatment guidelines for patients who must be treated against their will are outlined in Chap. 51 of this book.

Helpful Basic Principles in Treatment

1. Check if the patient has chosen the right time for her therapy.
2. Create a trusting framework in which the therapeutic measures, conditions, and therapy goals to be pursued are made transparent before the therapy begins.
3. Do not set therapy goals unilaterally, but together with the patient.
4. Make yourself an ally of the patient to try to overcome the illness together.
5. Give the patient a large part of the responsibility for the progress of the treatment.
6. Accept that the treatment can be lengthy and that it can be assumed that the patient will have great difficulty allowing changes in her symptoms.
7. Note that treatment cannot be carried out against the patient's will.
8. Ensure that the patient is integrated into an appropriate care chain.
9. Observe the patient's right to involuntary admission.
10. Do not give up hope.

52.3 Helpful Basic Principles in the Treatment of Chronically Ill Patients

52.3.1 Timing of Therapy Initiation

Patients who voluntarily enter therapy can be described as “therapy-motivated.” However, this does not mean that they are sufficiently “change-motivated” from the outset or that they

have consciously dealt with the fact that they will have to undergo a difficult process as part of the therapy, which will demand a lot from them. It is therefore important to check early on with the patient whether they are actually willing and able to cope with this task at the present time. The mere desire to give up symptoms is usually not enough to mobilize the necessary forces and to endure the difficult therapeutic process in the long term. For example, a patient with chronic AN may be motivated to accept help, but at the same time still refuse the necessary weight gain. Also, patients often do not see the factors maintaining the symptoms as being within themselves, but rather attribute them externally to other people or specific circumstances. If the patient is still in a very ambivalent phase of their illness (Prochaska and DiClemente 1992), the question arises as to the meaning of an intervention at this point in time. It is known that patients who failed at a first treatment attempt are able to benefit very well at a later point in time within the same setting and justify this in retrospect by the fact that there was no sufficient motivation or insight into the necessity of change at the first attempt.

52.3.2 Transparency of Framework Conditions

Especially for patients with chronic disorder courses who have often already undergone therapy and have not been able to achieve lasting improvement of their symptoms, it is particularly important to discuss the corresponding framework conditions, therapeutic approach, and expectations of the patient very transparently before the start of therapy. For this purpose, detailed preliminary discussions on site are suitable, in which the patients are informed comprehensively and in detail about the treatment setting and have ample opportunity to ask questions. Therapists should not conceal any distressing elements of the treatment just to motivate a patient to start treatment. Based on the information received during this conversation, the patient

should be able to make a free and well-founded decision for or against the treatment. Written information in the form of patient brochures has also proven helpful in this regard. In our experience, however, such written information should only supplement, not replace, a preliminary discussion.

52.3.3 Establishing Joint Therapy Goals

In order to achieve changes, patients must expend a lot of energy. This can only be done at the expense of other resources, and at least in the short term, it may be necessary to temporarily neglect other important and satisfying areas of life. It is therefore all the more important that the patient and therapist agree on

- which therapy goals are to be pursued within which time frame,
- which measures should be used to achieve
- these goals, and
- what consequences this will have for other areas of the patient's life.

This process of agreement takes time, and it is necessary to agree on realistic goals that the patient can identify with. If unrealistic goals are pursued, they will soon lead to frustration on both sides, jeopardizing long-term therapy success. Just as the therapist should not unilaterally formulate the goals, it is also important that therapists are not persuaded to agree to therapy goals of which they themselves are not convinced. As a rule, setting therapy goals is therefore a joint, sometimes tough process, at the end of which both parties must be convinced of the sense of the intended goals. "Lazy" compromises or seemingly consenting without conviction will not hold up in the long term. Once the therapy goals have been jointly developed and established—perhaps even in writing—the patient should be committed to giving their "best" within the treatment without overburdening themselves (commitment).

52.3.4 The Therapist as an Ally

When a patient enters therapy, she needs help. Her mental or physical condition is causing her to suffer, and she does not feel capable of giving up the distressing symptoms on her own. She relies on a therapist who first tries to understand the patient with her illness in order to then work out a way to cope with the illness together. In order to muster the necessary strength and confidence, the therapist should stand by her side as an ally, patiently work out her path with her, and above all, be present even when it becomes difficult and the patient may even threaten to discontinue therapy. It is precisely in such situations that the resilience of the therapeutic alliance becomes apparent. This requires particularly trained therapists who can maintain an overview of the dynamics of the therapeutic process even in the face of personal attacks, reflect on the situation, and act deliberately. In this way, it is possible to identify the specific barriers in the currently difficult situation with the patient and to develop joint, goal-oriented measures to solve the problem. This can also help to avoid unnecessary and destructive disputes, which often lead to lasting discord on both sides or even to therapy terminations.

52.3.5 Appeal to Personal Responsibility

Every type of treatment requires the patient's willingness to actively engage with her problems and to try out solutions without having the guarantee that they will be successful ("try first, criticize later"). It has proven helpful to make it clear to the patient from the outset that there is probably no treatment concept that will allow her to improve her symptoms without great effort, and that during therapy she may reach a point where she questions the treatment setting, the specific therapeutic approach, or even the therapist himself. Overcoming these phases in therapy is more likely to succeed if the patient is aware from the outset that the therapist can

ultimately only be "a tool" for success, but not responsible for progress. The patient should already check at the beginning whether she is willing to start therapy under the given circumstances—even if some conditions do not seem "optimal" to her. It is helpful to initially agree on a "trial therapy" with the patient for a clearly defined period (in the context of inpatient therapy, this is often 14 days). During this time, it is the patient's task to show the therapist or the therapeutic team that she can make progress under the given conditions. If this does not succeed, the indication for continuing treatment must be reviewed. The main responsibility for therapy progress is thus transferred to the patient. This is intended to prevent the patient from complaining unilaterally and disproportionately about supposed inadequacies of the therapy or the therapists, while losing sight of her own responsibility for therapy progress.

52.3.6 Acceptance of the Protracted Length of Treatment

Patients with chronic disorder courses have usually become accustomed to their symptoms over many years and have come to terms with their illness. The factors that ultimately led to the onset of the disorder are often still virulent; however, further conditions that maintain the disease have been added, which hinder the improvement of the disorder. In some cases, an "eating disorder identity" has even emerged as a result of the illness ("we anorexics"). The patients are also afraid of change because they are looking into an uncertain future and fear that they will not be able to cope adequately with the demands they anticipate upon recovery. The symptoms, therefore, offer protection in addition to various impairments, which the patient certainly cannot give up in just a few weeks or months. The various resistances to change within the therapy largely reflect the patient's fear of failure in the face of demands. In this situation, it should be examined which steps of change are currently realistic for the patient. It is often more favorable

to formulate and achieve smaller partial goals than to set too large goals and then fail at them. This approach also counteracts the frequent “black-and-white thinking” of patients, who often have a perfectionist drive and usually place high demands on themselves.

52.3.7 Voluntariness of Treatment

Resorting to therapy against the patient’s will should generally only be used as a last resort in the treatment process (see Chap. 51). As therapists, we should strive in each individual case to understand the patient in their symptomatology with their specific fears and, if possible, create conditions that also enable them to make progress within the treatment. It makes no sense to confront the patient with a setting and measures and persuade her to consent, which she is unable to accept and which she sees as having a coercive character. Patients will quickly (have to) drop out of such treatment and the chronicity will be further reinforced. On the other hand, we should not agree to conditions that we know will further support the patient in her avoidance behavior. We must learn to accept that our treatment offer is not accepted by patients in need of treatment and that they do not consent to the proposed therapy. We should respect this right of choice of the patients without fundamentally questioning our therapeutic basic conditions and/or reacting with a negative attitude towards the patient. On the contrary, we should encourage and support the patient in seeking helpful alternatives to our treatment.

52.3.8 Integration into the Care Chain

It can be assumed that the treatment process for chronically ill patients is generally more difficult and that a single therapeutic setting will not be sufficient. The treatment, therefore, requires careful, flexible coordination between different settings, which can be used as needed for a certain period. The range of therapeutic options

extends from outpatient self-help groups, outpatient psychotherapy, outpatient psychiatric care and treatment, involvement of the social psychiatric service, day clinic treatment, to inpatient psychiatric, internal medicine, or psychosomatic treatment, accommodation in residential groups, or even involuntary treatment as a last resort. The transitions between the different settings should be planned and discussed with the patients early on. The better the communication between the individual institutions about the treatment process and the coordination of the next treatment section, the easier it will be for the patient to engage in the proposed measures and benefit from them in the long term. If the institutions involved see themselves only as an important link in the chain of necessary therapeutic measures, they can succeed in not overburdening the patients during the therapeutic sub-process and setting up realistic therapy goals with them, which, when achieved, can lead to an increased self-efficacy expectation and motivation.

52.3.9 “Right to Involuntary Admission”

Considering the alarmingly high mortality and chronicity rates among patients with AN, the question arises whether, in individual cases and under special circumstances, the option of involuntary admission should be used more frequently (Chap. 51). In exceptional situations, patients may also have a right to involuntary treatment. The frequently expressed concern in this context that psychotherapeutic follow-up treatment would be impossible after such an intervention is incorrect. Responsible involuntary treatment is the beginning or continuation of psychotherapy under particularly difficult conditions. The goal of involuntary treatment is not to achieve a defined weight, but to continue therapy without coercion. In all measures carried out against the will of the patient, it is always important to ensure that the patient is treated with respect and her dignity is not unnecessarily violated.

52.3.10 Don't Give Up Hope

Therapy courses for patients with chronic eating disorders are hardly predictable. Experienced practitioners rightly point out that even formerly very difficult, seemingly hopeless cases can take a positive course after many years. Therefore, even in the most difficult courses, it seems justified to face patients and their relatives with hope and to assure them that improvements in symptoms up to recovery from the eating disorder are fundamentally possible. In light of the greater knowledge and better therapeutic options for eating disorders, William Gull's statement from 1873 remains valid: "None of these cases, however exhausted, are really hopeless as long as life exists".

Conclusion

The treatment of patients with chronic eating disorders poses a special challenge for every therapist and treatment team. It is not possible to establish universally valid criteria for the application of specific interventions depending on certain stages of the disorder. However, regardless of specific conditions and settings, helpful basic principles can be formulated as guidelines for therapeutic action, with the help of which power struggles and the "iatrogenic" chronicity of patients can be more easily avoided.

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Working with Family Members

53

Ulrike Schmidt

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53.1 Definitions and Context

The term family member can be defined as follows: “a person who is in a special legal or sociological relationship with another person or a group of persons, when one wants to emphasize this special relationship. Most often, people who are in close familial or personal relationships with each other are meant. The term is broader than that of a nuclear family. It includes, in particular, spouses or life partners and in-laws. In addition, the term in the sense of ‘belonging’ can also include people who belong to the life

environment of the person concerned.” (<http://de.wikipedia.org/wiki>)

The widely used expression in Anglo-Saxon literature, “carer,” describes a person of any age who provides unpaid support or care to a relative or friend who would not be able to cope without this help. The support is necessary because the person concerned is either sick, frail, or disabled, or suffers from a mental disorder (<http://www.carers.org/what-carer>).

In the broadest sense, work with family members is understood here as all theory- and evidence-based interventions that attempt to provide family members with new information—including new research findings—and practical skills to help them to cope better with an eating disorder. Such work with the family goes far beyond mere information provision and emotional support (e.g., through self-help groups). It is also distinct from family therapy and similar methods (multi-family groups) that are dealt with elsewhere in this book.

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In research on work with family members, the main focus is on approaches that involve targeted processing of maintaining interpersonal factors.

53.2 Why Work with Family Members?

Since the widespread introduction of community-based psychiatric care, the responsibility for the daily care, nursing, and support of mentally ill patients often lies with their family. It is known that the families of people with severe mental illnesses, such as psychoses or dementia, are heavily challenged and often carry a large objective and subjective burden (Graap et al. 2008a; Kyriacou et al. 2008). In the field of eating disorders, the involvement of family in the treatment of children and adolescents has long been common, e.g., through psychoeducational parent groups (Geist et al. 2000). In contrast, this development has been much more hesitant in the treatment of adults, although most people with anorexia nervosa (AN) still live with their family of origin or at least have close contact with the family and receive support from home in adulthood.

53.3 Burden on Family Members

Studies on mental health issues among family members of inpatients or outpatients with AN or bulimia nervosa (BN) indicate a high prevalence of anxiety and depressive symptoms (Anastasiadou et al. 2014). These symptoms seem to correlate with the extent of objective and subjective burden on the family members. Both the subjectively perceived burden and the number of problems caused by the illness are at least as high in family members of patients with AN as in the family of patients with depression or schizophrenia (Graap et al. 2008a; Martin et al. 2015; Treasure et al. 2001). Relatives of patients with BN also feel significantly burdened (Anastasiadou et al. 2014). Compared to families of adults with severe physical (e.g., cancer) or mental illnesses (such as psychoses, dementia,

or alcoholism), families of patients with AN spend about twice as much time in direct contact with the patient (Ränker et al. 2013; Viana et al. 2013), i.e., they are exposed to a high objective burden. A study of family members, mainly parents ($n = 224$) and partners ($n = 28$) of inpatients with AN ($n = 178$, mainly adults), found that family members spent most of their time providing emotional support and assistance with food intake. Mothers and partners of individuals with AN were similar in terms of the extent of support offered, whereas fathers spent less time caring for their daughters with AN. Approximately 30% of the sample suffered from stress and clinically relevant anxiety symptoms. A high degree of objective burden was associated with a high level of stress in the family. In particular, partners of individuals with AN had little support from others, and the severity of their anxiety and stress symptoms was comparable to that of mothers (Ränker et al. 2013).

53.4 Needs of Family Members

Studies in which families of eating disorder patients were asked about their needs have shown that they often identify large gaps in knowledge and skills in themselves and also feel inadequately supported and advised by professionals (Haigh and Treasure 2003; Graap et al. 2008b). It is important to note that the various groups of family members (e.g., mothers, fathers, partners/spouses, siblings) differ significantly in terms of their burden and thus also their needs.

“Interpersonal Vicious Cycle”

Recent research suggests that family members may contribute to the development of dysfunctional interpersonal vicious cycles (Fig. 53.1) through certain behaviors and thus unintentionally contribute to the maintenance of eating disorder symptoms (Treasure et al. 2020). Factors that play a role in this regard, based on empirical studies, are high levels of “expressed emotions”, which refers to either overprotective or excessively critical or even hostile attitudes of family members towards the patient. In addition,

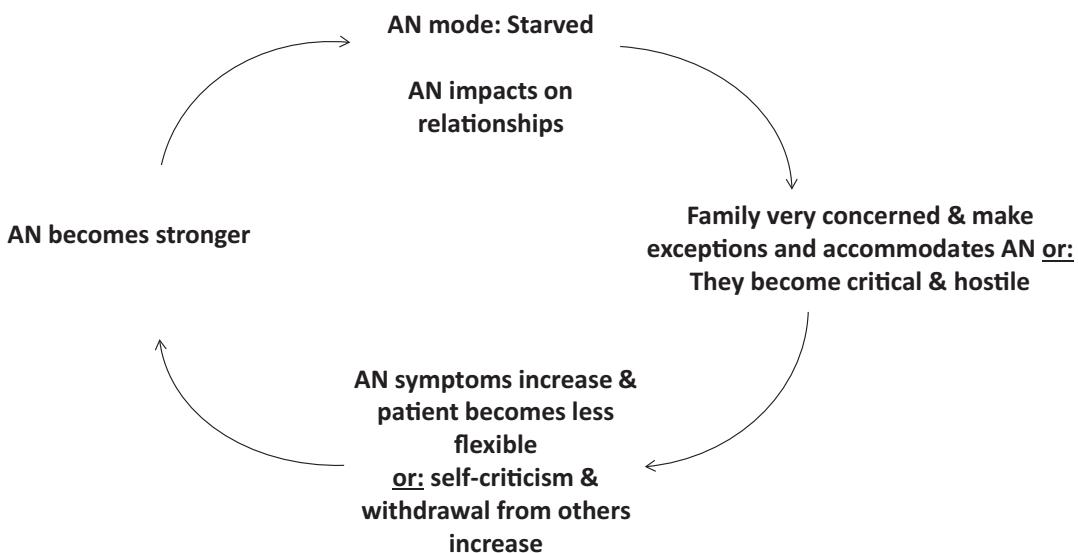


Fig. 53.1 The vicious cycle of dysfunctional interpersonal behavior

the family may adapt to the symptoms or even reinforce them (“accommodation and enabling of symptoms”) (Anastasiadou et al. 2014). This vicious cycle can be somewhat simplified in its representation.

- **Important** Family members can unintentionally reinforce the eating disorder symptoms of patients.

53.5 Goals and Contents of Working with Family Members

International guidelines (e.g., NICE 2017) recommend early involvement of family members in the treatment of patients with eating disorders. Goals of working with family members include (Treasure and Nazar 2016):

- providing family members with specific knowledge about symptoms, risks, treatment, and prognosis of eating disorders;
- teaching them skills to recognize and specifically change dysfunctional interpersonal vicious cycles that maintain the disorder (e.g., through improved communication with the person with the eating disorder);
- helping them recognize the negative effects of the eating disorder on their own mental health, seek support, and conserve their own resources;

- empowering them in the broadest sense by training them to become “experts” in the eating disorders of their loved one, learning to cope better with the eating disorder, and thereby building self-confidence.

Furthermore, the goal is to indirectly have a positive effect on the patient’s eating disorder symptoms in this way. An empirical model of the family, societal, and disorder factors that affect the subjective experience and coping strategies of family members has been developed (Treasure and Nazar 2016). The model identifies potential intervention targets and associated assessment scales.

53.6 Interventions for Family Members

A meta-analytical study examined all interventions for caregivers aimed at either reducing the subjective burden and any anxiety and depressive symptoms of family members, or helping them to support the person with AN more effectively. Both uncontrolled and randomized trials were included. Interventions included both training workshops and self-help procedures for family members. The self-help procedures were mostly guided and either manualized or internet-based. In most interventions, there was a reduction in anxiety and depressive symptoms

in family members with a medium effect size and a decrease in relative burden and expressed emotion with a small to medium effect size. These improvements remained stable during the follow-up period (Hibbs et al. 2015a). Since the publication of this meta-analysis, two more large randomized trials on manual-based supported family self-help with accompanying DVDs as a supplement to inpatient treatment (Hibbs et al. 2015b; Magill et al. 2016) or outpatient treatment of AN (Hodsoll et al. 2017) have been published. These studies replicate the results of the meta-analysis, i.e., long-term improvements were found in various family variables. In addition, effects on patient outcomes and health-care utilization (e.g., fewer inpatient days) were observed. Another smaller pilot study evaluated an internet-based cognitive-systemic intervention for caregivers compared to training workshops. Although there were few differences in improvements in family variables, the workshops were perceived as significantly more acceptable by participants (Dimitropoulos et al. 2019).

53.7 Summary and Outlook

Currently, several large studies on work with family members as a supplement to AN treatment are being completed (e.g., Cardi et al. 2017; Spencer et al. 2018). Based on the current state of knowledge, we can say that this treatment approach is perceived as very helpful and positive by family members (Treasure et al. 2021). However, several important questions remain largely unresolved, e.g., the relative merits of different intervention goals/contents and different types of support for self-help procedures. In addition, it is also unclear what the relative costs and benefits of training workshops compared to self-help procedures are, both for the family members themselves and for the patients and the healthcare system.

► **Important** Family members should also be involved in the treatment of adult patients with AN and BN.

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Relapse Prevention in Anorexia Nervosa

54

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54.1 Relapses in Anorexia Nervosa

Many patients with anorexia nervosa (AN) who undergo therapy benefit from acute treatment, achieve weight gain, and experience an improvement in eating disorder symptoms. However, AN is characterized by a high risk of relapse. Between a third and about half of treated patients suffer a relapse, with the risk of relapse being greatest in the first year after therapy and the very early point of three months after

therapy having already proven critical (Khalsa et al. 2017; Berends et al. 2018). In a majority of patients who have received inpatient treatment for an eating disorder, there is at least one hospital readmission during the course of the illness (Rigaud et al. 2011).

Definition of a Relapse

So far, no uniform criteria for a relapse in AN have been defined (Khalsa et al. 2017; Berends et al. 2018). Clinically, a relapse is generally understood as a significant deterioration in core symptoms of the eating disorder (e.g., a significant weight loss). In this respect, the assessment of a relapse is primarily based on the individual course of the patient's illness and the clinical impression of the treating professionals. Currently discussed stage models of AN include both objective criteria (BMI) and subjective symptoms (e.g., fear of weight gain) in a proposed definition of a relapse, recommend a fixed time criterion, and suggest using standardized measurement instruments to describe the eating disorder pathology (Khalsa et al. 2017).

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54.1.1 Protective and Risk Factors regarding Relapse

Not all patients with AN are equally at risk of relapse – some subgroups manage to overcome the eating disorder in the long term, whereas others experience repeated relapses. Empirically, a number of risk and protective factors regarding relapse in AN have been identified (Carter et al. 2012; Khalsa et al. 2017; Berends et al. 2018; Stockford et al. 2019). These provide important starting points for therapeutic content and priorities for relapse prevention.

Factors promoting relapse

- Low weight at discharge from inpatient therapy
- Hyperactivity
- Binge/purging subtype of AN and pronounced binge eating
- Pronounced body dissatisfaction and pronounced fear of weight gain
- Psychiatric comorbidity
- Low level of psychosocial functioning
- Long duration of illness

Factors promoting recovery or protecting against relapse

- Full remission at the end of therapy
- Age < 18 years
- Low weight- and body-related concerns
- Absence of depressive comorbidity
- Social support
- Strong motivation for change
- Strong therapeutic alliance
- Development of an eating disorder-independent identity
- Perception of recovery as a process
- Self-acceptance

54.1.2 Care Situation and Risk of Relapse

The often lengthy and severe course of AN poses particular challenges to the care of patients and necessitates the frequent utilization of different intensive therapy settings and various therapists. Thus, after completion of acute treatment for the eating disorder, the initiation of follow-up treatment is often sought to consolidate achieved therapy successes. Especially in healthcare systems with sectoral separation between (partial) inpatient and outpatient care, there may be a lack of networking and long waiting times at these transitions between treatment settings (Giel et al. 2011), which promote relapses into the illness (Herpertz et al., 2019).

54.2 Specifics of Relapse Prevention in Anorexia Nervosa

54.2.1 Importance

Dealing with relapse risks and setbacks should already be addressed in the later therapy phases of acute treatment (Herpertz et al., 2019). In particular, psychoeducation regarding the course of recovery as well as the course and significance of relapses is also useful in early phases of acute treatment, as the patients' attitude towards possible relapses seems to be an important predictor for the success of eating disorder therapy. After completing acute treatment, follow-up treatment should generally be provided, especially for subgroups of patients with particularly high relapse risk.

54.2.2 Treatment Goals

Relapse prevention aims to prevent relapses after acute treatment (usually inpatient or day-patient therapy). Since there is no uniform

definition of relapse in AN, this goal is very individually tailored, i.e., it is primarily about maintaining and ideally further stabilizing and improving the individual condition of a patient upon discharge from acute therapy.

Secondary treatment goals include

- achieving the longest possible relapse-free phase,
- improving eating disorder symptoms,
- improving general psychopathology,
- improving quality of life,
- if necessary, motivating for and transitioning to further follow-up treatment or the use of other support services.

54.2.3 Treatment Elements

Clinical guidelines have identified a number of therapeutic contents that are central to psychotherapeutic interventions for relapse prevention (Marlatt et al. 2002):

- Recording the previous course of the disorder, including previous relapses,
- Psychoeducation regarding the course of recovery and relapses,
- Reviewing and strengthening therapy motivation,
- Formulating individual treatment goals,
- Identification of possible relapse triggers,
- Identification of strategies for dealing with possible relapse triggers and for dealing with setbacks and relapses,
- Strengthening self-efficacy and individual resources.

54.3 Therapy and Care Concepts

So far, few interventions have been developed specifically for relapse prevention in AN. However, there are a number of structured

therapy and care concepts that can contribute to maintaining the achieved therapy successes and preventing relapses following acute treatment.

54.3.1 Guided Self-Help

Offers for guided self-help include therapy programs in which patients independently work on therapy content using specific materials and media (e.g., a manual, a homepage, or a smartphone app). Depending on the format, they can be therapist-supported or in contact with other patients, e.g., via email or chat. Such self-help programs represent relatively low-threshold offers, in which patients can independently access therapeutic help irrespective of location and time, while avoiding long waiting times for alternative care options (Section 54.1.2). The efficacy of an internet-based self-help program specifically designed for relapse prevention in AN after discharge from inpatient therapy has been demonstrated (Fichter et al. 2012). There is also initial evidence that specific smartphone apps are highly accepted by patients, but their efficacy has yet to be proven (Neumayr et al. 2019).

54.3.2 Pharmacotherapy

Although there is no evidence for the efficacy of pharmacological agents in the acute treatment of AN (Davis and Attia 2017; Herpertz et al., 2019), the potential benefit of pharmacotherapy in relapse prevention has been discussed, as medications may not work or not work sufficiently in acutely ill patients due to starvation effects, but could have effects in weight-rehabilitated patients during the relapse prevention phase (Walsh et al. 2006). However, there is no evidence to date that pharmacotherapy alone or in combination with psychotherapy can prevent relapses in AN (Walsh et al. 2006).

54.3.3 Psychotherapy

After completing inpatient or day care acute treatment for AN, outpatient psychotherapy is usually sought to prevent relapses and, if necessary, continue working on symptom improvement (for central elements of psychotherapeutic interventions for relapse prevention, see section 54.2.3). There is evidence that outpatient psychotherapy methods specifically aimed at relapse prevention effectively prevent or at least delay relapses. Relapses occurred less frequently and later in patients who participated in outpatient cognitive-behavioral relapse prevention in the first year after discharge than in patients in the respective control groups who received either standard aftercare (Carter et al. 2009) or nutritional counseling (Pike et al. 2003). The psychotherapeutic treatment concept “Maudsley Model of Anorexia Nervosa Treatment in Adults” (MANTRA) (Schmidt et al. 2012) includes a separate therapy program for relapse prevention in AN, which was developed based on the disorder model of anorexia and empirical risk and protective factors regarding relapse (Sect. 54.1.1) (Giel et al. 2013, 2015).

54.3.4 Therapeutic residential groups

While behavioral change with psychotherapeutic support within a protected framework, such as inpatient treatment, may be successful, it can be difficult to implement this at home in everyday life after discharge, leading to a threat of relapses into old patterns of behavior. Therefore, a limited stay in a therapeutic residential group can be helpful, providing an environment both outside a clinic and outside one's own social environment, where lessons learned from the acute treatment of AN can be transferred to everyday life and further developed. There are therapeutic residential groups specifically for patients with eating disorders: Here, those affected live together for a certain period of time, continue attending school, vocational training, or studying, and receive comprehensive

therapeutic services, including psychotherapy, nutritional therapy, and medical support. This care concept is particularly recommended for adolescent patients if chronicity is imminent or has occurred, in cases of social isolation and problems in coping with everyday life, and in cases where the patient's home situation is not sufficiently supportive or health-promoting (Herpertz et al., 2019).

Conclusion

Anorexia nervosa is characterized by a high risk of relapse. Treatment and care concepts specifically aimed at preventing relapses following acute treatment of anorexia can improve the course of the disorder. These include guided self-help, psychotherapy, and – for specific indications – therapeutic residential groups.

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Part VII

Definition, Classification, and

Epidemiology of Obesity



Diagnosis and Etiology of Obesity

55

Alfred Wirth

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55.1 Diagnosis of Obesity

The diagnosis for defining obesity is simple. For the care of people with overweight and obesity, anthropometric measurements are sufficient.

55.1.1 Anthropometry and Definition of Obesity

The body mass index (BMI) is determined using weight-height indices. It is calculated from the quotient of body weight and body height:

$$\text{BMI} = \frac{\text{Body weight (kg)}}{\text{Body length } h^2 (\text{m})}$$

Obesity is defined based on the BMI (Table 55.1); the BMI is a measure of body fat mass.

For several years, the term overweight has been used synonymously with the term pre-obesity in publications. Bariatric surgeons occasionally refer to patients with a BMI $> 50 \text{ kg/m}^2$ or 60 kg/m^2 as “superobese.”

Equally important and even more significant for the metabolic consequences of obesity than the BMI is the *waist circumference*, which is a rough measure of intra-abdominal (visceral) fat. The waist circumference is measured in the standing patient at mid-breath between the lower edge of the ribs and the upper iliac crest. If the hip circumference is also measured, the *waist-to-hip ratio* can be determined, a value with similar significance to the waist circumference (Table 55.2).

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Table 55.1 Classification of obesity in adults according to BMI. This classification applies to Europeans; lower thresholds apply to other ethnicities (e.g., Asians) (WHO 2000)

Category	BMI (kg/m^2)	Risk of comorbidities
Underweight	< 18.5	low
Normal weight	18.5–24.9	Average
Overweight	>25.0	Slightly increased
Pre-obesity	25.0–29.9	Slightly increased
Obesity class I	30.0–34.9	Increased
Obesity class II	35.0–39.9	High

Table 55.2 Waist/hip circumference and risk for obesity-associated complications (according to Lean et al. 1995)

Risk for metabolic and cardiovascular complications	Waist circumference (cm)		Waist-to-hip ratio	
	Men	Women	Men	Women
Increased	≥ 94	≥ 80	≥ 1.0	≥ 0.85
Significantly increased	≥ 102	≥ 88		

55.1.2 Methods for Measuring Body Composition

Body composition is of great importance for a differentiated view of obesity. Body fat mass is distributed differently in individuals, which is relevant for morbidity, quality of life, and mortality. Some people in the overweight range have no increased fat mass but a strongly developed musculature, and some have very little muscle but a relatively large proportion of fat (sarcopenic obesity). Nowadays, there are numerous methods, some of which are easy to handle, while others are very complex and complicated, so they are only used for scientific purposes (Bosy-Westphal and Müller 2013; Okorodudu et al. 2019).

Skinfold thickness measurement With a measuring clamp (e.g., caliper), the subcutaneous fat layer thickness can be measured

at various body sites. The sum of the skin-fold thickness can be used to estimate body fat mass using regression formulas. In children and adolescents, the results are relatively valid, and there are reference values for Germany. In adults, especially in people with obesity, the method is less precise, with deviations of up to 20% compared to reference methods.

Bioelectric impedance analysis (BIA) In the *BIA method*, the electrical alternating current conductivity in body fluid is measured. Four electrodes are attached to the hand and foot, with the current frequency usually being 50 kHz. The impedance is determined, which is the resistance to alternating current, composed of the resistive resistance (water and electrolyte content) and the capacitive resistance (cell membranes). Using algorithms and reference methods, parameters of body composition (total body water, extracellular body water, body cell mass, fat-free mass) can be calculated. The body fat mass is obtained from body weight—body cell mass. The phase angle is an indicator of hydration and cell membrane integrity. The BIA method is now also frequently used in clinical practice. It is better suited for estimating body composition than for monitoring progress, as small changes in body weight do not adequately reflect changes in body compartments. So-called fat scales with impedance measurement are not very precise, as the current is only conducted through the legs and lower abdomen.

Dual X-ray absorptiometry (DXA) In this X-ray method, two different photons are emitted, attenuated differently in the body by different compartments, and reabsorbed. The radiation exposure is low, but not tolerable for pregnant women and children. DXA was primarily developed for bone density measurement. The method can also quantitatively capture soft tissues such as body fat and muscles. To capture regional body fat in the visceral or gluteal-femoral region, special software is required. Patients weighing >150 kg cannot be examined by many devices.

Density measurement (densitometry) In *hydrometry* (underwater weighing), the body volume is measured according to the Archimedean principle (water displacement) and the body density is calculated from body mass and body volume. It is a classical method with precise results. However, the equipment, personnel, and time required are considerable, so the method is only used for special scientific investigations, but increasingly less so.

Air-displacement plethysmography This method can also be used to determine body density, with a precision of 2–3%. The measuring principle is based on the Poisson gas law. Body surface and thoracic gas volume, determined in the body plethysmograph, as well as other parameters, are included in the calculation. The measurement can be performed in a few minutes. It is much less labor-intensive than hydrometry and much more comfortable for the patient. Children can be examined with special devices.

Computed tomography (CT) and magnetic resonance imaging (MRI) These methods allow for a differentiated and quantitative assessment of body organs that are of interest in the diagnosis of obesity: total body fat, visceral fat, subcutaneous fat tissue, gluteo-femoral fat tissue. Depending on the target size, several scans are required, with visceral fat being measured at the level of L4. Differences in organ density are shown in grayscale scans. Quantitative evaluation is carried out using planimetric methods. A CT involves significant radiation exposure, while an MRI does not and can therefore also be used for pregnant women and children.

Ultrasound The widespread availability of these devices in practices and clinics is one reason to also perform measurements in people with obesity. More than half of those affected have fatty liver. Using certain scores, the liver fat content can be determined. The subcutaneous fat layer thickness can be easily measured at many body sites. The determination of the

sagittal (intra-abdominal) diameter correlates with the visceral fat mass.

Dilution methods Dilution methods are suitable for measuring body water. Isotopes such as deuterium (D_2O), oxygen ($H_2^{18}O$), or tritium (3H_2O) are commonly used. The isotopes distribute in all fluids, and body water is measured. Isotopes can be measured accurately, with the precision for total body water being about 2%. The water content of the body in a 70 kg man is 63%, and in an obese person, it is significantly less depending on the extent. However, the muscular water content is quite constant at 73%. The measurement parameters provide good results regarding total body water, extracellular water, fat mass, and fat-free mass (muscle mass). The method is used only for scientific purposes.

► Important

- Obesity is defined by weight-height indices (BMI).
- Measuring waist circumference provides further indications for morbidity and mortality risk.
- Some methods have proven effective in clinical practice depending on the question: skinfold thickness measurement, bioelectrical impedance analysis (BIA), dual X-ray absorptiometry (DXA).
- In scientific research, other methods are used: air-displacement plethysmography, magnetic resonance and computed tomography, as well as dilution methods and ultrasound.

55.2 Causes of Obesity

55.2.1 Genetic Predisposition

Genetic research has generated many insights in recent years, as a number of new techniques have been applied that can also be used in large population groups. Inheritance can affect energy intake (hunger and satiety regulation), energy expenditure, and energy storage.

Significant findings come from **twin research**. Twins were either observed over several years or were experimentally under- or overfed. In **adoption studies**, genetic effects can be convincingly investigated, as the adoptees share the genetic material with their biological parents and the environment with their adoptive parents. An evaluation of the Danish adoption register with 3,580 individuals revealed the following (Stunkard et al. 1986): The weight of the adoptees did not correlate with that of the adoptive parents, but only with that of the biological parents.

If a genetic variant, a mutation in a single gene, exists, it is referred to as a **monogenic form** of obesity. Affected are individuals who are not only obese but also exhibit additional characteristics, in which case a **syndromal obesity** exists. These individuals can be diagnosed through careful clinical examination and by taking a medical history. These syndromes are rare but are of great clinical interest due to high morbidity. More than 50 such syndromes are known worldwide, some of which are mentioned here: Prader-Willi syndrome, Ahlström syndrome, Cohen syndrome, Carpenter syndrome, Albright's hereditary osteodystrophy, Rubinstein-Taybi syndrome, etc.

In some **monogenic forms**, only obesity is present, with a so-called major gene effect. This has been demonstrated for the hormone leptin and leptin receptors. Leptin reduces the expression of proopiomelanocortin (POMC) in the hypothalamus, which activates the release of melanocortin-4 receptor (MC4R) over several stages. A mutation in the MC4R is found in 2–6% of children with extreme obesity (Hinney et al. 2010).

More common than monogenic forms are **polygenic forms** of obesity. Genome-wide association studies (GWAS) can identify gene variants. In a meta-analysis, 941 BMI-associated polymorphisms were described, explaining 6% of the variance in BMI (Yengo et al. 2018). Of great importance is the FTO gene, the presence of which increases the risk of obesity by 1.5 times. GWAS can so far only describe 6% of

the genetic causes, a small part of what has been shown in formal genetic studies (50–80%).

55.2.2 Disturbance of Energy Intake

The energy balance is controlled in the hypothalamus by biological mechanisms that are partly determined by genetics and/or the environment. The consumed food is important in terms of type and quantity, as it is not only relevant for its energy content but also affects biological and psychological mechanisms. If the energy balance is positive, mainly body fat is stored; if it is negative, fat is broken down. This system, maintaining a constant body weight, works for many people throughout their lives. Often, the regulation is disturbed by caloric overconsumption, as there were many phases of malnutrition and famine in evolutionary history. This “experience” also explains why counter-regulatory mechanisms are activated during weight loss.

55.2.3 Regulation of Hunger and Satiety

The regulation of hunger and satiety is often represented in analogy to the “satiety cascade” developed by Blundell (2010): Appetite and hunger initiate the eating process. This is terminated by a feedback mechanism through the consumed food and sensory influences (“satiation”). The resulting “fullness” causes no more eating and the meal is finished for an extended period, satiety (“satiety”) sets in. The satiety between meals (“inter-meal satiety”) and the length of breaks between meals depend on the type and amount of food and its chemical properties (macro- and micronutrients). For example, tasty food stimulates hunger and shortens the time between meals.

Biological signals for the regulation of hunger and satiety mainly come from the gastrointestinal tract. Ghrelin and cholecystokinin greatly stimulate hunger and food intake. They are produced in the gastric fundus and in the

proximal small intestine (duodenum and jejunum), respectively. Glucagon-like peptide and peptide YY reduce appetite and food intake. In addition to these substances, there are a number of other substances that play a role outside the gastrointestinal tract. Orexigenic substances stimulate hunger and appetite: neuropeptide Y, melanin-concentrating hormone, agouti-related protein, cannabinoids, etc. Anorectic substances have the opposite effect: leptin, amylin, serotonin, norepinephrine, endocannabinoid receptor inhibitors, corticotropin-releasing hormone, etc.

55.2.4 Malnutrition

For many years, Western society has been in an environment with an abundance of food. The general availability, tastiness, and low prices encourage overconsumption. Fig. 55.1 shows the results of 19 studies in which overnutrition

of 17,000–84,000 kcal was determined and a weight gain of 1.4–8.9 kg occurred (Bray and Bouchard 2020).

55.2.5 Significance of Macronutrients

Fat Fat in the diet promotes weight gain. Fat contains twice as much energy as carbohydrates or protein. Individuals with obesity consume more fat than those with normal weight. The following questions arise: Is more fat consumed not only for reasons of taste, but also due to lack of satiety? Do people with obesity behave differently than those with normal weight? Many studies on this topic show that fat has little satiating effect and meals with high fat content and thus high energy content do not cause increased or longer-lasting satiety. Since high-fat foods

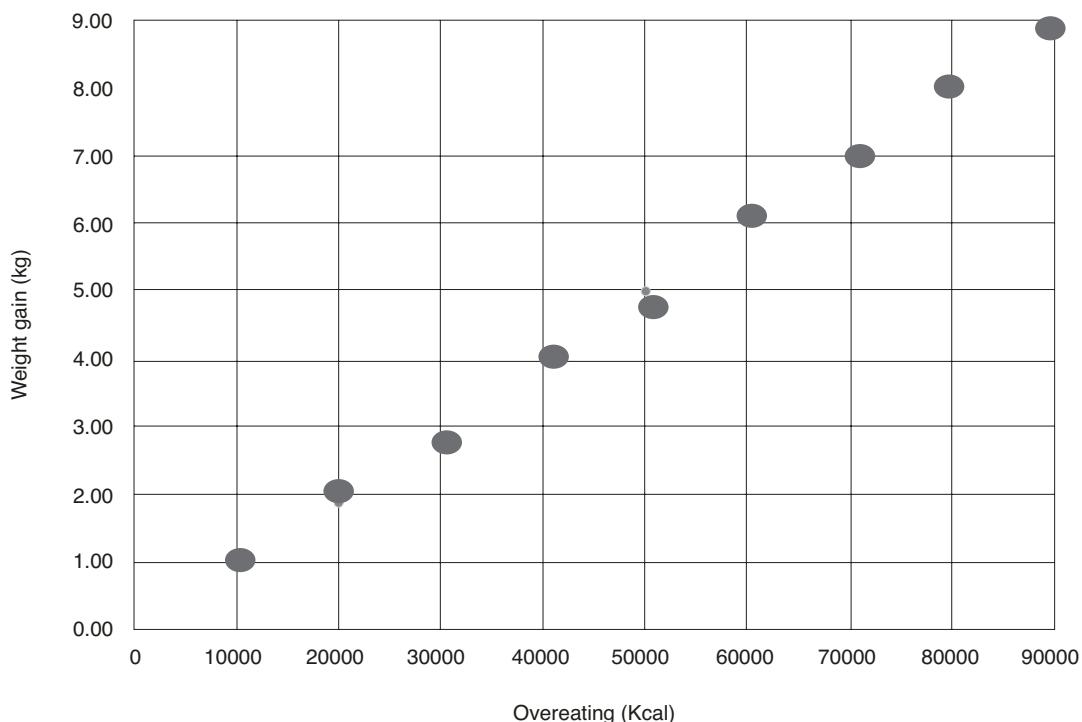


Fig. 55.1 Weight gain with overnutrition in 19 studies with different observation periods. (Modified after Bray and Bouchard 2020)

taste good and provide little satiety, they are often eaten in excessive amounts, referred to as “passive overconsumption”.

Fatty foods often lead to overnutrition:

- tastiness
- high energy density
- low volume
- low satiety

Carbohydrates Carbohydrates consist of sugars with different chemical compositions. Sugary drinks have a particularly negative impact on weight, especially in children and adolescents. Complex carbohydrates (e.g., fiber, whole grains) are evaluated differently, as they have a low energy density and provide significant satiety. According to the German Society for Nutrition (DGE 2017): “An increase in whole grain product intake is associated with preventive benefits.” Consuming carbohydrates with a lower glycemic index may be advantageous, but the evidence for this is weak. Sweeteners (e.g., saccharin, cyclamate, aspartate, acesulfame-K, etc.) contain almost no energy, and foods with sweeteners (“diet” products) contain less than those with sugar. In moderation, sweeteners do not increase food intake.

55.2.6 Alcohol

Although low and moderate alcohol consumption can have positive effects on health, alcohol has a negative impact on body weight. Alcoholic beverages with high calorie content (e.g., beer) were found to be positively correlated with body weight in many studies.

55.2.7 Portion Sizes

Many people consume little fat and sugar and still become overweight. Reasons for this include increasing packaging sizes in recent years. Observations from the USA over 20 years show that packaging sizes for soft drinks

and fruit juices increased by about half (Nielsen and Popkin 2003). The same applies to snacks, french fries, hamburgers, and cheeseburgers. Experimental studies show that large packaging sizes and large portions also lead to increased energy intake. Those who have a lot on their plate usually eat a lot (Mesas et al. 2012).

Distribution of meals—eating frequency Most studies, including meta-analyses, found a weak association between the frequency of meals and their distribution throughout the day. It has been proven that one should not snack between meals unless hungry. There is also no recommendation on how often one should eat per day; eating 2, 3, or 4 times a day is of no importance. However, those who consume larger amounts of food in the evening or at night are at risk for weight gain. More important than the “eating pattern” are energy content, energy density, and portion sizes (Mesas et al. 2012).

Fast food and convenience products Predominantly younger individuals frequently consume fast food, a product that often contains a lot of fat, refined sugars, and little dietary fiber. Fast food is often characterized by large portions, tastiness, high energy density, and a high glycemic index. According to the German Frozen Food Institute, per capita consumption of convenience products has doubled in the last 20 years.

Energy density The energy density of foods, i.e., the quotient of energy content (calories) and quantity (g), is of great importance for the development of obesity (Bes-Rastrollo et al. 2008). Those who consume foods with high energy density (e.g., animal fats, sweets) have little on their plate but still many calories. Foods with low energy density are water- and fiber-rich foods such as vegetables, fruits, soups, and water.

Diagnosis of energy intake Table 55.3 provides an overview of nutritional assessment methods.

Table 55.3 Overview of nutritional assessment methods; the use for research and/or practice depends on the respective question; pro=prospective; retro=retrospective. (Mod. after Holzapfel and Wirth 2013)

Method	Prospective/ Retrospective	Practice/ Research	Evaluation
Weighing	Pro	Practice/Research	Very accurate, time-consuming
Nutrition diary	Pro/Retro	Practice/Research	“Gold standard” in combination with weighing
Food frequency questionnaire	Retro	Practice/Research	No quantity information, fast, suitable for large cohort
Nutritional history	Retro	Practice	Dependent on memory, “obsolete”
24-hour recall	Retro	Practice/Research	Dependent on memory
“New technologies”	Pro/Retro	Research	Promising, not yet established, benefits still unclear

Weighing Weighing in combination with a nutrition diary is considered the gold standard. In experimental situations, the amount of food on the plate and the leftovers are usually weighed. The energy content can be calculated from the difference and the food composition with an accuracy of about 2%. If the plate is continuously weighed during eating, it is called a “Universal Eating Monitor” (UEM). The so-called “Food Dispenser” has become established in science; here, even solid foods can be administered.

Diet History This is a structured interview in which retrospective data on nutrition is collected. Using a standardized questionnaire, a dietary survey (sequence and frequency of meals), quantity (in household measures) of individual foods, dietary habits, seasonal peculiarities, and social circumstances are conducted.

The dietary history can be supplemented by a so-called “24-hour recall”. In this case, the food intake of the past three days is usually asked by a nutritionist; the result can be recorded on standardized forms.

Food record In a food record, the consumed foods are recorded in writing or electronically. For example, 100 common foods and beverages are provided in tabular form for selection. The patient/participant enters the number of individual foods (e.g., two teaspoons of sugar, one slice of whole grain bread).

Food frequency questionnaire In food frequency questionnaires, patients/participants

indicate the consumption frequency of certain foods in a table (in writing or electronically), which are sorted by groups (e.g., cereal products, dairy products, vegetables, and fruits). The frequency classification ranges from “daily” to “three to four times per week” to “never”. In the therapeutic area, an evaluation can be made based on a rating using traffic light colors (e.g., commendable [green], questionable [yellow], not recommended [red]). Compared to the food record, food frequency questionnaires have the advantage of placing fewer demands on the patient in terms of time and intelligence. The questionnaire can also be evaluated semi-quantitatively.

Accuracy of interviews, questionnaires, and records

The main advantage of all these methods lies in the simple, fast, and cost-effective collection. Both the interviewer and the patient may have biases. People with obesity significantly underestimate the quantity of food compared to those with normal weight (“under-reporting”). In a valid study, people with obesity under-reported their food intake by 34-47% (Lichtman et al. 1992).

55.2.8 Physical Inactivity, Immobility

A low energy expenditure due to physical inactivity contributes to the development of obesity, as does an increased energy intake. While basal metabolic rate and thermogenesis, the other

components of energy expenditure, can only be influenced to a small extent, there are naturally large variations in physical activity. A distinction is made between spontaneous and intentional activity, the former being unconscious/genetically predetermined (e.g., fidgeting), the latter being deliberately initiated. The resting energy expenditure (basal metabolic rate) is essentially determined by age, sex, fat-free body mass (muscle mass), ethnicity, and genetic predispositions.

Almost all studies (observational and experimental) show that high physical activity reduces or prevents weight gain; in industrialized societies, adults gain 0.5–0.8 kg in weight per year. In a large study with 20,259 normal-weight women under 40 years of age, physical activity was recorded, among other things. After 14 years of observation, obesity was especially less likely to develop in women who engaged in moderate to high-intensity activity (jogging, swimming, aerobics, basketball) (Fig. 55.2). However, walking, strolling, and exercising at home had

no significant effect (Rosenberg et al. 2013). Other studies have shown that younger individuals benefit more from increased physical activity than older ones, with no gender differences. Guidelines recommend engaging in moderate to intense physical activity for >150 minutes per week.

55.3 Recording of Physical Activity

Resting energy expenditure and thermogenesis are measured using indirect calorimetry (gas exchange). In the respiration chamber, spontaneous activity can also be determined by motion sensors. Total energy expenditure can be accurately recorded under everyday situations using doubly labeled water.

Physical activity is usually recorded using two different measurement variables, the metabolic equivalent (MET) and the physical activity level (PAL).

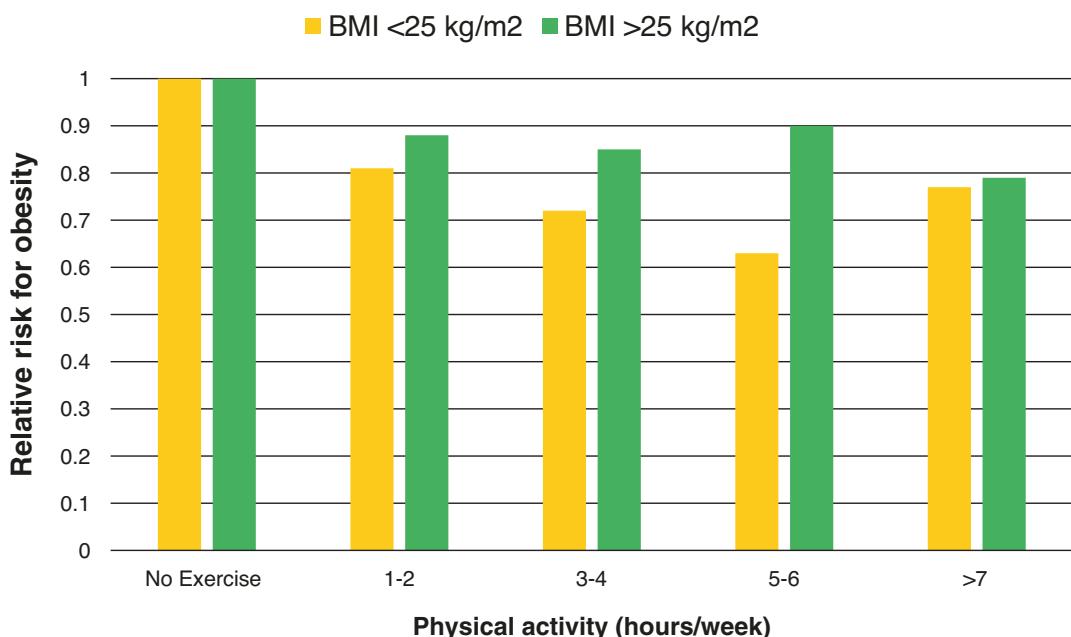


Fig. 55.2 Prevention of obesity through physical activity (medium to strong activity) (Modified from Rosenberg et al. 2013)

MET (metabolic equivalent) 1 MET corresponds to the resting energy expenditure of 3.5 ml O₂/kg/Min or 1.2 kcal/kg/Min. METs are always given as multiples of resting energy expenditure. MET is an absolute measure of energy consumption:

MET for physical activities:

- light activity: >3 METs (e.g., slow walking)
- moderate activity: 3–6 METs (e.g., walking at 4–7 km/h)
- intense activity: >6 METs (e.g., jogging)

PAL (physical activity level) PAL is primarily used to determine total energy expenditure. 1 PAL corresponds to resting energy expenditure.

PAL classification for physical activities:

- sedentary: >1 to 1.4
- lightly active: >1.4 to <1.6
- active: >1.6 to <1.9
- very active: >1.9 to <2.5

Example: Total energy expenditure for a 45-year-old assembly line worker with a BMI of 29.3 kg/m²:

- Resting energy turnover 1908 Kcal/d (measured)
- 8 hours of work as an assembly line worker with 1.6 PAL
- 8 hours of leisure time 1.4 PAL
- 8 hours of sleep with 0.95 PAL

The total energy expenditure is calculated: $(8 \times 1.6) + (8 \times 1.4) + (8 \times 0.95)/24 \times \text{basal metabolic rate} = 2518 \text{ Kcal/d}$

55.4 Low Socioeconomic Status

In the study on adult health (DEGS1), a representative survey of 8152 women and men aged 18–80 years in Germany from 2008 to 2011, a clear relationship between BMI and socioeconomic status was found regarding the prevalence of obesity (Kurth 2012). Women with a

low status were two to three times more likely to be obese across all age groups than women with a high social status. In men, the trend was much less pronounced, with a low social status increasing the prevalence of obesity by about 10% (younger) to about 50% (older).

55.5 Sleep Deprivation—Disturbed Sleep

In children, there is a close relationship between sleep duration and body weight. This relationship is also present in adults, as shown by a meta-analysis of twelve studies (Zhou et al. 2019). As with previous studies, it was found that a sleep duration of seven hours per night has the lowest risk of developing obesity (Fig. 55.3). A reduction in sleep duration significantly increases the risk, while an extension hardly does.

Individuals with shortened sleep duration eat irregularly, often at night, and are more hungry during the day. The background for this may be increased ghrelin and cortisol levels as well as decreased leptin concentrations. A short sleep duration also increases fatigue and leads to less physical activity.

55.6 Diseases Associated With Obesity

Hypothyroidism Hypothyroidism is present in about 3% of cases of obesity. Due to the simple diagnosis and good therapeutic success, this disease should always be ruled out. Determining the basal TSH in plasma is sufficient for this purpose.

Cushing's disease Cushing's disease should only be verified or ruled out in cases of clinical suspicion (frequency <1%). Red striae and trunk-centered fat distribution are hardly pathognomonic for this disease and often occur in obese individuals without elevated cortisol levels.

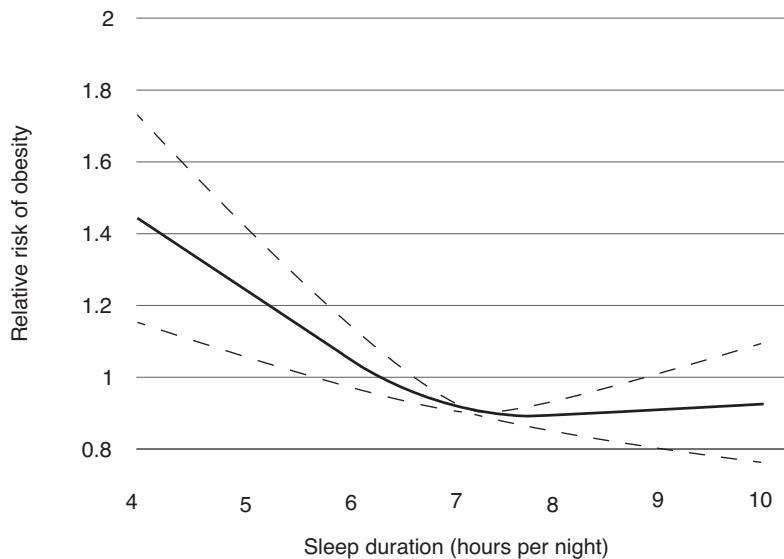


Fig. 55.3 Sleep duration and risk of obesity. Mean values (solid line, standard deviation dashed line) (Mod. after Zhou et al. 2019)

Polycystic ovary syndrome (PCOS) This syndrome is associated with obesity (50%), hirsutism (70%), amenorrhea (50%), infertility (70%), and large, sclerotic, cystic ovaries. The cystic ovaries are diagnosed sonographically.

Hypothalamic symptom complex There is a disturbance in the hypothalamus, the center for hunger and satiety, with various underlying causes. Tumors, inflammatory processes, leukemic infiltrates, traumas, and aneurysms can cause damage at different locations with varying symptomatology.

55.7 Drugs and Weight Gain

Drugs with weight gain as a side effect are mainly found in psychiatric disorders/diseases, but also in diabetes mellitus, inflammatory diseases, and hypertension. A systematic review of 43 randomized trials found the following results regarding weight gain (Himmerich et al. 2005): antipsychotics (2.1–7.1 kg), mood stabilizers (2.5–5.8 kg), insulin (1.8–6.6 kg), sulfonylureas (1.4–5.0 kg), tricyclic antidepressants (1.7–3.7

kg), cortisone (2.0 kg), beta-blockers (0.5–2.3 kg). In a more recent meta-analysis of 307 articles, some substances are mentioned that cause a weight gain of >5 kg with long-term use (Bak et al. 2014).

Antidepressants Antidepressants are often prescribed, especially for patients with obesity, as they are more likely to experience depression and anxiety compared to people with normal weight. Many patients find themselves in a vicious cycle:

weight gain → depression → antidepressants
→ further weight gain → increased depression

The highest weight gains are observed with *amitriptyline*, *mirtazapine*, and *paroxetine*, which amount to 2–3 kg in chronic treatment, as shown by a meta-analysis (Serretti and Mandelli 2010; Fig. 55.4). Some antidepressants initially reduce weight and increase it in the long term (e.g., *duloxetine*, *paroxetine*, *citalopram*). *Bupropion* significantly reduces weight not only in the short term but also in chronic therapy.

Mood stabilizers These “mood enhancers” are also often prescribed for patients with obesity,

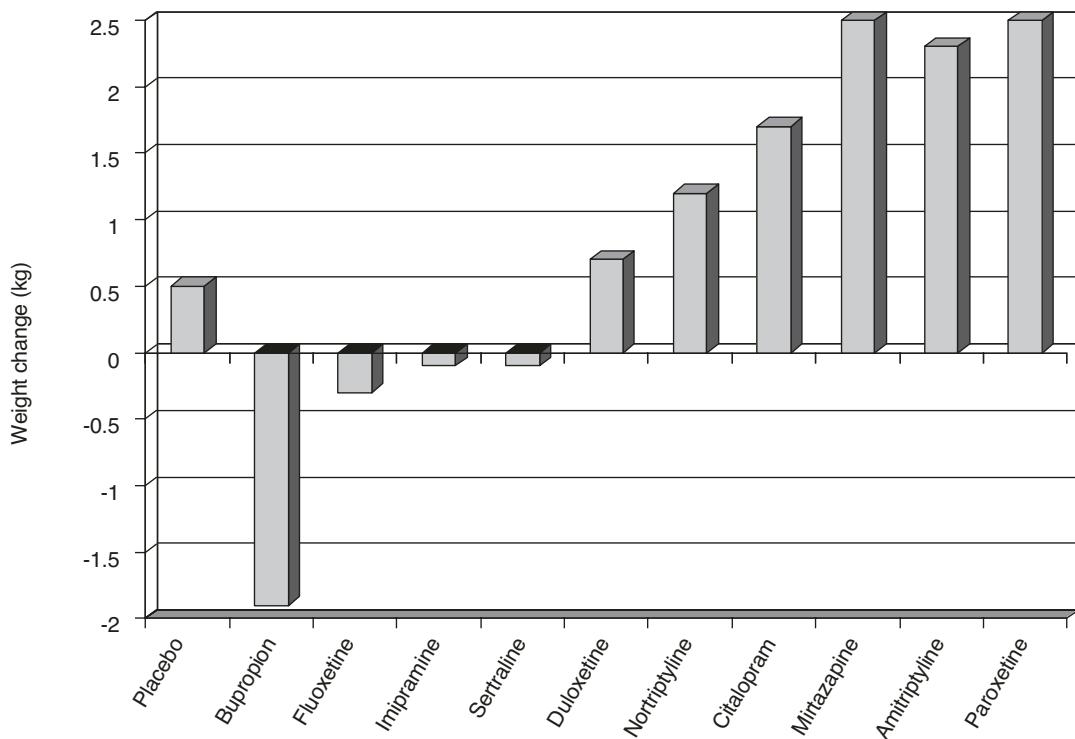


Fig. 55.4 Antidepressants and weight change, meta-analysis. (Modified from Serretti et al. 2012)

but often for other indications (e.g., epilepsy). *Lithium* leads to weight gain in about 25% of patients, often in the range of 4–12 kg. Weight gain to a similar extent has also been proven for *gabapentin*. *Carbamazepine* increases weight less, mainly due to fluid retention. *Lamotrigine* appears to be weight-neutral (Torrent et al. 2008).

Neuroleptics Some representatives of this substance class lead to significant weight gains. For decades, this has been described for *olanzapine* and *clozapine* with average weight gains of 8–12 kg. It is reported that more than half of individuals taking *clozapine* gain more than 10% and one in five gains more than 20% (Torrent et al. 2008). Less pronounced weight gains occur with *molindol*, *loxapine*, *pimozide*, *risperidone*,

quetiapine, *amisulpride*, *aripiprazole*, *ziprasidone* and *haloperidol*.

Insulin and oral antidiabetics Insulin, a growth hormone, increases body weight by 5–10 kg through various mechanisms. Sulfonylureas and glinides also cause weight gain.

Corticosteroids Cortisol increases body weight, typically in the form of abdominal obesity with a round face, striae rubrae, muscle weakness, and osteoporosis. Cortisol stimulates appetite and fat formation.

Estrogens/contraceptives Estrogens in the context of hormone replacement therapy do not increase body weight, whereas contraceptives promote body fat accumulation by inhibiting fat oxidation.

β-Blockers β-blockers lead to a slight weight gain. They lower the sympathetic tone and thus the energy consumption and inhibit lipolysis as well as fat oxidation.

Conclusion

- Inheritance affects energy intake, energy expenditure, and energy storage.
- The inheritance of the “obesity” trait contributes to the development of obesity by about 50%.
- Monogenic forms of obesity are rare, while polygenic traits are often observed.
- Obesity can also manifest itself in the form of a genetic syndrome (syndromal obesity).
- The determination of energy intake is often distorted by methodological problems.
- A dysregulation of appetite, hunger, and satiety, as well as a low resting energy expenditure, often lead to long-term weight gain. It is primarily a genetic phenomenon.
- The satiating effect of macronutrients is as follows: protein > carbohydrates > fat
- Energy-dense foods (fat, sugar) lead to weight gain due to their high energy content, good palatability, and low satiety. This includes fast food and convenience products.
- Physical activity should also be assessed.
- Our sedentary lifestyle and low occupational muscle work also explain the increasing prevalence of obesity in recent decades.
- A short sleep duration can increase body weight.
- Diseases can also lead to weight gain.
- In particular, numerous psychotropic drugs foster obesity

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Epidemiology of Obesity

56

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56.1 Introduction

The prevalence of obesity has substantially increased in almost all countries of the world, and a further increase is also expected for the future (N. C. D. Risk Factor Collaboration 2016). Obesity is a risk factor for a number of chronic diseases, especially type 2 diabetes mellitus, coronary heart disease, and certain cancers (Haslam and James 2005; Nimptsch and Pischon 2015). Consequently, obesity is also associated with a lower life expectancy (Whitlock et al. 2009). Even though obesity is not yet referred to as a chronic disease in all countries,

it can be considered as a chronic entity, as the individual BMI in adulthood is a relatively stable characteristic in the short term and tends to increase rather than decrease over the course of life. Long-term weight loss, on the other hand, is less common, as intervention measures for weight reduction in overweight or obese people usually only show short-term effects. This chapter provides an overview of the epidemiology of obesity.

56.2 Definition of Obesity in Epidemiological Studies

Since the 1980s, the body mass index (BMI, calculated from the quotient of body weight in kilograms and the square of body height in meters) has been the globally accepted measure for the definition of overweight and obesity in adults, with a BMI greater or equal to 25.0 kg/m^2 being considered overweight and a BMI greater or equal to 30.0 kg/m^2 being

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considered obese. Normal weight is defined as a BMI between 18.5 and 24.9 kg/m², and a BMI below 18.5 kg/m² is considered underweight. The obesity threshold, also supported by the World Health Organization (WHO), is based on the observation in epidemiological studies that a BMI of 30.0 kg/m² or higher is associated with a higher mortality risk (Expert Panel on the Identification 1998; World Health Organization 2000). The mentioned thresholds for overweight and obesity apply particularly to Western populations. Lower thresholds for the definition of overweight and obesity have been proposed for Asian populations, as it has been observed that Asians, compared to non-Asians with the same BMI, have a higher body fat percentage and a higher metabolic risk (insulin resistance, diabetes, dyslipidemia) (Pan and Yeh 2008). For children and adolescents, there is no universally valid BMI-based definition of obesity due to the rapid changes in proportions and body composition during growth. Instead, the WHO recommends the use of age-specific BMI reference curves (WHO Growth Standards) for the definition of obesity in children and adolescents, which were constructed from data of a multicenter, population-based study from 1997–2003 (WHO Multicentre Growth Reference Study Group 2006; de Onis et al. 2007).

In both clinical and scientific-epidemiological contexts, the BMI has proven its worth, as it is easy to measure and is associated with both morbidity and mortality. The BMI correlates with fat mass; however, it is not a perfect measure, as it cannot distinguish between fat mass and fat-free mass and does not take into account body fat distribution. Visceral fat is particularly important for the metabolic changes associated with obesity and the resulting increased disease risk.

► **Important** While the largest proportion of fat mass is found subcutaneously, the adipose tissue in the abdominal cavity, i.e., the adipose tissue surrounding the organs (visceral fat), has the highest metabolic activity: Visceral adipose tissue produces relatively more hormones and cytokines, which promote metabolic disorders such as insulin resistance

and chronic inflammatory processes (Gallic et al. 2010).

Simple measures for assessing body fat distribution are waist circumference and waist-to-hip ratio. These measures have the advantage of correlating more strongly with visceral adipose tissue than BMI. The WHO recommends additional measurements for body fat distribution in individuals with a BMI between 25.0 and 34.9 kg/m²; with a waist circumference greater than or equal to 102 cm for men or 88 cm for women, or a waist-to-hip ratio greater than or equal to 0.95 for men or 0.80 for women as a criterion for abdominal obesity (Expert Panel on the Identification 1998; World Health Organization 2000). However, recent studies show that waist circumference measurement is also important for morbidity and mortality risk in individuals with lower BMI (below 25.0 kg/m²) (Pischon et al. 2008; Feller et al. 2010). Newer techniques for refined diagnosis of obesity, such as imaging methods like magnetic resonance imaging (MRI) to distinguish between fat mass and fat-free mass or subcutaneous and visceral fat, are promising but currently have limited clinical significance, as established thresholds are still lacking.

In addition to the described “eutopic” fat accumulation, ectopic fat deposition likely plays a special role in disease risk (Shulman 2014). This involves (presumably due to a capacity overload of adipose tissue) abnormal fat deposition in organs (mainly in the liver and muscles), leading to insulin resistance and its associated consequences (Shulman 2014). Ectopic fat deposition can be quantified primarily with magnetic resonance spectroscopy; however, the liver enlargement associated with fatty liver also contributes to waist circumference.

To assess the prevalence of obesity epidemiologically, reliable data sources are needed. In epidemiological studies and national and regional health surveys, the collection of body weight and height has become standard, with differences in whether the measurements are taken using standardized methods or self-reported by study participants. Measures of body fat distribution, such as waist circumference or waist-to-hip

ratio, are often, but not always, measured in a standardized manner in studies.

56.3 Global and Temporal Trends in Obesity Prevalence

► **Important** National, regional, and multi-center studies have shown that the prevalence of obesity has increased dramatically over the past 50 years, not only in industrialized countries but also in emerging and developing countries.

The global and temporal trends of BMI and obesity prevalence at the population level are currently being systematically investigated using a variety of population-based studies and surveys with measured BMI data from two privately funded initiatives: on the one hand, by the Non-Communicable Disease Risk Factor Collaboration (NCD-RisC) (N. C. D. Risk Factor Collaboration 2016, 2017), and on the other hand, by the Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating Group (Finucane et al. 2011)

The most comprehensive data on the development of measured BMI and obesity prevalence were provided by NCD-RisC. For adult trends, data were evaluated from 1,698 population-based studies with BMI measurements for 19.2 million participants in 200 countries for the years 1975–2014 (N. C. D. Risk Factor Collaboration 2016). For trends in children, adolescents, and adults, data were evaluated from 2,416 population-based studies with a total of 128.9 million participants in 200 countries for the years 1975–2016 (N. C. D. Risk Factor Collaboration 2017).

The data collected by NCD-RisC show that the mean BMI and obesity prevalence in adults worldwide have increased over the past four decades.

► **Important** Between 1975 and 2014, the age-standardized global obesity prevalence increased from 3.2% to 10.8% in men and from 6.4% to 14.9% in women.

The highest obesity prevalences in 2014 were observed for men and women in Polynesia and Micronesia (50% of women and 38% of men were affected by obesity). Prevalences of over 30% were observed in 2014 for men and women in English-speaking high-income countries (Australia, New Zealand, Canada, USA, Ireland, UK) as well as for women in southern Africa, the Middle East, and North Africa.

A global increase in mean BMI was also observed between 1975 and 2016 for children and adolescents aged 5–19 years, with strong regional differences. The smallest increase was recorded for boys and girls in Eastern Europe, while the highest increase was observed for boys and girls in Polynesia and Micronesia and for girls in Latin America. Interestingly, the BMI increase curve for girls and boys has flattened since 2000 in Northwest Europe, English-speaking high-income countries, and the Asia-Pacific region, while the increase in East, Southeast, and South Asia continues unabated. The age-standardized obesity prevalence (defined as $BMI > 2$ standard deviations from the median of the WHO reference curve for children and adolescents) has increased in the last four decades, from 0.7% to 5.6% in girls and from 0.9% to 7.8% in boys. Despite the strong increase in obesity prevalence, more girls and boys worldwide are still moderately to severely underweight (2016: 8.4% for girls, 12.4% for boys) than affected by obesity, with only a slight decrease in the prevalence of underweight in the last four decades. The highest prevalences of underweight in 2016 were observed in South Asia, particularly in India (22.7% for girls, 30.7% for boys). An increase in obesity prevalence among children and adolescents was observed worldwide in all regions, with the increase being less pronounced in high-income regions, but particularly pronounced in southern Africa. The highest obesity prevalence in 2016 was observed in Polynesia and Micronesia for both sexes (25% for girls, 22% for boys), followed by English-speaking high-income countries.

The figures on obesity prevalence and global temporal trends compiled by the Global Burden

of Metabolic Risk Factors Collaboration are overall comparable to those of the NCD-RisC, although methodological differences can be found in the data sources used, the number of countries included, and the age definitions (children and adolescents aged 2–19 years) (Finucane 2011; Stevens 2012).

56.4 Development of Individual BMI Over the Life Course

In order to understand the epidemiology of obesity, it is important to note that the figures shown for the prevalence of obesity always refer only to a snapshot of the current weight status of the study participants. On an individual level, however, body weight and BMI change over the course of life. While the individual BMI in middle age is a relatively stable characteristic in the short term, there is a tendency for weight gain in the long term in adulthood, despite that fact that the negative consequences of obesity for health are widely known. Exceptions to this are only seen in very old age or in the last years before death. An analysis of three long-term studies from Sweden showed that there are two turning points in BMI development in adulthood (Dahl et al. 2014): BMI initially increases steadily between the ages of 25 and 65, with this increase stopping after the age of 65. At the age of 80, there is finally a decrease in BMI. The influence of known lifestyle factors such as physical activity, alcohol intake, and smoking on BMI varies in strength over the life course. However, it must be taken into account that with increasing age, the ratio of fat mass to muscle mass changes, i.e., fat mass increases while muscle mass decreases, which is not necessarily reflected in the BMI. Longitudinal studies have shown that waist circumference increases with age, especially in women, and this occurs throughout the entire life span. This means that in older age, waist circumference and fat mass can continue to increase despite a stable or even declining BMI, which overall has an unfavorable effect on the risk of chronic diseases (Kuk et al. 2009). In addition, body weight during

childhood and adolescence plays a key role in the epidemiology of obesity, as overweight children have a high risk of being affected by obesity in adulthood (Baird et al. 2005).

56.5 Determinants of the Rising Prevalence of Obesity

The cause of obesity at the individual level is still considered to be a long-term positive energy balance, i.e., a higher energy intake from food than energy consumed through basal metabolism, the thermal effect of food, and physical activity. Determinants of obesity include a wide range of complex biological and social factors as well as environmental conditions that influence energy balance. These determinants include physiological and psychological susceptibility factors at the individual level, physical activity and dietary factors, as well as food production, supply, and marketing, socioeconomic factors, and environmental conditions that influence physical activity and dietary behavior at the societal level.

► **Important** Although primarily behavioral and environmental factors influence individual energy balance, genetic factors also play a role.

The heritability of BMI has been estimated at 40–70% in twin studies. On the other hand, genome-wide association studies have found that only a limited proportion of up to 6–11% of BMI variability can be explained by genetic variants (Speliotes et al. 2010). The globally observed increase in mean BMI and obesity prevalence cannot be explained by genetic influences alone.

Socioeconomic status and country-specific differences in wealth, on the other hand, partly explain some of the observed temporal trends and regional differences in obesity prevalence. An increase in obesity prevalence has been observed since the mid-1970s, initially in high-income countries, followed by middle-income countries as wealth increased, and finally in

low-income countries. In high-income countries, obesity is now primarily affecting less affluent population groups. In low- and middle-income countries, it was assumed until the 1990s that obesity mainly affected the wealthy. However, more recent studies show that even within emerging and developing countries, low-income groups and the poorer population are increasingly affected by obesity, as data from Brazil, for example, show (Monteiro et al. 2007). The adoption of the so-called Western lifestyle, characterized by a high intake of highly processed foods with high proportions of white flour, fat, sugar, and salt, as well as low physical activity and increased sitting, is considered a key factor in the global rise in obesity prevalence.

Conclusion

The worldwide increase in obesity prevalence among children, adolescents, and adults, as well as the known associations between obesity and the risk of a number of chronic diseases, underscore the urgency and necessity of measures for obesity prevention. Primordial obesity prevention, i.e., the prevention of the development of obesity, plays a particularly important role, as weight loss at the individual level is known to be difficult to achieve and long-term success in maintaining a healthy BMI after weight loss is rarely achieved. Since children and adolescents with an elevated BMI also have a higher probability of being affected by overweight and obesity in adulthood, obesity prevention should already begin in childhood and adolescence.

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Psychosocial Factors of Obesity in Childhood and Adolescence

57

Petra Warschburger

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Obesity in childhood and adolescence has long been a neglected topic. Meanwhile, it has become clear that this is by no means a temporary or minor phenomenon, but rather a serious health problem, particularly due to its diverse psychological consequences. Children and adolescents with obesity experience increased social stigmatization (e.g., teasing), and this has a negative impact on their psychosocial well-being (e.g., self-esteem, body image, quality of life). In addition, there are increased rates of clinical disorders in both internalizing (e.g., anxiety, depression) and externalizing behaviors (e.g., aggression, ADHD). In general, these burdens are particularly pronounced in groups that also seek clinical treatment, but, to a lesser extent, they are found in population-based studies as well. In recent years, there has also been an increase in findings

on reduced self-regulation skills. Psychosocial factors play an important role in the development and maintenance of obesity and should be given central importance in treatment.

57.1 Definition and Prevalence of Obesity

Obesity refers to an excessive relative body fat percentage, which is associated with increased morbidity and mortality. It is estimated using the BMI. When determining critical BMI values for children and adolescents, their growth and pubertal development must be taken into account. This is done using age- and sex-specific BMI percentile curves. As a criterion for the presence of obesity, values above the 97th percentile are recommended; overweight is defined as BMI values above the 90th (and below the 97th) percentile (see Kromeyer-Hauschild et al. 2001).

The prevalence of overweight and obesity is very high in our society. According to current

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data from a representative nationwide study in Germany (Schienkiewitz et al. 2018), 9.3% of 3- to 17-year-old children and adolescents are overweight and an additional 5.9% are obese. This means that approximately 800,000 children and adolescents in Germany are affected by obesity. With the start of school, there is a significant increase in prevalence, and no gender-specific prevalence differences are found. Particularly affected are children and adolescents from lower social classes and with a migration background. While the prevalences in Germany have been relatively stable since the beginning of the 21st century, the *severity* of obesity has increased.

57.2 Social Stigmatization, Teasing, and Obesity

57.2.1 Negative Social Evaluation

Obesity cannot be hidden; from the physical appearance, conclusions are drawn about a person's personality traits. Even preschool children rate children with overweight/obesity as "stupid, lazy, and unpopular". This negative evaluation tendency has not decreased despite the increasing prevalence of overweight and obesity, but on the contrary, has become even more frequent and pronounced (cf. Puhl and Heuer 2009). These negative attributions are found in all population groups and are partly internalized by those affected and applied to their own person (internalization of weight stigma).

57.2.2 Teasing

Social stigmatization manifests itself in childhood and adolescence primarily in the form of teasing. Teasing is an integral part of the social life of almost all children and is defined as a deliberate provocation that refers to a salient characteristic of the "victim" and is accompanied by "playful" hints such as exaggerations

and ambiguous remarks. In the literature, the term "bullying" is also often used, which additionally includes physical forms of social exclusion of a direct (e.g., pushing) or indirect nature (e.g., denying someone access to a group).

Studies consistently show that overweight and obesity are associated with increased teasing and/or bullying experiences (Puhl and Heuer 2009) and that these negative comments or exclusion experiences have various psychosocial consequences. This is particularly true for children and adolescents who have internalized these negative attributes (Zuba and Warschburger 2017). The experience of stigmatization (and its internalization) contributes to the emergence of vicious cycles: for example, children and adolescents who are teased during sports activities subsequently tend to avoid physical exercise. As a result, they increasingly lack athletic competencies, which in turn provide further opportunities for teasing. Often, in response to these experiences, attempts are made to regulate negative mood through eating (eating as a coping strategy), which contributes to further weight gain.

► **Important** Almost all children experience teasing. It occurs more frequently in children and adolescents with overweight and often centers around the same theme.

The negative social image of people with obesity, combined with stigmatization and discrimination in everyday life, is considered the central source of the development of psychological stress. The experience of stigmatization also contributes substantially to the maintenance, as well as the development, of obesity (Major et al. 2018). Moreover, social exclusion experiences can be seen as a breeding ground for the development of psychological disorders and increased stress perception.

► **Important** Appropriate coping strategies for dealing with persistent teasing are crucial for psychosocial well-being.

57.3 Psychological Disorders and Behavioral Problems

Regarding the question of psychological comorbidity in obesity during childhood and adolescence, numerous studies have been published to date, both in clinical and population-based samples. Often, rather than investigating the percentage of children and adolescents who suffer from problems requiring treatment, the studies drew comparisons with normal-weight peers at the level of mean values (Warschburger 2000, 2011). Cross-sectional studies predominate, which do not allow for conclusions about the temporal relationship between weight status and psychological burden. However, prospective studies also point to bidirectional relationships and an escalation process between psychological burden and (further) weight gain. In the literature, there are indications of an increased occurrence of mental disorders and psychosocial problems, especially within the group in question for treatment offers. Therefore, the possibility of a mental disorder requiring treatment must be diagnostically clarified particularly in this context.

Mental disorders and behavioral problems

- Affective disorders
- Anxiety disorders
- Externalizing disorders (such as ADHD, conduct disorders)
- Eating disorders (binge eating and loss of control eating)
- Low self-esteem
- Negative body image

57.3.1 Affective Disorders

In school samples, there was an approximately 30% increased occurrence of depression and depressive symptoms in children with obesity, while no increased risk was found for overweight (Sutaria et al. 2019). Many authors rather

speak of “unhappiness” and point out that the criteria for full manifestations of affective disorders are not necessarily met. On the other hand, the data in clinical groups, especially in girls from adolescence onwards, clearly indicate significantly increased prevalence rates of up to 40%. There seems to be a bidirectional relationship between depression and obesity. From adolescence onwards, there are also indications of increased suicidal thoughts, so suicidality should be examined in this age group using screening instruments.

57.3.2 Anxiety Disorders

The findings regarding anxiety disorders are relatively inconsistent. Surveys were generally not conducted using clinical interviews, but rather with general questionnaires for screening behavioral problems. Only the clinical groups were found to be more affected, whereas population-based studies showed indications of increased anxiety, but not increased rates of manifest anxiety disorders. Compared to children affected by asthma or neurodermatitis, children with obesity showed the highest levels of anxiety, and especially social anxieties (Warschburger 2000).

57.3.3 Externalizing Disorders

A number of studies observed increased attention problems up to manifest attention deficit and hyperactivity disorders (ADHD) in children and adolescents with obesity. In addition, there is evidence that comorbidity with ADHD negatively affects the course of therapy and further weight development. This relationship is explained by the limitation of self-regulation skills, such as inhibitory control or reward delay in children and adolescents with obesity (Favieri et al. 2019). In addition to the increased attention problems, a higher occurrence of physical aggression, especially in boys, was observed (Tso et al. 2018).

57.3.4 Loss of Control Eating and Binge Eating

Maladaptive eating behaviors are widespread in children and adolescents with overweight and obesity. Research has focused on the experience of loss of control while eating (LOC) and the associated consumption of large amounts of food (binge eating, BE). The criteria for the full manifestation of a binge eating disorder (BED) are rare in children and adolescents. Disturbed eating behaviors such as LOC and BE are among the most common comorbid disorders in obesity and are observed in about 25% of children and adolescents with obesity (He et al. 2017). These pathological eating behaviors should also be addressed in treatment.

57.3.5 Self-Esteem and Body Image

Data predominantly indicate lower self-esteem, especially from puberty onwards and in girls. However, the study findings are very heterogeneous, and more pronounced impairments were found primarily in the clinical setting (Pinquart 2013a). Increased dissatisfaction with one's own appearance or a negative body image are very strongly pronounced and widespread in children and adolescents with obesity (Pinquart 2013b). This is particularly relevant as increased body dissatisfaction is considered a risk factor for the development of an eating disorder.

Conclusion

Although psychological problems occur relatively frequently, the majority of children and adolescents with obesity are not affected by a clinically relevant disorder. Nevertheless, screenings for psychological disorders should be considered, especially in weight reduction programs. There is no homogeneous psychosocial profile, with the spectrum ranging from internalizing disorders (such as depression or pathological eating behavior) to externalizing disorder patterns (such as attention problems or aggression). Although

there are still very few prospective studies on the temporal relationship between obesity and psychological disorders in childhood and adolescence, depressive and aggressive behaviors are considered more as a reaction to overweight and especially the experienced stigmatization. The relatively frequently found problems suggesting attention deficit and hyperactivity disorders are attributed to the reduced self-regulation skills that play a prominent role in both disorder patterns.

57.4 Quality of Life

Many psychological problems do not have the status of disorders, but still represent a special burden for children and adolescents and their families. In the context of chronic illness, the health-related quality of life of those affected is increasingly investigated. Quality of life, as a multidimensional construct, represents the *subjective* level of functioning in various areas of life (such as psychological and physical well-being, social and family life) and thus more sensitively captures psychosocial well-being. Reviews and meta-analyses have shown that children and adolescents with overweight/obesity report a lower quality of life compared to their normal-weight peers of the same age and gender. This observation is particularly pronounced in clinical samples and with increasing age. Parents, compared to their children, tend to rate the health-related quality of life lower. Although impairments are often found in various dimensions of quality of life, they are particularly pronounced in the areas of social well-being and physical functioning. Compared to other chronic diseases, such as atopic dermatitis, asthma, and even cancer, lower values were found, which further emphasizes the special psychosocial burden associated with obesity (see Warschburger 2005). Quality of life is increasingly considered as a secondary outcome in intervention studies alongside weight. It is consistently shown that comprehensive multidisciplinary treatment programs are not only associated with weight reduction but also contribute

to an improvement in the quality of life of those affected (Peirson et al. 2015).

► **Important** The health-related quality of life of children and adolescents with obesity is significantly impaired.

57.5 Conclusion: Importance of Psychological Factors

The potential of psychosocial burden for those affected seems considerable in view of the high visibility of obesity and the high attribution of responsibility. Predominantly, it is indicated that mental disorders and psychosocial stress are consequences of obesity or the associated stigmatization. This is also emphasized by studies that have observed a reduction in psychosocial impairments following successful weight loss. The relationship between experiences of stigmatization and psychological stress further underlines the importance of addressing these experiences in the context of treatment. Children and adolescents should acquire strategies to deal with these experiences appropriately.

Psychosocial problems are a central source of motivation for seeking intervention. However, this also entails the risk of unrealistic expectations regarding psychosocial changes being tied to weight loss. In general, high psychological stress is associated with lower therapeutic success. Psychosocial aspects should therefore always be considered within the scope of the intervention. During the anamnesis, it should be clarified whether a clinically relevant disorder is present that should be treated concurrently or beforehand. In particular, if a depressive disorder is present, it should be treated primarily; mental disorders such as anxiety or aggressive behavior disorders do not represent an absolute contraindication but should be appropriately considered within the scope of the intervention.

Furthermore, reduced self-regulation competencies emerge as a relevant factor for the development and maintenance of obesity. Here, a neurocognitive profile with reduced executive

functions, increased reward sensitivity for food, and strong attentional focus on (high-calorie) food becomes the center of interest. Newer interventions specifically aim to reduce these neurocognitive characteristics and thus contribute to successful weight reduction (Jansen et al. 2015).

Weight control programs should not focus solely on reducing overweight but should primarily aim for a healthy diet and exercise, as well as placing the mental health of children and adolescents at the center of treatment. Psychological aspects play an important role in the development and maintenance of obesity and thus also form central starting points in treatment.

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Socioeconomic Aspects of Obesity

58

Sven Schneider and Bärbel Holzwarth

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58.1 Background

The risk of overweight is unevenly distributed within the German population: In this country, there are socioeconomic differences in the prevalence of overweight and obesity. These disparities, also referred to as “social” or “stratification gradient,” are considerable:

According to data from the nationwide “German Health Interview and Examination Survey for Children and Adolescents” (KiGGS; for the years 2014–2017), 27% of girls and 24% of boys with low socioeconomic status (SES) in the age group of 3 to 17 years are overweight, compared to only 7% and 9% of their peers with

high SES (Schienkiewitz et al. 2018). These differences are even more pronounced when considering the obesity prevalence included in the above figures. Girls with low SES have a prevalence of 8%, which is four times higher than in girls from the high SES group (2%). A social gradient is also evident among boys, where those with low SES have a prevalence of 11% compared to those with high SES at 3% (Schienkiewitz et al. 2018). Data from the school entry examinations of the federal states suggest that the social differences remained relatively constant in the period from 2001 to 2015 (Lampert et al. 2017).

The social gradient continues into young adulthood and remains more pronounced among young women than young men: In the age group of 18 to 29 years, 32% of women in the low SES group are overweight or obese, compared to 17% in the high SES group. Even in this age group, the gap is wider than among men, where the comparative figures are 33% and 25% (for the years 2014–2015; Schienkiewitz et al. 2017). Moreover, such a gradient has

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been observed in higher age groups for many years (Schienkewitz et al. 2017). Incidentally, not only the obesity-specific social gradient per se but also the more pronounced association between SES and obesity in women compared to men has long been observed in other industrialized countries (Lampert et al. 2017).

In the following, we present a model to explain these socioeconomic differences in obesity prevalence (Fig. 58.1). Our model posits an interconnectivity in which individual behavior results from various factors at macro and micro levels, ultimately leading to an imbalance between energy intake and energy expenditure and resulting overweight.

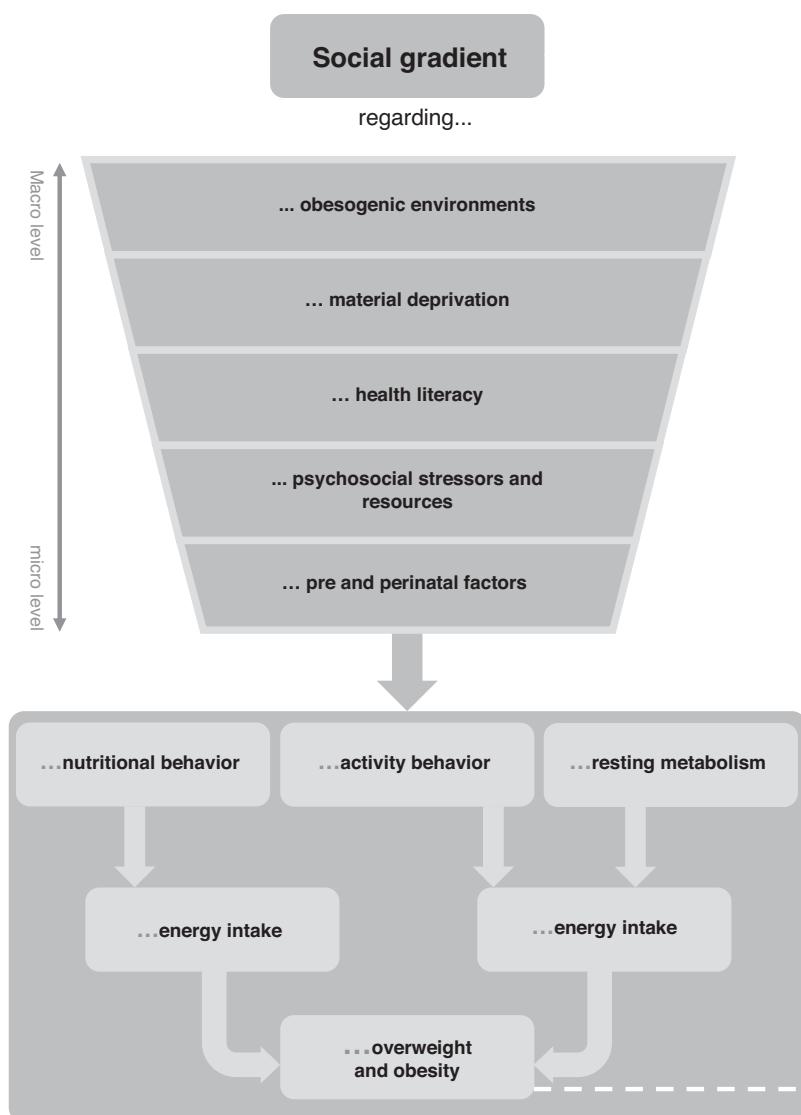


Fig. 58.1 Conceptual explanatory model for socioeconomic differences in obesity prevalence

58.2 Model Proposal

58.2.1 Obesogenic Environment

The term “obesogenic environment” refers to the sum of all influences from the environment, opportunity structures, and living conditions on the development of overweight (Swinburn et al. 1999). Obesogenic environments particularly promote unhealthy eating habits and physical inactivity. In the context of the topic of this chapter, it should be noted that at the level of social areas, the neighborhood socioeconomic status often correlates negatively with obesogenic characteristics.

This applies, on the one hand, to many aspects of the so-called food environment: The supply in the regional, stationary retail trade (b2c) and in the food services industry is relevant for individual eating behavior. Internationally and now also for Germany, it has been proven that in low-SES residential areas, there are regularly more fast-food providers than in privileged areas. The supply density of snack bars, kebab shops, and hamburger restaurants is higher in low-SES residential areas, and the distance to the nearest fast-food provider is shorter (Schneider et al. 2013). Thus, the food environment can fundamentally reinforce and contribute to a social gradient in terms of significantly higher exposure to unhealthy foods. In this context, the term “deprivation amplification” has been established internationally for the consequences of an unhealthier food environment in deprived residential areas (Schneider et al. 2019).

On the other hand, in socioeconomically disadvantaged residential areas—at least in this country—there is often a higher traffic density, which restricts non-motorized mobility (children’s cycling, the objective and subjective safety of pedestrians, etc.). Although the quantitative provision of exercise opportunities (playgrounds, soccer fields, green spaces, and jogging tracks) is often comparable or even better in disadvantaged residential areas than in socioeconomically better-off

areas, studies from Germany also show that the quality of these central exercise resources for children is often significantly worse in disadvantaged residential areas (Buck et al. 2019). The importance of obesogenic environments for the development of overweight and obesity goes far beyond the social gradient considered here. Therefore, obesogenic environments are dedicated to a separate chapter in this book (Chap. 74).

58.2.2 Material Deprivation

Material deprivation can be partly responsible for the development of overweight and obesity, as well as for a poorer state of health and a shorter life expectancy (Schneider 2002). A low income reduces access to a comprehensive range of healthier foods and opportunities for physical activity: European studies show that food prices determine purchasing and thus eating habits. The relative share of food expenditure in a household’s total expenditure is lowest for higher incomes, at less than 10%, significantly higher for low incomes, at around 30%, and highest for households receiving social benefits, at around 40% (Robertson et al. 2007). Thus, food expenditure becomes a flexible spending item with savings potential, especially for low-income households, unlike rent costs, for example. The most favorable calorie-per-euro ratio, according to the authors, can be achieved in the case of a limited financial budget by purchasing cheap foods with high energy density and low nutrient density (Robertson et al. 2007). The nutritional quality of dishes in the catering industry also correlates with the price, as a recent nationwide study in German full-service restaurants has shown (Rüsing et al. 2020). Likewise, options for physical activity depend on material conditions. Many organized and unorganized sports cannot be realized with a low budget. In addition to club fees, the costs for sports equipment, joining fees, and fees for sports and fitness studios should be mentioned as examples.

58.2.3 Health Literacy

Health literacy is the individual's ability to independently find, process, and understand basic information and use services to make appropriate health-related decisions (Chari et al. 2014). In relation to the socioeconomic differences in obesity prevalence to be explained, it seems relevant here that the realization of health-promoting behavior requires the acquisition of and access to health-relevant knowledge. This addresses more direct educational effects, such as medical knowledge (on basic metabolic processes, etc.) and the anticipation of health-relevant behavior (for example, relevant knowledge about the negative consequences of an unhealthy diet and the effects of regular exercise). Indirect effects also play a role, such as the ability to research, discuss, act, and self-discipline acquired through education (Maas et al. 1997; Becker 1998). In addition, there is a more favorable doctor-patient communication for patients with a high SES (Gerhardt 1991).

Numerous international studies have shown that health literacy is positively correlated with educational level and thus with social status (Chari et al. 2014). However, a review prepared for the European Commission concluded that a lack of relevant information on nutrition and exercise among participants in the 2006 Eurobarometer survey was not a significant reason for an unbalanced energy balance, regardless of SES (Robertson et al. 2007). Consequently, the authors argue that the importance of pure information campaigns in the sense of classical health education should not be overestimated (Robertson et al. 2007).

58.2.4 Psychosocial Stressors and Resources

Socioeconomic differences in obesity prevalence can also be explained by the fact that individuals with higher SES have fewer stressors and more resources than other status groups. Stress exposure is often higher among socioeconomically

disadvantaged individuals (Hapke et al. 2013), also due to social and economic deprivation. Additionally, there is often a specific stress exposure in the workplace. Studies based on the effort-reward imbalance model developed by Siegrist, for example, show a significantly higher stress exposure in poorly paid jobs and precarious employment relationships (Siegrist 1994). The effects of chronic stress on the cortisol axis, appetite, food intake, and ultimately overweight and obesity are described in detail elsewhere in this book. Subjective stress exposure can be moderated, i.e., buffered, by relief resources. Important resources in this context are psychological and emotional support, instrumental, informational, and financial assistance, as well as the additional effect of social networks through social control.

58.2.5 Pre- and Perinatal Factors

Pre- and perinatal determinants for overweight and obesity are also unevenly distributed across social groups. Weight is influenced by the pre- and perinatal behavior of the parents, and especially the mother (Weschenfelder et al. 2019). Although the complex interactions between maternal BMI, maternal weight gain during pregnancy, fetal programming, breastfeeding behavior, and infant nutrition cannot be discussed in detail here, the known association between the mother's SES, her BMI, and the child's birth weight should be mentioned (Weschenfelder et al. 2019).

58.2.6 Nutrition, Exercise Behavior, and Resting Metabolism

According to the social-ecological model, the factors discussed so far, which are intended to explain socioeconomic differences in obesity prevalence, can be assigned either to the macro level or to the micro level. This is illustrated in our model (Fig. 58.1). All these factors interact with each other and, at the same time, influence

individual behavior—specifically, nutrition behavior, exercise behavior, and resting metabolism (Lehrke and Laessle 2009). In particular, the latter has increasingly come into the focus of research due to recent findings on the independent importance of sedentary behavior.

The state of research on socioeconomic differences regarding these three lifestyle aspects is extensive and clear: The nutrition and exercise patterns of socioeconomically disadvantaged individuals pose a higher risk of a positive energy balance. Their *energy intake* exceeds the *energy expenditure* according to numerous studies, because the purchased, available, and ultimately consumed food items have a higher energy content and a lower content of micro-nutrients than is the case with typical shopping baskets of socioeconomically better-off individuals. Individuals with low SES, for example, eat fewer vegetables and fruits, and they drink more sweetened soft drinks than those with high SES (Robertson et al. 2007). The energy balance on the expenditure side is less clear: On the one hand, it is known for children and adolescents that socioeconomically disadvantaged individuals engage in less exercise (Krug et al. 2018), on the other hand, socioeconomically disadvantaged individuals generally perform more manual physical activities and sit less at work (Wallmann-Sperlich et al. 2014). Particularly striking socioeconomic differences are evident in children and adolescents, such as in the consumption of soft drinks (Schneider et al. 2020). In this context, it is also interesting that especially socioeconomically disadvantaged girls are physically less active and more sedentary than other adolescents (Robertson et al. 2007).

58.3 Modern Explanatory Approaches—The Life Course Perspective

The etiology of obesity and especially its socioeconomically unequal distribution have not yet been fully deciphered. Scientific consensus is a multifactorial genesis of macro- and

micro-factorial influences (Reeske and Spallek 2011). In this chapter, only the most important determinants of the mentioned social gradient discussed in the literature could be outlined. Even in the course of this brief description, it became clear that explaining these complex relationships requires a consideration of the entire life course. After all, some determinants have a different significance in different life phases. With regard to relevance, the initially important breastfeeding, for example, gives way to parental table and eating culture, which later gives way to local school catering and finally to occupational stress exposure and the walkability of the residential neighborhood.

From social epidemiology and medical sociology, it is known that factors influencing health inequalities interact throughout life and can accumulate over time. In the mentioned neighboring disciplines, the research branch of life course research has therefore been established in recent decades. Reeske and Spallek therefore call for always taking socioeconomic aspects into account in obesity prevention—ideally within the framework of a life course-based approach (Reeske and Spallek 2011).

58.4 Selection Thesis

Our model also takes into account the reverse direction of effect, i.e., the influence of overweight and obesity on SES. The selection thesis, also referred to as the drift thesis (Schneider 2002), is represented in our illustration in the form of a retrograde arrow. This causal relationship is relevant both intrapersonally and interpersonally: Social psychology has shown that obese individuals are disadvantaged compared to slim or athletic individuals in professional and other social contexts. Intrapersonally, it is also conceivable that the health consequences of overweight may hinder professional and social advancement. Interpersonally, the selection thesis means that obese parents pass on their risk of overweight to some extent to the next generation.

Conclusion and Outlook

Health and health inequality are two different and highly relevant entities. Even if it were possible to curb or even reduce the spread of obesity in our society in the coming years, obesity-specific health inequality could remain unchanged or even increase, namely if, according to the phenomenon of “preaching to the converted”, future interventions primarily reach the high SES groups. Therefore, we conclude that it will continue to be difficult to curb socioeconomic differences in obesity prevalence without an interdisciplinary consideration of the multifactorial events and without concerted interventions at the micro and macro levels.

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Genetic Aspects of Obesity

59

Helge Frieling, Anke Hinney and Stefan Bleich

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The etiology of obesity is multifactorial. Social environmental factors, such as advertising or consumer pressure, and material environmental factors, such as means of transportation, architecture, and the constant availability of high-calorie food, have created an “obesogenic” environment that promotes obesogenic behaviors. These include consuming large, high-calorie meals, little exercise, and/or spending a lot

of time in front of the television, computer, or gaming console. However, these factors have different effects on different people; they do not cause an increase in body weight for everyone. The predisposition for obesity is largely hereditary. This has been most impressively demonstrated by three experimental twin studies. In one study, twin pairs were deliberately given an energy intake that was too high for their body height, while in two other studies, they were given an intake that was too low. These studies consistently showed that there were groups of participants with very strong weight gains or losses, those who hardly reacted in terms of body weight, and an intermediate group with moderate weight gains or losses. The fact that weight changes were very similar within a twin pair, while there were large differences between different twin pairs, suggests a strong hereditary component.

The attempt to elucidate the molecular basis for this heritability has made great progress in recent years. The complex phenotype of obesity

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can be caused by a whole range of monogenic and, above all, polygenic variants (genotypes). Since body weight is also a continuous variable that moves along a continuum between normal and pathological values, the investigation of possible genetic influencing factors is additionally complicated. Genes with small effects may be overlooked in an (arbitrary) dichotomization into normal/obese. Therefore, not only “classical” case-control studies are useful for investigating the genetic basis of body weight, but also population-based studies with body weight, measured as body mass index (BMI), as the target variable.

59.1 Twin and Adoption Studies

There is a large number of twin and adoption studies, according to which the heritable proportion of body weight and fat mass can be quantified at about 64-80%. Studies on adopted twins who grew up separately showed a close relationship between the BMI of the children and that of the biological parents, but hardly any relationship with the BMI of the adoptive parents. The prevalence of obesity was also only comparable between biological parents and children. Further twin studies were also able to demonstrate the heritable components of both physical parameters of energy utilization (e.g., basal metabolic rate, thermogenesis, and energy expenditure during light and moderate physical exertion) and habitual physical activity.

Animal Models

Almost all findings on genes and metabolic pathways involved in the regulation of appetite, energy balance, and adipose tissue were initially obtained in animal models and could then be transferred to humans. Likewise, most monogenic forms of obesity were first discovered through spontaneous mutations in rodents or in

knock-out mice and then confirmed in humans. The discovery of leptin and its physiological functions is an illustrative example:

The so-called *obese* mouse, a mouse with a mutation that leads to extreme obesity, was discovered in 1949 at the Jackson Laboratories. This strain lacks the product of the leptin gene (*LEP*). A second strain, the so-called diabetes mouse *db*, lacks the leptin receptor (*LEPR*). Parabiosis experiments, in which animals from both strains share a blood circulation, suggested that one strain has a mutation affecting a soluble factor, while the other strain has a mutation that destroys the corresponding receptor. This assumption was confirmed in 1994/95 by the cloning and identification of the *leptin* and *leptin receptor genes*.

Another example of a spontaneous mutation leading to obesity is the so-called agouti yellow (*A^y*) mouse. The yellowish *A^y* mice have been known for about 200 years. The agouti peptide is normally produced in skin cells and blocks the action of α -melanocyte-stimulating hormone (α -MSH). In *A^y* mice, the agouti peptide is expressed in all cells and thus also blocks the anorexigenic α -MSH signals in the brain, which are mediated via the melanocortin-4 receptor (MC4R). Blockade of MC4R accordingly leads to hyperphagia and obesity. Loss of the α -MSH activating enzyme, carboxypeptidase E (CPE), also leads to obesity. A CPE spontaneous mutation was detected in another obesity strain, the *fat* mouse.

There are now numerous knock-out strains that exhibit obesity or fat distribution disorders. A constantly updated overview can be found in the Obesity Gene Map (<http://obesitygene.prc.edu/>).

59.2 Monogenic Disorders

Severe obesity is a known symptom of complex pleiotropic diseases such as Prader-Willi syndrome or Bardet-Biedl syndrome, which also exhibit dysmorphia, mental retardation, and single organ damage. These syndromes are caused by disorders of individual genes. In addition, there is a group of diseases in which obesity is the central symptom. These diseases follow a Mendelian inheritance pattern and are usually associated with very severe obesity, which typically begins in childhood. The genes identified so far are mostly located in the leptin-melanocortin metabolic pathway (Table 59.1). Especially in patients with a mutation of the leptin gene, obesity can be causally treated with

leptin substitution. However, overall, less than 100 cases worldwide have been described for this mutation.

59.3 Association Studies

Molecular genetic analyses investigate the association between genetic variants (genotype) and a specific trait expression (phenotype).

59.3.1 Candidate Gene Approach

Genes for which there are biochemical, physiological, molecular genetic, or molecular biological indications of relevance for the expression of body weight (e.g., obesity) are called candidate genes. Thus, there is an *a priori* hypothesis about the influence of the gene (gene product) on the development of obesity (Hebebrand et al. 2013). The genotyping of genetic variants (alleles) in such a candidate gene is carried out in a large number of trait carriers or patients (“cases”) and unaffected individuals (“controls”). An association is present if there are significant (relevant) differences in allele or genotype distribution between cases and controls. Since effect sizes of these genetic variants are often very small, a large number of both cases and controls is required.

59.3.1.1 Melanocortin Receptor 4

A central role in the control of appetite and satiety is played by the feedback loop of α -MSH and the associated neuronal melanocortin receptor subtype 4 (MC4R) (“animal models”). Over 150 different mutations and variants are known in the MC4R, which can lead to (partially) extreme overweight. About 2–5% of extremely obese individuals carry such MC4R mutations, which are associated with reduced receptor function. The quantitative effect of these mutations is 4.5–9 BMI points. This means that carriers of the mutations are about 15–30 kg heavier than non-carriers, as determined in a family study (Hinney et al. 2013).

Table 59.1 Examples of nongenic forms of obesity in humans

Gene	Chromosomal Locus	OMIM
Corticotropin Releasing Hormone Receptor 1 (CRHR1)	17q12–q22	122561
Corticotropin Releasing Hormone Receptor 2 (CRHR2)	7p14.3	602034
G Protein-coupled Receptor 24 (GPR24)	22q13.3	601751
Leptin (LEP)	7q31.3	164160
Leptin Receptor (LEPR)	1p31	601007
Melanocortin 3 Receptor (MC3R)	20q13.2–q13.3	601665
Melanocortin 4 Receptor (MC4R)	18q22	155541
Neurotrophic Tyrosine Kinase Receptor Type 2 (NTRK2)	9q22.1	600456
Proopiomelanocortin (POMC)	2p23.3	176830
Proprotein Convertase Subtilisin/Kexin Type 1 (PCSK1)	5q15–q21	162150
Single-minded Homolog 1 (SIM1)	6q16.3–q21	603128

Mutations in the mentioned genes are associated with an obese phenotype. Information from Obesity Gene Map. OMIM: Online Mendelian Inheritance in Man

A polymorphism in the *MC4R* gene, in which valine is replaced by isoleucine at position 103 in the protein (Val103Ile), was initially considered insignificant after its discovery, as neither a functional effect of the polymorphism nor a direct association with obesity could be demonstrated. However, in a large family analysis, a transmission disequilibrium for the isoleucine allele was observed, which was less frequently inherited by overweight children. In a meta-analysis of all studies with a total of 7,937 participants, a negative association between the Ile103 allele and obesity was found. This finding was confirmed in a further meta-analysis of more than 10,000 participants and 18,000 controls. However, there is evidence of an improved receptor effect, which is consistent with the weight-reducing effect (Hinney et al. 2013).

59.4 Polygenic Forms of Obesity

Many common genetic variants each make a (very) small contribution to the risk of obesity in polygenic forms of obesity. In 2018, one of the largest studies on obesity polygenes was published by the “Genetic Investigation of Anthropomorphic Traits” (GIANT) consortium. This is a meta-analysis of approximately 700,000 individuals of European origin. In total, 941 nearly independent variants were found to be associated with BMI expression. A previous study showed that the respective obesity risk variants increase body weight by an average of about 170 g. The maximum weight increase is 1.5 kg per risk allele. In addition to the genes known from the candidate gene studies described above, such as *MC4R*, obesity polygenes were identified.

The *FTO* gene ('fat mass and obesity-associated' gene) is the obesity polygene with the largest effect size. Homozygous carriers of the risk allele of a variant in the first intron (non-coding region) of the gene are about 3 kg heavier than non-carriers. Their risk of becoming obese is approximately 1.5 times higher (Frayling et al. 2007). The *FTO* protein plays a role in

DNA methylation. The strongest *FTO* expression is found in neurons. When the *FTO* gene is switched off in mice, it results in reduced fat mass. Increased *FTO* production, on the other hand, leads to obesity. Whether this is due to altered calorie intake, energy expenditure, or both is still unclear (Müller et al. 2013). In humans, increased expression of the *FTO* gene is associated with increased fat mass, and this effect is due to increased food intake (Müller et al. 2013). In 2015, a study pointed to another pathway of the *FTO* locus for regulating adipocyte thermogenesis. It was shown that variants in the genes *IRX3* and *IRX5* neighboring the *FTO* gene have an obesity effect.

59.4.1 Polygenic Risk Scores

In order to better capture the individual genetic risk for the development of obesity, polygenic risk scores have been increasingly derived from GWAS datasets in recent years. A polygenic risk score represents the sum of the existing risk variants and their effect sizes in an individual. Across a population of cases versus controls, these scores are usually normally distributed, with the median or mean being higher in cases than in controls. In the case of obesity, these scores work a bit differently, as they are usually directly correlated with BMI and can thus potentially estimate a BMI based on the polygenic score using various statistical methods. In recent studies, interesting associations and interactions between various polygenic BMI scores and environmentally induced risk factors have been demonstrated. For example, the polygenic influence on BMI is moderated by socioeconomic status in childhood, social perception of body image, and individual educational history. There is also a different influence of genetic risk in different age cohorts. Despite these findings, the proportion of body weight that can be explained by polygenic influences remains relatively small. An increase in the BMI polygenic score by one standard deviation (!) increases BMI by 5.7%.

59.5 Conclusion

The investigation of genetic contributions to BMI and obesity shows on the one hand clear and known genetically determined syndromes with obesity, and on the other hand risk genes are also emerging for non-syndromal (polygenic) obesity. The examination of interactions between genetic risk and obesogenic environment for the development of obesity, which has come much more into focus in recent years, is exciting. In the future, more personalized approaches to therapy and prevention could be successful.

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Microbiome and Inflammation in Obesity

Isabelle Mack

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60.1 Gastrointestinal (GI) Microbiota

The human gut is a complex ecosystem in which a large variety of microbes live, belonging to the domains of bacteria, archaea, and eukaryotes—our GI microbiota. The composition and diversity of microbial species not only vary considerably along the gut compartments but also differ between individuals and are influenced by age, genetics, health status, diet, and other factors.

Dysbiosis is associated with inflammatory bowel diseases and colon cancer, and also with diabetes and metabolic syndrome, suggesting a systemic influence of the GI microbiota on human health. Furthermore, the GI microbiota

can affect the host's brain function and behavior through communication via the gut-brain axis.

Since the characterization of germ-free animals compared to conventional animals in the 1960s and 1970s, it has been shown that the GI microbiota plays a physiological role in the host's weight regulation. However, only in the last 15–20 years has researchers' interest turned to the relationship between GI microbiota and weight regulation in humans (Mack et al. 2018).

- **Important** Gut microbes produce short-chain fatty acids (SCFA) such as butyrate, propionate, and acetate through fermentation of dietary fibers and endogenous substrates. It is believed that these fatty acids contribute 5–10% to human energy requirements.

Moreover, it has been shown that SCFA interact with specific G-protein-coupled receptors expressed by enteroendocrine cells in the gut, thereby influencing the release of satiety hormones such as peptide YY.

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In addition, proteins or amino acids that escape digestion, or endogenous mucins, are fermented by gut microbes to branched-chain fatty acids (BCFA) such as isobutyrate and isovalerate and to toxic compounds such as phenols and indoles (both co-carcinogens), ammonia (mutagen, cytotoxin), amines (neurotransmitter/mutagen precursors), HS⁻ and thiols (both cytotoxins). Several of these toxic compounds have the potential to negatively affect the host's gut physiology, motility, and psychology, the latter via the gut-brain axis (Mack et al. 2016).

60.2 GI Microbiota in Obesity

The observation that germ-free pigs have a lower body weight than conventionally raised pigs was described in 1966 and 1972. In a large sample of mice derived from Swiss-Webster mice ($N = 97$), Gordon and colleagues showed the opposite, and another study with ICR strain mice showed similar results to those in pigs, but the weight differences were smaller. Fully fed germ-free Lobund-Wistar rats had a lower body weight compared to their conventionally raised littermates, but the opposite was shown in these rats when food intake was restricted. No differences in body weight were observed in germ-free chickens compared to conventionally raised chickens, and similar weight loss trends during fasting were observed. Interestingly, about 40 years later, Bäckhed and colleagues showed, after a thorough morphological characterization of germ-free animals, for C57BL/6J (B6) that germ-free mice had a lower body weight and less body fat than conventional animals despite increased food consumption and reduced energy expenditure. After transferring feces from conventional animals to germ-free animals, the latter gained body weight and body fat, despite lower food consumption and increased energy expenditure similar to that of conventional animals. In view of the literature mentioned above, it seems that the extent to which the GI

microbiota influences body weight depends on the animal species, the age of the animals, and/or the specific strain. However, with Bäckhed and colleagues' publication, further researchers' attention turned to the GI microbiota and its role in weight regulation. In 2005, Gordon and colleagues reported significantly different ratios of the phyla Bacteroidetes and Firmicutes in the stool of lean versus obese mice with leptin deficiency (ob/ob mice), with more Firmicutes and fewer Bacteroidetes in the obese mice. A similar pattern was found for the diet-induced obesity mouse model. More importantly, Turnbaugh and colleagues showed that the differences in the ratio of the dominant phyla Bacteroidetes and Firmicutes also had functional effects on the host: The gut microbiota was associated with different capacities for energy extraction from food. In particular, the gut microbiota of obese mice produced larger amounts of SCFA, and the excreted feces contained less energy than the feces of normal-weight animals. Finally, Ley and colleagues were the first to show that differences in the ratio of Bacteroidetes to Firmicutes exist between normal-weight and obese humans and that weight loss in the latter led to a shift in this ratio towards a similar ratio to that in normal-weight individuals.

Since then, many more articles have been published dealing with obesity and gut microbiota. For example, significant changes in gut microbiota after bariatric surgeries have been described, and the role of gut microbiota in central nervous system functions has been recently discussed. However, the contribution of specific microorganisms to the development of obesity remains controversial, as many subsequent studies were unable to confirm the differences between Bacteroidetes and Firmicutes. Nonetheless, a recently conducted re-analysis of raw data from ten individual human obesity studies showed a relationship between the human microbial gut community and obesity status. It is important to note, however, that this association was weak (Mack et al. 2018).

60.3 GI Microbiota and Inflammation in Obesity

All inflammation markers are associated with obesity and obesity-related diseases. Examples include CRP, PAI-1, and inflammatory cytokines. The mechanisms and relationships between inflammation and obesity are not fully understood, and the GI-microbiota likely plays an important role in this regard. Many review articles have been published on this topic, but most findings come from preclinical studies, while human studies are few in number with small sample sizes and often show contradictory results. It is currently assumed that dysbiosis of the GI-microbiota impairs intestinal permeability, and the resulting activation of the immune system may contribute to a low-grade chronic inflammation. Modulation of intestinal permeability by influencing the gut microbiota is therefore an attractive intervention approach (Cox et al. 2015).

60.4 Influence of Diet and Lifestyle on the GI Microbiota in Obesity

The GI-microbiota is largely determined by the host's immune system. However, external factors strongly influence the habitat of GI-microbes, leading to adaptations. For example, if the diet changes, this means a change in the food source and possibly also in intestinal peristalsis, leading to adjustments in the ecosystem of GI microbes in the gut. Similarly, changes in activity and sleep habits can affect the GI-microbiota, either directly through changes in the GI tract itself or indirectly, e.g., in the case of weakening the immune system. Studies in both humans and other vertebrates have shown that adaptations to a changed diet can occur within a few days, which speaks for a high adaptability of the GI microbiota and suggests that it is potentially easily influenced (Santos-Marcos et al. 2019).

Our GI-tract is divided into different compartments. The utilization of non-absorbed food components takes place in the colon. Preferred food substrates for the GI-microbiota include dietary fibers, which can be classified according to solubility, chemical structure, and physicochemical and physiological properties. Well-known examples are polysaccharides such as psyllium (psyllium husks), beta-glucan (endosperm of oats and barley), and inulin, resistant starches, and oligosaccharide and disaccharide dietary fibers (McRorie 2015).

► **Important** It should be emphasized that dietary fibers not only provide fermentation substrates for GI microbes in the colon but also 1) contribute to increased satiety through volume and swelling or water-binding capacity in the stomach, 2) support the slowed absorption of simple sugars into the blood in the small intestine, and 3) also act as a mechanical stimulus and form stools in the colon due to their physicochemical properties.

When the absorption capacities of simple and double sugars in the small intestine are exhausted, these substrates are rapidly utilized by the GI-microbiota. A main product of carbohydrate fermentation is SCFA, which the host uses as an energy source but which also has various other positive physiological effects. As mentioned above, in addition to carbohydrates, amino acids, the building blocks of proteins, can also be fermented. These come from food as well as from the intestine itself, and their fermentation produces a number of unfavorable metabolic products for the host. Lipids, on the other hand, usually reach the colon in smaller amounts and do not play a decisive role in fermentation due to the anaerobic conditions prevailing there. However, lipids can have antibacterial effects due to their physicochemical properties and are currently being researched in this regard (Oliphant and Allen-Vercoe 2019).

► **Important** For practice in obesity treatment, this means that the GI microbiota can be positively influenced by a balanced diet, with an appropriate proportion of dietary fiber. The German Society for Nutrition's recommendation of 30 g/d of dietary fiber can be used as a guideline.

These recommendations are similar in all European countries and are based on findings related to cardiovascular diseases and intestinal health. The dietary fibers themselves are not further specified. However, most people find it difficult to adhere to these guidelines. In practice, 30 g/d of dietary fiber can be achieved, for example, by consuming three slices of whole-grain bread, three potatoes, two handfuls of fruit, and three handfuls of vegetables (Stephen et al. 2017).

Considering the current situation, where low-carbohydrate or carbohydrate-reduced diets are used in obesity therapy, special attention should be paid to high-quality carbohydrates, i.e., those with a high fiber content, with regard to GI health. Under protein-rich nutrition, the community structure of GI microbes tends to change unfavorably, according to current assessment (Santos-Marcos et al. 2019). A conclusive evaluation of the topic of GI microbiota and health with long-term protein- and fat-rich nutrition and potentially low fiber content is currently not possible.

► **Important** In the context of weight reduction in obesity, patient compliance with the chosen nutritional strategy is crucial and can therefore vary individually (Mack and Hauner 2007). As long as weight success is accompanied by a properly functioning GI tract, regular bowel movements, and normal metabolic levels, there is primarily no reason to interrupt or reevaluate the nutritional strategy.

In the course of successful therapy, it is then worthwhile to take a closer look at dietary habits and possibly adjust them.

60.5 Influence of Pro- and Prebiotics on GI Microbiota in Obesity

According to the expert consensus of the International Scientific Association for Probiotics and Prebiotics (Gibson et al. 2017), probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit to the host. Depending on the mechanism of action, inactivated bacteria or their components can also be just as effective and safe. They are referred to as parabiotics or postbiotics. Commonly used microbes include lactobacilli and bifidobacteria. A prebiotic, on the other hand, is a substrate selectively utilized by the host organism's microbiota (activating metabolic activity), thereby causing a health-promoting effect. All dietary fibers are thus prebiotics, which act both species- and site-specifically. For example, lignin has a probiotic effect in ruminants but not in humans. When pro- and prebiotics are combined, they are called synbiotics. Typically used prebiotics are fructo- and galactooligosaccharides, which are classically considered dietary fibers.

Study findings regarding pro- and prebiotics are not only inconsistent in the field of obesity but also in areas where probiotics have traditionally been used from the very beginning, such as in GI complaints and diseases, e.g., irritable bowel syndrome.

The reason is that studies on probiotics use different individual microbes or a mixture of microbes in different dosages and treatment durations, with different research questions and study designs. Therefore, summarizing the research in the context of meta-analyses is a significant challenge and often reaches the limits of its informative value. Only a few pro- and parabiotics are approved as drugs (Mack et al. 2021) and are subject to strict testing (Preidis et al. 2020). "Next generation probiotics" give hope for better development in the field. The situation is even more complex for prebiotics, and especially symbiotics, because a colorful mix of known and unknown mechanisms and their interactions come together, ultimately rendering

it unclear why no, positive, or negative effects are observed. In addition, the fermentation of prebiotics in the intestine depends on the individual's GI microbial equipment, which can lead to different effects individually.

Overall, it is important to note that placebo effects in probiotic studies tend to be high. A recently published elaborate meta-analysis on probiotics and inflammatory markers in healthy and sick individuals showed no superiority of probiotics for the inflammatory markers TNF-alpha, IL-6, IL-1b, IL-4, IL-10, and IFN-gamma in healthy individuals and those with metabolic diseases. An improvement in CRP values under probiotics for metabolic diseases (with high heterogeneity between studies) did not withstand subgroup analysis for metabolic syndrome (Kazemi et al. 2020), and in another meta-analysis, CRP values improved under placebo (Lopez-Moreno et al. 2020). The influence on body weight also seems negligible, but positive effects were shown for probiotics that influenced the GI microbiota compared to those where it remained constant (Lopez-Moreno et al. 2020; Suzumura et al. 2019). Even after bariatric surgery, with a limited number of studies, no advantage of a probiotic intervention emerged for physical or psychological development (Cook et al. 2020). However, it is currently assumed that within the framework of "next generation probiotics," one or the other candidate will be found that shows positive effects on obesity-associated parameters, e.g., *Akkermansia muciniphila* (Depommier et al. 2019). A broad meta-analysis found a positive influence of prebiotics on perceived satiety and an improvement in postprandial glucose levels and insulin concentration, but not for other parameters (Kellow et al. 2014). A specific meta-analysis on prebiotics in obesity showed no superiority of prebiotics over placebo regarding body weight and body composition, but an improvement in CRP and TNF-alpha, albeit with very high heterogeneity of studies, so no clear conclusion can be drawn (Qu et al. 2019). Another meta-analysis confirmed the improvement in CRP values in obesity, but also with a limited number of studies (da Silva Borges

et al. 2020). It is unclear whether prebiotics can contribute to health if the recommended fiber intake is achieved through diet. It is also unclear whether the intake of the same amount of prebiotics is equivalent to a mixture of fibers through the diet, which also contains other essential components, such as secondary plant substances. However, since the recommended daily amount of fiber is usually not achieved, the question arises whether prebiotics could make a supplementary contribution to reaching these guidelines.

Conclusion

In summary, no recommendation can currently be made for a specific pro- or prebiotic for the treatment of obesity with inflammation. However, it can be assumed that among the "next-generation probiotics" there are candidates suitable for use in obesity therapy. Prebiotics may potentially contribute to achieving the recommended daily fiber intake.

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Risk Factors of Obesity in Childhood and Adolescence

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61.1 Background

The high prevalence of overweight and obesity in children and adolescents in Germany remains persistent. While the frequency and extent of obesity are fortunately no longer increasing in young children, in adolescence, the trend towards increased obesity and a higher frequency of obesity continues to rise (Kurth and Schaffrath Rosario 2010; Blüher et al. 2011). In addition to genetic factors, unhealthy and disease-causing lifestyles, dietary factors, and lack of exercise play a central role in the development of obesity. Overweight and the underlying behavior-related risk factors are significantly influenced by the immediate and broader social environment. Overweight and obesity in children are distributed differently within and between social classes and groups. Children from socially disadvantaged families are much more likely to be overweight or

obese than children from privileged families with a high socioeconomic status. It is important for approaches to prevention and/or therapy to recognize and address risk factors for the development of obesity or weight change. In particular, it is also necessary to explore barriers that make it difficult or even impossible for those affected to participate in prevention or therapy programs. Only when barriers to participation and involvement are identified and their effects understood can effective prevention and treatment programs be designed and ultimately implemented. Risks of obesity for the social life, health, and development of children and adolescents must also be investigated, and their causes must be recognized and ultimately prevented or treated.

Possible Causes and Risk Factors (Worldwide)

- Genetics
- Ethnicity
- Fetal, early imprinting/programming
- Biological factors
 - Adipocytokines, hormonal signals
 - Underlying diseases, syndromes

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- Medications
- Disabilities
- Psychological factors
 - Resilience
 - Dependency (Addiction?)
- Socioeconomic and sociocultural conditions
 - Poverty
 - Income
 - Living conditions
 - Food supply: quantity and quality
 - Sedentary and resting lifestyle
- Personal factors
 - Family structure
 - Neighbors and friends
 - Education, training
- Globalization
- Industrialization
- Modernization
- Urbanization

Influencing Factors and Barriers to the Success of Therapy and Prevention

- Upbringing
- Education within the family, of the parents
- Family structure, single parents
- Age of the child, siblings, parents
- Parents' income
- Poverty
- Friends/peers
- Sociocultural factors
- Nutrition
- Habits
- Religious affiliation
- Environmental factors
- Living situation
- Indoor temperature of apartments; air conditioning
- Climate and outdoor temperature

61.2 Risk Factors and Causes

61.2.1 Social Inheritance

In the sense of the social inheritance hypothesis, higher prevalence rates of obesity and overweight, and a movement and nutrition behavior that promotes overweight and obesity, are often found among the parents and other relatives of affected children. However, the immediate circle of friends of affected families also generally has a high prevalence of obesity (Igel et al. 2013). In individual studies, the coincidence of obesity in the circle of friends is reported to be higher than in the biological family.

“Obesogenic” characteristics of the living environment, such as socioeconomic deprivation of the neighborhood, distance to parks and playgrounds, limited access to healthy foods, and lack of footpaths and bicycle paths, promote overweight and obesity even in children. In the city of Leipzig, for example, the prevalence of overweight in preschool children is almost twice as high in socially disadvantaged neighborhoods as in socially privileged neighborhoods. Concepts of neighborhood-based health promotion to reduce the prevalence of obesity in children in the sense of an “intention-to-treat” study approach have therefore been presented (Igel et al. 2013; Gausche et al. 2014).

61.2.2 Genetics

Genetic disorders associated with obesity are common. Many of these obesity syndromes have a characteristic age of presentation, a unique phenotype, and sometimes overlapping clinical symptomatology. The latter emphasizes that in some of these syndromes, common signal transduction pathways are disturbed and affected, leading to obesity. Once the genetic backgrounds of these syndromes are fully understood, the functional consequences

and causes of obesity development will also be understood. In addition, new specific therapies based on basic scientific findings will become conceivable.

Bardet-Biedl syndrome and Prader-Willi syndrome, which is the most common obesity syndrome and is caused by a loss of “imprinted” genes on chromosome 15q11–13, should be mentioned. In addition, other genetic obesity syndromes such as Alström syndrome, Cohen syndrome, Albright’s hereditary osteodystrophy (pseudohypoparathyroidism), and finally Carpenter syndrome are described. The MOMO syndrome, Rubinstein-Taybi syndrome, and deletions on chromosomes 1, 2, 6, and 9, as well as other genetic syndromes, are associated with obesity already in early childhood. Monogenic obesity forms are rare but are increasingly being targeted by pharmacological therapies.

Overall, a **polygenic inheritance** of obesity risk is generally assumed. In many genome-wide studies, a large number of obesity loci and so-called copy-number variations associated with obesity development have been found. In most cases, very large cohorts of affected individuals were studied as part of consortial, multicenter studies. The effect size of individual “obesity genes” is generally low. In particular, variants of the FTO gene are characterized by obesity, “obesogenic” behavior, and a certain “resistance” to interventions in affected individuals. Many other “obesity genes” have been found in the area of the G-protein-coupled receptor family and in genes encoding proteins in neuronal networks: Considering the important role of the central nervous system in the reception and transmission of hunger, satiety, and hedonic and reward signals, this is not surprising.

61.2.3 Availability of Food and Portion Sizes

Particularly in England and the USA, it has been found in recent years that both the prevalence of obesity in children and the portion size of fast food and soft drinks have increased. When

healthy subjects are offered food on large plates and/or in large portions, more is consumed. Conversely, small cutlery sizes and smaller plate sizes lead to smaller food portions being consumed. The general availability of food in many countries and societies also leads to eating outside of meals and an uncontrolled and excessive intake of food in terms of quantity and calorie content. The consumption of sweetened beverages has also been proven to have a significant effect on weight gain in children: In a clinical, randomized experiment, replacing sweetened beverages with sugar-free, unsweetened, low-calorie beverages led to weight loss in the participants within half a year of the study duration. Not food itself, but parameters such as portion sizes, availability of food, and hidden calories and sweet drinks are thus risk factors for the development of obesity in childhood and adolescence.

61.2.4 Sedentary and Resting Lifestyle

The term sedentary and resting lifestyle encompasses a variety of personal and societal attitudes and beliefs. This involves fundamental questions about the organization of everyday life, but also content-related descriptions of food preferences, meal sizes, and frequencies. Additionally, there are lifestyle-related differences in terms of physical activity and sports participation, as well as in the consumption of new media and television. While long television viewing times have always been associated with obesity, the relationship between the use of new media and body weight is less clear. Lack of physical exercise and sedentary activities naturally lead to lower calorie expenditure and, together with increased calorie intake, are considered mediators of weight gain and weight control. Insufficient physical exercise and poor nutrition should not be seen as causal factors, but rather as mediators and “facilitators.” It is important to note that, for example, membership of sports clubs and activity-focused leisure behavior are stratified. Frequency and intensity of sports participation are linked to

higher educational levels and higher income. Moreover, high consumption of fruits and vegetables in children is again associated with higher parental educational levels and higher family income. A sedentary or resting lifestyle is considered one of the most important risk factors for obesity at all ages. It must be emphasized once again that the effects are neither causal nor necessarily direct.

61.2.5 Industrialization and Globalization

Western lifestyle is associated with the development of obesity, particularly in emerging countries. Historically and in an evolutionary context, industrialization and globalization, along with urbanization and modernization, have also been recognized as societal risk factors for obesity: To what extent the accessibility of fast food and sweetened beverages, as well as advertising strategies of food corporations, play a role has so far not been sufficiently researched. The influence of food production processes ("food processing"), plastic packaging, freezing methods, freeze-drying, and preservation on the obesogenicity of nutrition has barely been investigated. Moreover, although it is known from animal experiments that environmental temperature and light cycles influence weight gain in experimental animals such as mice and rats, it has not been conclusively clarified whether living environment, light cycles (illuminated rooms), and sleep duration significantly influence human weight development. However, reports on studies showing an inverse relationship between sleep duration and body weight and weight gain, even in children, have increased in recent years. The reduction in sleep duration in many countries over the past 100 years coincides with the increase in obesity prevalence in the same countries.

61.2.6 Health Risks of Obesity

Even in childhood and adolescence, individuals with obesity have increased blood pressure,

glucose intolerance, and lipid metabolism disorders, as well as fatty liver, back pain, genu valgum, and flat foot, and dermatoses, e.g., psoriasis, more frequently than lean individuals. In particular, the fact that cardiovascular risk factors and surrogate markers for the development of cardiovascular diseases in adulthood are already measurable in childhood is alarming. It is therefore also justified to classify obesity as a disease and to develop and implement appropriate treatment strategies. In summary, obesity in early life is associated with higher utilization of health services, higher disease burden, and increased mortality. Cancer, cardiovascular diseases such as heart attack and stroke, as well as hypertension and diabetes mellitus occur much more frequently in obese people than in lean individuals (Baker and Sørensen 2011).

61.2.7 Risk Factors and Barriers

By designing living environments, it might be possible to sustainably minimize obesogenic risk factors in the sense of a public health approach, positively influence the lifestyle of all residents of a city or municipality, and thus partially overcome the prevention dilemma. However, mainly due to methodological weaknesses of primary studies, the evidence for complex neighborhood-based health promotion is still insufficient (Baker and Sørensen 2011; Hayes et al. 2014).

Another research context that has not yet received sufficient attention revolves around the question of why it is difficult to introduce obese patients to therapy programs and why adherence to these programs is low. What barriers exist that prevent children and adolescents from following the recommendation to exercise more, eat healthier, consume less television, and engage in fewer sedentary activities? For example, it is known that children of single parents, parents with low educational attainment, and parents with low income participate less in obesity programs and are less adherent than children from intact families with higher social status. Greater distance to therapy facilities and time restrictions may also

be barriers to participation and involvement (Alff et al. 2012).

Conclusion

Obesity is usually a polygenically inherited disease caused and maintained by environmental conditions in the social context. Given the multitude of risk factors that promote and drive the development of obesity from an early age, only fundamental, multi-level, and multifactorial prevention and therapy concepts can be successful. Only when the diversity and complexity of risks and causes are recognized and acknowledged by all stakeholders and those affected will there be success in the treatment and prevention of unhealthy overweight and obesity.

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Part VIII
Comorbidity of Obesity



Social and Psychosocial Consequences of Obesity: Weight-Related Stigmatization and Discrimination

Anja Hilbert

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62.1 Weight-related Stigmatization and Discrimination in Obesity

Compared to many other physical and mental health disorders, obesity is associated with the most socially accepted stigma. This stigma, including, for example, the blame for being overweight, can lead to actual discrimination in a variety of areas of life.

► **Important** A social stigma is a characteristic that makes a person appear deviant, conspicuous, or impaired. Stigmatizing attitudes towards people with obesity include prejudiced attributions of negative evaluations due to their overweight. If people with obesity are denied the equal treatment they need because

of their overweight, this is referred to as weight-related discrimination.

Stigmatizing attitudes that characterize people with obesity as lazy, weak-willed, undisciplined, ugly, and emotionally disturbed are widespread in the population. They are related to pervasive beliefs of responsibility and a cultural devaluation of obesity. Stigmatizing attitudes towards people with obesity are particularly common among men, older individuals, and those with lower levels of education. However, they are independent of the respondents' body mass index (BMI, kg/m²).

► **Theoretical Classification of Obesity Stigma: Attribution Theory** Theoretically, reactions to stigmas such as obesity are often explained by referring to the attribution theory. Attribution theory states that the more a stigma is attributed to internal, controllable causes, the stronger the negative reactions to it. Ideologies of individualism or political conservatism are the main background for these attribution patterns.

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Weight-related discrimination experiences are common in people with obesity in areas such as the workplace, healthcare, school, and personal relationships. Discrimination experiences within close relationships, such as partnerships, family, or friendships, which may consist of negative comments about body shape and weight, are perceived as particularly intrusive. The more severe the obesity, the more frequent the weight-related discrimination. Even after weight loss to normal weight, formerly obese individuals are stigmatized. It is not clear whether women with obesity are overall more affected by weight-related stigmatization compared to men; however, there seem to be stronger disadvantages for women with obesity in specific areas.

62.1.1 Professional Life

Numerous studies document disadvantages for adults with obesity in professional life. Experimental investigations have shown that candidates with obesity are less frequently selected for interviews and hiring, particularly for positions with representative functions, than candidates with normal weight. Stigmatizing attitudes of superiors, colleagues, and employees characterize people with obesity in the professional world as less competent, ambitious, and deserving of promotion, as well as lazier, undisciplined, emotionally unstable, and less attractive. Epidemiological data indicate that people with obesity are less frequently hired compared to normal-weight individuals with comparable professional qualifications, they hold leadership positions in companies less often, and receive lower salaries—this particularly affects women with obesity. Working individuals with obesity report weight-related discrimination, such as lower remuneration or dismissals due to overweight.

62.1.2 Healthcare

Evidence of weight-related stigmatization and discrimination has also been found in healthcare. Stigmatizing attitudes towards adults with

obesity exist among members of many healthcare professions, including doctors, nurses, dietitians, and even those professionally involved in weight loss treatment. These negative attitudes include attributions of lack of self-control and willpower, poor hygiene, and assumptions of not following treatment recommendations, sometimes even being dishonest and hostile. Doctors and nursing staff report being reluctant to treat patients with obesity. Conversely, patients with obesity report feeling inadequately cared for, especially regarding their body weight. Indeed, there is evidence that patients with obesity receive certain examinations less frequently than normal-weight patients due to stigmatizing attitudes and also avoid certain, for example, preventive healthcare services due to shame about their own weight.

62.1.3 Childhood

Stigmatizing attitudes have been documented in children from around the age of 3 years. Subsequently, children with obesity are considered mean, stupid, ugly, and lazy and are rejected as playmates. Students with obesity, in turn, feel excluded, teased, and insulted by their peers due to their weight. Teachers also show stigmatizing attitudes towards students with severe overweight. Evidence has been found of disadvantages for adolescents with obesity in university admissions and financial support for education from their own families, regardless of the family's educational level and income, and particularly for girls with obesity. Parents seem to play a central role in conveying negative weight-related attitudes and are themselves a source of weight-related criticism towards their children.

62.1.4 Public Social Sphere

The obesity stigma is also present in other areas of life: For example, cases of discrimination against people with obesity have been reported regarding tight seating in public transportation, theaters, or airplanes, less customer-oriented

advice from salespeople in retail, and lower chances of renting housing or participating in adoption processes.

62.1.5 Media

The obesity stigma also appears to be transmitted by a negative media portrayal of people with obesity. While representations of overweight individuals on television and other media are underrepresented, obese characters, for example in television shows, are rarely shown as attractive, have fewer romantic interactions, and receive less physical affection compared to non-obese television characters. In contrast, they are more often depicted eating or being ridiculed.

62.1.6 State of Research

Stigmatizing attitudes towards people with obesity are so widespread in the population that they can be considered normative. Conversely, weight-related discrimination is an experience that people with obesity often encounter in many different life contexts. While previous research has primarily focused on these two aspects of the obesity stigma, objective weight-related disadvantages often remain unproven. Because actual weight-related discrimination in everyday life is methodologically difficult to assess, many study results are based on experimental case vignettes and manipulations of causality, often using student samples, which limits the generalizability of the findings. In addition, potential confounding variables such as age, origin, or gender were not systematically considered.

62.2 Psychosocial Consequences of Weight-Related Stigmatization and Discrimination

Various studies have shown that people with obesity also harbor stigmatizing attitudes towards their own social group. In this respect,

the obesity stigma differs from other stigmatized groups, which exhibit a positive “ingroup preference” for their own group. A possible explanation for this self-stigma is that when attributing internal causes, the assignment to the group of individuals with obesity offers little support. Psychologically, experiences of weight-related discrimination and the internalization of the obesity stigma seem to increase vulnerability to psychopathology.

Population-based data for adults indicate that experiences of weight-related discrimination are cross-sectionally not associated with self-esteem and depressive symptoms. However, among participants in weight loss programs, it has been found that experiences of discrimination are indeed associated with low self-esteem, anxiety, depressive symptoms, and greater dissatisfaction with one's own body. Clinical samples with obesity are generally more psychopathologically burdened than non-clinical samples. However, it remains unclear whether experiences of discrimination causally impair psychological functioning in adults or are reported more frequently due to a psychopathologically altered selective perception.

On the other hand, it has been shown for children and adolescents that experiences of weight-related discrimination are relevant for the development of psychopathology. Affected children, especially girls, for example, have an increased likelihood of being teased or criticized by other same-aged children or even family members because of their weight. Teasing experiences predict a lower self-esteem, impaired quality of life, increased dissatisfaction with one's own body, binge eating, dieting behavior, depressive symptoms, and even suicidal thoughts and attempts in children and adolescents with obesity, even after controlling for body weight. In retrospective surveys of adults with binge eating disorder, weight-related teasing and criticism from peers and family were also identified as risk factors in childhood and adolescence for the development of the eating disorder. Increasingly evident is that experiences of weight-related discrimination can mediate the relationship between obesity and

psychopathology, stress, and general health parameters. Longitudinal studies have shown a clear association between experiences of discrimination and an increased risk of developing or maintaining overweight or obesity, through associations with obesogenic eating behaviors, such as overeating and low physical activity.

Comparatively little is known about the internalization of the obesity stigma or self-stigma. Current research on adults and adolescents shows that self-stigma explains psychopathology and general health variables to an extent that goes beyond experiences of discrimination, stigmatizing attitudes, and body mass index. Vulnerable individuals, for example, those with low self-esteem, are particularly affected by the negative consequences of self-stigma.

62.3 Conclusion and Outlook

Obesity not only affects people with a low socioeconomic status in particular, but also entails social and psychosocial impairments. Stigmatizing attitudes towards people with obesity are widespread in the population and seem to have increased over the past four decades, parallel to the pandemic increase of this health disorder. These include attributing negative characteristics to affected individuals, such as being lazy and weak-willed. Weight-related stigmatization can essentially be explained by internal attributions to an alleged individual misconduct of those affected. Thus, stigmatizing attitudes are also an expression of a reductionist understanding of the complex, multifactorial etiology of obesity, in which genetic predispositions and external influences of the obesogenic environment are neglected. In view of the ubiquitous obesity stigma, it is not surprising that people with obesity often face weight-related discrimination in many important areas of life. Weight-related discrimination experiences are particularly relevant for the development of psychopathology in childhood and adolescence, whereas in adulthood, associations between such experiences and psychopathology

are only present in subgroups. Due to the possible psychopathological relevance of discrimination experiences, further exploration of weight-related discrimination and stigmatization processes represents a significant challenge for future research, not least to determine starting points for stigma reduction; stigma reduction has so far been achieved in only a few existing studies, mostly not sustainably. In particular, empowering individuals with obesity in dealing with weight-related discrimination and self-stigma seems promising. Legal measures to protect against weight-related discrimination have so far achieved only moderate public support, for example, in Germany.

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Obesity and Comorbid Mental Disorders

63

Stephan Herpertz and Magdalena Pape

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63.1 Mental Stress and Illnesses in Obesity

In the case of mental stress, it is ideally necessary to distinguish between causal factors and consequential states of obesity, but this is usually not possible. While the view that obesity represented a personality disorder was widespread until the 1960s, modern obesity research predominantly interprets mental aspects as dependent variables. Thus, follow-up studies show that weight loss in most people is associated with an improvement in psychological symptoms, particularly anxiety and depression.

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63.2 Psychosocial Stress

Regardless of the etiology of obesity, the psychosocial stress of a person with obesity is unmistakable. It is mainly due to the discrepancy between the increasing average body weight of the population and the traditionally high societal norms of slimness. Even children and adolescents with obesity are exposed to significant societal prejudices (Hilbert et al. 2013). Since social stigmatization is expected to have an impact on self-esteem, the self-esteem regulation of children with obesity compared to those with normal weight has been repeatedly investigated. Despite controversial study results, the self-esteem of younger children with obesity seems to be only slightly or not at all impaired, whereas adolescents from puberty onwards show a clear problem with self-esteem (Goodman and Whitaker 2002).

The described discrimination, particularly in women, often has negative effects both on

relationships and in the workplace. A frequently replicated observation is the inverse relationship between socioeconomic status and the prevalence of obesity. Social status, especially in women, has an impact on weight: the lower the social class, the higher the weight (Gortmaker et al. 1993).

63.3 Psychosomatic Aspects of Obesity

Although genetic findings suggest a stronger “genetic-biological control” of eating behavior and body weight, approximately 10–40% of the variance in body weight at the population level can be attributed to environmental factors such as diet and physical activity (Silventoinen et al. 2010). Behavior-related factors are to be understood both in the context of sociocultural conditions and against the background of individual socialization (individual learning history).

- ▶ **Important** In addition to satisfying hunger, eating has important other functions to fulfill. For instance, eating often serves the purpose of affect regulation, e.g., in the sense of coupling negative emotional states and food intake (e.g., parents comforting their children by offering sweets).

With regard to obesity, of particular interest are habitualized actions related to food intake which ultimately influence eating behavior both qualitatively and quantitatively for the purpose of stress reduction and at least temporary postponement of dysphoric feelings, and change the balance of energy intake and expenditure. Thus, within the overall cohort of people with obesity, a subgroup can be identified in whom mental problems and disorders lead to a change in eating and exercise behavior, the consequence of which is a persistent positive energy balance with overweight and obesity.

In addition to depressive disorders, anxiety, somatoform disorders, and binge eating disorder

(BED) are the most common comorbid mental illnesses of obesity (Baumeister and Härtter 2007; Carey et al. 2014). Certain forms of obesity show phenotypic behavioral similarities with addiction disorders.

63.4 Obesity and Depression

Obesity and especially atypical depression show important similarities, such as lack of drive, lack of physical activity, pathological hypercaloric eating behavior, e.g., in the form of a BED, overweight, and finally increased morbidity and mortality in the context of cardiovascular diseases and type 2 diabetes mellitus.

- ▶ **Important** In particular, more recent prospective studies identify depression in childhood and adolescence as a risk factor for the development of obesity in adulthood.

The data on the relationship between depression and obesity in adulthood is more conflicting. The literature shows both positive and negative, as well as no relationships between depressive symptoms and body weight, although more recent meta-analyses highlight a bidirectional relationship between obesity and depression (Luppino et al. 2010). Thus, obesity represents a risk factor for the development of depression, and conversely, depression is more often associated with obesity.

Psychosomatic and psychobiological factors are suggested to explain the apparent association between depression and obesity. Depending on the severity of obesity, significant, usually painful complaints of the musculoskeletal system can occur, which can be accompanied by a significant restriction of mobility, in turn resulting in a depressive mood (Hagena and Herpertz 2020).

The described negative stigmatization is likely to weigh more heavily on women than on men, against the background of diverging developments of increasing body weight and socially mediated beauty ideals (“thin is in”) in recent decades. Moreover, the success of conservative

weight loss measures is only moderate, which leads to the repeated experience of not only failure but also the paradoxical yo-yo effect in those affected and can contribute to a depressive development in the sense of the etiological model of “learned helplessness” (Hagena and Herpertz 2020).

Psychobiological factors, in particular, stress models and – related to this – the activation of the hypothalamic-pituitary-adrenal (HPA) axis are discussed in the development of depression. Conversely, increased cortisol levels as an expression of hyperactivity of the HPA axis are held responsible for an increase in visceral fat tissue in depressive patients. The weight-increasing effect of many psychotropic drugs, including many antidepressants, should not be underestimated in the comorbidity of obesity and depression.

- ▶ **Important** There is a bidirectional relationship between depression and obesity, with both psychosomatic and psychosocial as well as psychobiological factors playing a role. In particular, women with obesity often experience high levels of distress—up to depressive symptoms.

63.5 Pathological Hypercaloric Eating Behavior and Binge Eating Disorder

BED was introduced as a new eating disorder entity in the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) in 2013. While BED occurs in the general population with a prevalence of 1–3%, it is relatively common in samples of people with obesity who suffer from their overweight and seek medical or mental health help for weight loss, with up to 30%. In contrast to anorexia nervosa and bulimia nervosa, which primarily affect women, approximately 40% of affected patients are men. Obesity often associated with BED frequently motivates patients to engage in regular fasting,

usually time-limited episodes of strict dieting behavior and subsequent drastic weight loss. However, a steady weight gain usually resumes afterwards, often exceeding the body weight before the start of the diet (yo-yo effect). Obese people with BED have lower self-esteem compared to obese individuals without an eating disorder. Other comorbid mental disorders, particularly affective disorders and personality disorders (Davis et al. 2008), are more frequently observed. The development of obesity, often associated with early dieting and unsuccessful attempts at weight loss, begins anamnestically earlier compared to obese individuals without an eating disorder. Further differences exist with regard to food or energy intake, which is greater in obese people with BED both globally and on days without binge eating episodes. There is a direct relationship between psychopathology and the degree of eating disorder, while the psychopathological findings seem to be less associated with the extent of obesity (de Zwaan and Friederich 2006; Herpertz 2008).

In addition to BED, there are numerous variants of pathological eating behavior. It is worth mentioning so-called “grazing”, in which patients primarily consume sweet foods over a long period and not within a short time. Also noteworthy is night eating syndrome, which was first described in 1955 and is characterized by a rather hypocaloric diet during the day, hyperphagia during the night hours, and sleep disturbances (Müller et al. 2018).

63.6 Obesity, Personality Traits, and Personality Disorders

The relationship between personality traits and body weight has been investigated through both cross-sectional and longitudinal studies, with the aim of identifying personality characteristics that are frequently associated with obesity (cross-sectional studies), and to assess the possible predictive value of personality traits for weight development, e.g., in the context of conservative and surgical weight loss measures (longitudinal studies) (Dalle Grave et al. 2008).

A stronger expression of the traits “neuroticism”, “impulsivity”, and “extraversion” represents a risk factor for the development of overweight and obesity, whereas “conscientiousness” seems to have a protective function. Likewise, the relationship between impulsivity and eating behavior is particularly relevant with regard to binge eating symptoms (Gerlach et al. 2015).

Insufficient regulation of affects can be an expression of a general disturbance of impulsivity in the sense of an impulse control disorder, as is primarily found in certain personality disorders such as emotionally unstable personality disorder (borderline personality disorder (BPD)).

The comorbidity of obesity and BPD has so far been primarily investigated in clinical samples (Frankenburg and Zanarini 2006), with prevalence rates of 7–40%. In samples of bariatric surgery patients, usually with obesity grade III, prevalence rates range between 1.0 and 30%. BPD is of multifactorial origin and the product of a complex interplay of innate temperament, severe childhood stress, and relatively subtle forms of neurological and/or biochemical dysfunction. Severe childhood stress includes traumatic experiences such as sexual abuse. Indeed, in psychiatric or psychosomatic care, comorbid patients are found in whom impulse control disorder, e.g., in the context of BED, plays a significant role in the genesis of obesity (Jasinska et al. 2012). At the same time, obesity has a protective character against sexuality for some of these patients. When comparing women with obesity and women with normal weight in primary care, significant associations can be shown between the highest body weight (lifetime), body weight at the time of the study, lifetime sexual abuse, self-harming behavior, and borderline personality symptomatology.

63.7 Obesity and Addiction Disorders

During the consumption of sugary and high-fat foods, neurophysiological activities can be observed that resemble the consumption of alcohol and other addiction-inducing substrates

(Volkow et al. 2013). In particular, the dopaminergic reward system, which is also involved in the development and maintenance of (non-) substance-related dependencies, seems to play a role (Chap. 27). In some affected individuals, an uncontrolled, excessive eating behavior (food addiction) develops.

While nicotine consumption and overweight are often associated, the study findings regarding the comorbidity of obesity and alcohol dependence are heterogeneous (VanBuskirk and Potenza 2010), with different etiological concepts being discussed. Overweight and obesity are discussed as protective factors for the development of alcohol dependence, while on the other hand, excessive alcohol consumption can contribute to overweight or obesity due to increased energy intake. In addition, some patients develop alcohol dependence after bariatric surgery, which is interpreted, among other things, as a shift in addiction (Steffen et al. 2015). With regard to (non-)substance-related dependencies such as internet-related disorders, the association with overweight or obesity is explained by physical inactivity and unhealthy eating habits (Aghasi et al. 2020).

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Metabolic Syndrome and Depression

64

Bernd Löwe

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64.1 Background

A series of metabolic risk factors for coronary heart disease, heart attack, and cardiovascular mortality typically co-occur. Various terms have been used in recent decades to describe the combination of these cardiovascular risk factors; today, the term “metabolic syndrome” has largely prevailed.

- ▶ **Important** The metabolic syndrome, formerly also called “Syndrome X” or the “deadly quartet” (Kaplan 1989), refers to a symptom complex of reduced glucose tolerance, obesity, dyslipoproteinemia, and arterial hypertension.

64.1.1 Prevalence

Due to the increase in the prevalence of obesity, diabetes mellitus, and metabolic syndrome in the last 20 years and the occurrence already in early childhood (Eckel et al. 2005), it is now referred to as a “global epidemic”; prevention strategies are urgently called for (Zimmet et al. 2001). Parallel to the increase in metabolic syndrome, depressive disorders are being diagnosed more frequently, and it is expected that they will become the leading global cause of disease burden by 2030.

64.1.2 Definitions

Although the term “metabolic syndrome” is widely accepted, various definitions have long been used. In 1998, the WHO developed the first internationally recognized definition of the metabolic syndrome. In response, the Adult Treatment Panel III (ATP III) developed a new definition of the metabolic syndrome, which

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was much simpler to capture compared to the WHO definition. In 2005, revised versions of the ATP-III criteria were issued in parallel by the International Diabetes Federation (IDF) and the American Heart Association/National Heart, Lung and Blood Institute (AHA/NHLBI), which correspond to the specified limits for hypertriglyceridemia, reduced HDL cholesterol, arterial hypertension, and increased fasting glucose. However, the waist circumference thresholds in the American AHA/NHLBI definition are higher than in the IDF definition, and the diagnostic algorithm shows slight differences. In 2009, a joint Interim Statement was issued by the IDF, NHBLI, AHA, and other international associations (World Heart Federation, International Atherosclerosis Society, and International Association for the Study of Obesity), which aimed to standardize the definition of the metabolic syndrome (Alberti et al. 2009). Table 64.1 shows the diagnostic criteria for the metabolic syndrome that are listed in this statement, with at least three of the five criteria needing to be met.

64.1.3 Criticism of the Concept of Metabolic Syndrome

However, justified criticism of the concept of metabolic syndrome has also been expressed: The American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) published a provocative call for critical questioning of the concept of metabolic syndrome (Kahn et al. 2005). In this publication, the definition is criticized as imprecise and the clinical benefit of summarizing known risk factors into a syndrome is questioned. It is suggested that clinicians, until better research results are available, should diagnose and treat only the individual risk factors instead of the metabolic syndrome. In contrast, the IDF argued that, given the worldwide epidemic of diabetes mellitus and cardiovascular diseases, it makes sense to identify individuals with risk factors for these diseases as early as possible and encourage them to change their lifestyle (Alberti et al. 2005).

Table 64.1 Definition of the metabolic syndrome. (Data from Alberti et al. 2009)

Diagnostic Criteria (min. 3 of 5)	Thresholds
Central obesity*	Waist circumference ≥ 94 cm (men of European origin) ≥ 80 cm (women of European origin)
Hypertriglyceridemia	Triglycerides > 150 mg/dl Specific treatment for this lipid disorder
Low HDL cholesterol	< 40 mg/dl (men) < 50 mg/dl (women) Specific treatment for this lipid disorder
High blood pressure	Systolic ≥ 130 mmHg Diastolic ≥ 85 mmHg Treatment of previously diagnosed arterial hypertension
Increased fasting glucose	≥ 100 mg/dl Previously diagnosed type 2 diabetes mellitus

* Normal values for waist circumference differ for various ethnic groups. An overview of the norm values can be found in Alberti et al. (2009)

64.2 Epidemiology

64.2.1 Metabolic Syndrome

Internationally, the prevalences of metabolic syndrome vary greatly: In various samples of the American general population, prevalences of 20–40% were reported (Ford 2005a), while, for example, in France, much lower prevalences of 7% were found (Eckel et al. 2005). Reliable figures on the frequency of metabolic syndrome in the German general population are not available. The prevalence of metabolic syndrome increases significantly with age (Eckel et al. 2005), e.g., in American women from 12% at the age of 20–29 years to 61% at the age of 60–69 years (Ford 2005a). The frequency of metabolic syndrome increases with increasing body mass index; hypertensive individuals are about twice as likely to have metabolic syndrome as normotensive individuals (Ford 2005a). Similarly, in patients with coronary heart disease (CHD), the age-adjusted prevalence of metabolic syndrome (Ford 2005a) is doubled compared to patients without CHD. Sedentary lifestyle, smoking, and chronic work stress have been identified as additional risk factors for metabolic syndrome (Adams et al. 2005). In individuals with metabolic syndrome, the probability of occurrence of cardiovascular diseases and diabetes mellitus is significantly increased compared to individuals without metabolic syndrome (Ford 2005b). As the INTERHEART study and other studies have impressively shown, the increased risk of myocardial infarction applies not only to the full picture of metabolic syndrome but also to a similar extent for each of its components, i.e., arterial hypertension, abdominal obesity, diabetes mellitus, and hyperlipidemia (Yusuf et al. 2004).

64.2.2 Depression

According to a study by the WHO, the 12-month prevalence of depressive disorders in the general German population is 3.6% (Demyttenaere

et al. 2004). However, in physically ill patients, the prevalence of depressive disorders is estimated to be around 20–35%, with the prevalence increasing significantly with the severity and chronicity of the physical illness.

- ▶ **Important** Large studies and meta-analyses have now shown that a depressive disorder is a significant risk factor for cardiovascular morbidity and mortality. A depressive disorder increases the risk of dying from a myocardial infarction by about a factor of 2.

Since depressive disorders and metabolic syndrome are already associated with considerable morbidity and mortality on their own, it is to be feared that a combination of the two will have particularly serious consequences. However, there are only a few studies on this, which do not allow for a conclusive quantitative assessment.

- ▶ **Important** Patients with the individual components of the metabolic syndrome, i.e. diabetes mellitus, arterial hypertension, or obesity, suffer from depressive disorders significantly more often than persons without these risk factors (Anderson et al. 2001).

64.2.3 Metabolic Syndrome and Mental Disorders

The metabolic syndrome is of particular relevance for psychiatry, psychosomatic medicine, and psychotherapy, as it occurs more frequently in patients of these disciplines. A recent meta-analysis based on 198 studies found that about one in three patients (32.6%) (Vancampfort et al. 2015) with a severe mental illness suffers from a metabolic syndrome. In patients with depression, the prevalence of metabolic syndrome was

31.3% (Vancampfort et al. 2015). The relationship between mental disorders and metabolic syndrome is bidirectional: depression increases the risk of developing a metabolic syndrome (adj. OR approx. 1.5), and the metabolic syndrome increases the risk of developing depression (adj. OR approx. 1.5) (Pan et al. 2012). It should be noted that the pharmacological treatment of mental disorders, especially with antipsychotics and tricyclic antidepressants, can also contribute to the development of a metabolic syndrome: among persons with mental disorders, antipsychotic-naïve patients have the lowest prevalence of metabolic syndrome. Moreover, the risk increases significantly with psychopharmacological combination therapy compared to monotherapy. A particularly high prevalence of metabolic syndrome was found in patients treated with clozapine, at 47.2% (Vancampfort et al. 2015). In addition to psychopharmacological medication, numerous other mediating mechanisms have been assumed for the relationship between depression and metabolic syndrome.

64.3 Relationship Between Metabolic Syndrome and Depression

Interactions between metabolic syndrome and depressive disorders occur at the behavioral, metabolic, genetic, and iatrogenic levels. In general, depressive patients exhibit a less healthy lifestyle than non-depressive individuals. The less healthy lifestyle in depressed individuals, which promotes the development of metabolic syndrome, includes increased rates of nicotine abuse, malnutrition, inadequate sleep hygiene, and lack of exercise (Kahl 2005).

A significant relationship between depression and metabolic syndrome is also seen in insulin resistance, which is associated with hypercortisolism, activation of pro-inflammatory cytokines, decreased physical activity,

and atherosclerotic complications (Ramasubbu 2002). The cause of hypercortisolism may be an increase in TNF- α (tumor necrosis factor- α) and interleukin-6 as part of an imbalance between anti- and pro-inflammatory cytokines, which subsequently leads to an increase in diabetogenic hormones (adrenocorticotropic hormone ACTH, corticotropin-releasing hormone CRH, growth hormone GH) and, through interaction with insulin receptors, modulates the activity of the pituitary-hypothalamic-adrenal cortex system. Due to this metabolic constellation, there is an increased risk for the development of metabolic syndrome with impaired glucose tolerance, relative insulin resistance, dyslipidemia, and an increase in intra-abdominal fat tissue compartments. In this context, intra-abdominal (visceral) fat tissue plays a particularly important role. Depressed patients are often obese and have an increased volume of intra-abdominal fat components: This, in turn, represents an increased risk for the development of metabolic syndrome and diabetes as well as cardiovascular diseases. Finally, genetic correlations are likely significant for the development of metabolic syndrome in depression, although a monogenic etiology is not assumed (Ramasubbu 2002). However, there are also contradictory findings for the assumption of a genetic component. The development of metabolic syndrome in depressed individuals can also be iatrogenically promoted by the intake of antidepressant medication. Weight gain and metabolic deterioration due to antidepressant medication, particularly tricyclic antidepressants, have been described.

Figure 64.1 illustrates mechanisms and factors that exert an impact in the development of metabolic syndrome with depression and clarifies how a metabolic syndrome can cause both a worsening of depressive symptoms and a potentiation of somatic morbidity. Both the affective disorder and the progressive somatic morbidity, in turn, lead to a worsening of depressive symptoms. Ultimately, a classic vicious cycle emerges with self-reinforcing mechanisms and disastrous consequences.

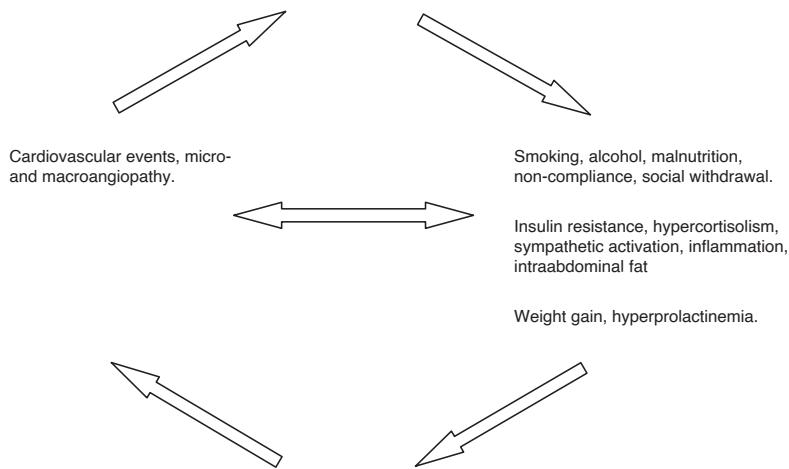


Fig. 64.1 Interactions between depression and metabolic syndrome; insulin resistance: reduced sensitivity of carbohydrate metabolism to insulin. (From Löwe et al. 2006; with kind permission of Hans Huber Publishers)

64.4 Therapy

64.4.1 General Aspects

A prerequisite for successful treatment is comprehensive diagnostics of mental and somatic disorders. Diagnosing mental disorders in patients with metabolic syndrome can pose particular challenges for the treating physician: Typically, the mental disorders are not pre-diagnosed, and the recognition of psychological symptoms can be complicated by the overlay of physical and psychological complaints. In many cases, the patient is externally motivated and sees their problems more in their overweight and physical complications than in psychosocial causes. As with other physical illnesses, it can be assumed that the frequency of mental disorders increases with the severity and chronicity of the metabolic syndrome and its sequelae. However, metabolic syndrome seems to be less sufficiently treated in patients with severe mental disorders than in patients without mental disorders (Kreyenbuhl et al. 2006).

- **Important** If a patient suffers from both metabolic syndrome and a depressive disorder, both disorders must be considered simultaneously in the treatment plan.

Since a mutual reinforcement of features of the metabolic syndrome and symptoms of mental disorders can be assumed, the psychosocial treatment of this patient group must be multidimensional and aim to enable the patient to successfully manage their physical and emotional stress. Only if the patient's depression improves will they be motivated to actively work on the components of the metabolic syndrome.

- **Important** In fact, the two basic therapeutic principles in the treatment of metabolic syndrome, namely physical activity and weight loss, are also effective in treating depression.

In some cases, the risk factors of metabolic syndrome, i.e., hypertension, diabetes mellitus, and hyperlipidemia, must also be treated with

medication (Eckel et al. 2005). In the treatment process, cooperation between general practitioners, internists, physicians for psychosomatic medicine and psychotherapy, and physicians for psychiatry and psychotherapy must ensure that the patient feels sufficiently informed about diagnosis, treatment options, and prognosis. Adequate medical treatment of risk factors or comorbid physical disorders is also a prerequisite for effective therapy. Weight, blood pressure, fasting blood sugar, HbA1c, and lipids must be monitored frequently enough to provide feedback to the patient and the physician on the success of the therapy. Accompanying addiction withdrawal (smoking!) is necessary in many cases. The motivation and compliance of the patient can often be strengthened by involving the family or circle of friends. A key goal of treatment is to promote health behavior so that the patient can manage their metabolic syndrome and comorbid diseases in the long term. In treating a depressed patient with metabolic syndrome, it is of great importance not to treat the patient as “mentally ill” but as a normal person suffering from unusual stress.

- ▶ **Important** Accompanying antidepressant pharmacotherapy is sometimes indicated for mild and moderate depressive episodes, and almost always for severe depressive episodes.

64.4.2 Treatment Principles

The psychosomatic treatment of the patient, which can be carried out in individual and group settings, should be resource-oriented and include the following components.

Psychoeducation The patient and their closest reference person must be informed about both the metabolic syndrome and its treatment as well as depressive disorders so that they have the necessary basic knowledge to manage their health problems independently.

Health behavior To increase physical activity, structured activity plans should be developed. The therapist reinforces the implementation of physical activity. Additional consultations should be provided regarding lifestyle and nutrition.

Explanatory models The patient's subjective explanatory and treatment models must be included in the treatment so that the patient and doctor can reach mutual decisions regarding the applied treatment methods.

Deriving the focus and therapy planning The treatment mandate, the focus of treatment, and the therapy goal should be explicitly discussed with the patient. Depending on the therapeutic orientation of the therapist, the Operationalized Psychodynamic Diagnostics (OPD-2) or a structured problem and behavior analysis are suitable as a basis, for example.

Cognitive techniques Patients must learn to identify and change dysfunctional negative cognitions and evaluations.

Integration of reference persons Interpersonal problems are the most common subjective cause of emotional problems in patients with physical illnesses. The inclusion of the family or the most important reference persons in couple or family sessions serves to solve interpersonal problems and to learn health-promoting behaviors for the entire family.

Problem-solving skills To achieve sustainable improvements, it makes sense to practice with the patient to recognize, analyze, and constructively solve problems early on.

Motivational interviewing To effectively address motivational problems related to behavior changes, motivational interviewing techniques have proven to be effective.

64.4.3 Efficacy

So far, there are no studies on the efficacy of psychotherapeutic treatment of patients with

depression and metabolic syndrome. Such studies are urgently needed, as this patient group represents a numerically rapidly growing high-risk group for cardiovascular and other diseases or death. The controlled studies on the efficacy of psychotherapy or antidepressant pharmacotherapy in depressive patients with coronary heart disease or diabetes mellitus (Didurjeit et al. 2002; Glassman et al. 2002; Katon et al. 2004; Lustman et al. 1998) suggest, however, that these interventions could also be effective in patients with metabolic syndrome.

Conclusion

Depression and metabolic syndrome have become more common in recent decades and co-occur more frequently than by chance. Both are risk factors for cardiovascular mortality, and can mutually reinforce each other in a vicious cycle through factors such as inactivity, social withdrawal, metabolic parameters, and non-compliance. Therefore, diagnostic and therapeutic measures must simultaneously take into account both metabolic syndrome and depression. The goal of treatment is not only to achieve remission of depression but also to enable the patient to successfully and independently manage the health challenges of metabolic syndrome.

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Tobacco Dependence in Eating Disorders and Obesity

65

Marlen Brachthäuser and Anil Batra

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In Germany, 26.4% of men and 18.6% of women older than 15 years smoked in 2017 (Federal Statistical Office 2018). In a study on smoking behavior among adolescents and young adults aged 15–20 years, the Federal Statistical Office determined a smoking prevalence of less than 11%. Smoking prevalence and the number of cigarettes smoked daily increase with age.

Today, smoking is considered the most significant single risk factor for a variety of serious

diseases and premature death in industrialized countries. Approximately 121,000 smokers die annually in Germany as a result of tobacco consumption (German Cancer Research Center 2015). The harmful health effects of tobacco consumption are due to numerous toxic or carcinogenic substances—such as carbon monoxide, nitrogen dioxide, benzene, nitrosamines, polycyclic aromatic hydrocarbons, free radicals, heavy metals, and many others—that are inhaled with tobacco smoke. The harmful health effects also exist for non-smokers who are regularly exposed to tobacco smoke (“passive smokers”). The most common tobacco-associated diseases include cardiovascular diseases, carcinomas (especially of the lung, larynx, and esophagus), and chronic obstructive bronchitis. Several studies have shown that the life expectancy of a regular long-term smoker is reduced by about 8–10 years (Doll et al. 2004).

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65.1 Foundations of Tobacco Dependence

Tobacco dependence is multifactorial and arises from the complex interplay of social, psychological, and (neuro)biological factors. The interactions of physiological and psychological effects lead to a consolidation of smoking behavior and promote the development of dependence.

65.1.1 Neurobiological Aspects of Tobacco Dependence

The psychopharmacological effects of nicotine are held responsible for the development of physical dependence. The nicotine inhaled through tobacco smoke unfolds its effects in the central nervous system within 7–10 seconds and has a bivalent spectrum of action, which, depending on the dose, has both calming and stimulating effects. After inhalation of tobacco smoke, nicotine centrally increases the concentration of various neurotransmitters such as dopamine, acetylcholine, norepinephrine, and serotonin by stimulating presynaptic nicotinic acetylcholine receptors. This is associated with different active qualities (well-being, mood elevation, activation, calming, reduction of anxiety, subjectively experienced increase in cognitive performance). The dopaminergic activation mediated by nicotine in the mesolimbic “reward center” (nucleus accumbens) seems to be important for the development of dependence. An adaptation following regular nicotine consumption leads to a reduction of dopamine release in the nucleus accumbens below the baseline level during nicotine withdrawal. As a result of repeated and prolonged receptor desensitization, the density of central nicotinic $\alpha 4\beta 2$ -acetylcholine receptors increases compensatorily. This “up-regulation” depends on the nicotine dose and only decreases after a longer abstinence period. The increased number of free nicotinic $\alpha 4\beta 2$ -acetylcholine receptors is, among other things, held responsible for the development of withdrawal symptoms (Heinz et al. 2012).

The nicotine withdrawal syndrome (ICD-10, F17.3) is characterized by the symptoms listed in the overview.

Symptoms of Nicotine Withdrawal Syndrome

- Intense craving for smoking
- Feeling of illness or weakness
- Anxiety
- Dysphoric mood
- Irritability
- Restlessness
- Insomnia
- Increased appetite
- Increased coughing
- Ulcerations of the oral mucosa
- Concentration problems

65.1.2 Psychosocial Aspects of Tobacco Addiction

In the psychodynamic understanding, smoking represents a neurotic maladjustment; smoking is seen as oral drive satisfaction, as a regulatory mechanism for internal psychological deficits, or as unconscious self-destructive behavior. From a learning theory perspective, social modeling, classical and operant conditioning processes, as well as cognitive learning processes related to the expectation of effects and individual functional significance of smoking, are responsible for the development and maintenance of addiction. At the beginning of the smoker's career, social reinforcement processes and the association of smoking with positive concepts such as sociability, but also “being slim,” play a role. With regular tobacco consumption, the pharmacological effects of nicotine become increasingly important. Smokers increasingly use the pleasant effects of nicotine in a targeted and functional way for reward, stress reduction, and relaxation, and eventually, tobacco consumption is maintained to avoid withdrawal symptoms (Batra 2011).

65.2 Diagnosis of Tobacco Addiction

An important prerequisite for planning an intervention is a comprehensive diagnosis that allows for the assessment of possible complications in tobacco cessation and the risk of relapse (Batra et al. 2015; AWMF 2021). This includes the collection of smoking history variables (daily cigarette consumption, smoking onset, smoking duration), the functionality of smoking behavior in the social environment, risk factors (pregnancy, psychiatric and somatic diseases, regular intake of medications), as well as the assessment of dependence criteria according to the ICD-11 (tobacco addiction F17.2) and the strength of dependence with the Fagerström Test for Cigarette Dependence (FTCD, Fagerström 2012; Heatherton et al. 1991; see also AWMF 2021)

The FTCD allows for an assessment of the strength of dependence and, according to current treatment guidelines, is a reliable instrument for estimating the occurrence of withdrawal symptoms. The higher the total score, the more withdrawal symptoms are to be expected, and the higher the risk of relapse. The strength of dependence and the evaluation of individual questions provide indications for the necessary pharmacological and psychotherapeutic interventions.

65.3 Tobacco Addiction and Eating Disorders

The following will first present studies on the prevalence of smoking and tobacco addiction in eating disorders, as well as the relationships between smoking and conspicuous eating behavior.

Some studies analyze smoking behavior within the diagnostic categories of eating disorders, while others compare data between patients and healthy controls.

The prevalence rates of smoking are assumed to be between 20 and 30% internationally. In Germany, a prevalence of 24.5% is reported. In comparison, the proportion of smokers

(averaged for both genders) among people with depressive and/or anxiety disorders is estimated at 35%, while prevalence rates of 65–95% are reported for patients with psychotic or other addiction disorders (Batra 2000; Rüther et al. 2014).

The meta-analysis by Solmi et al. (2016) summarized results from 31 studies on the prevalence of tobacco dependence in eating disorders (AN, BN, or binge eating disorder (BED)) compared to healthy controls. Across all studies, a significantly higher proportion of smokers was found among people with BN and BED. In the presence of AN, the proportion is slightly (but not significantly) lower than in healthy control groups. The highest lifetime prevalence for tobacco dependence is found in BED (47.7%), followed by BN (39.4%). A similar result was reported in a study by Anzengruber et al. (2006) in 1,524 women with or without one of the eating disorder diagnoses. Smoking behavior and the intensity of dependence were determined using the Fagerström Test. Women with eating disorders showed higher prevalences of tobacco dependence, with the highest rates found among the binge-eating/purging subtype of AN. Binge-eating/purging behavior appears to be the variable with the strongest association with smoking behavior (White and Grilo 2006). Insofar as this was differentiated in the studies, the lowest smoking rates were found among the patients with restrictive-type AN—below the prevalence of healthy control groups.

Brewerton et al. (2014) examined several relevant variables of tobacco dependence in a sample of 850 women and girls with AN or BN (AN, restrictive type: n = 306; AN, binge-eating/purging: n = 293; BN: n = 251). There was no difference between the individual groups regarding the onset of smoking, but significantly more study participants (59.9%) started smoking only after the onset of their eating disorder. In the case of already disturbed eating behavior in childhood, there also seems to be an accumulation of substance abuse. The strength of nicotine dependence, measured with the FTND, as well as the daily cigarette consumption, were

significantly higher in the overall group of women with an eating disorder than in the controls. Within the group, those with restrictive AN again showed the lowest nicotine dependence and the lowest daily cigarette consumption. Taking into account the strength of tobacco dependence, there were no significant differences between the groups regarding the number of abstinence attempts. Ex-smokers had a significantly higher BMI than non-smokers and smokers.

Patients with a self-reported eating disorder diagnosis reported more frequent use of electronic cigarettes containing nicotine for weight control in a more recent study (Morean and L'Insalata 2018).

- ▶ **Important** In the presence of BED and BN, the prevalence of tobacco smoking and the intensity of tobacco dependence are significantly higher than in people without an eating disorder. In the case of AN, the smoking prevalence depends on the presence of a binge-eating/purging type versus a restrictive subtype: there is a tendency for increased smoking rates in the purging type, while lower smoking rates can be expected in restrictive AN.

So far, there are no studies on the over-additive health risks of smoking in cases of bulimia/anorexia. However, bulimia and tobacco addiction share a number of medical risks in the area of cardiovascular diseases, as well as diseases of the mouth and throat, esophagus, and stomach. It can be assumed that the risk of esophageal cancer is significantly higher in cases of comorbidity than in the presence of only one disorder.

Theoretical research findings are provided by Ehrlich and colleagues (2012) in a study on the epigenetic influence of malnutrition and smoking on the DNA methylation of a disease-relevant gene in connection with stress and food control. Smoking, but not malnutrition in connection with anorexia, influenced the DNA methylation of the risk gene. Patients with

anorexia are likely to have an increased risk of esophageal cancer. The simultaneous presence of risk factors such as smoking, alcohol consumption, and malnutrition is more likely to contribute to the etiopathogenesis of the carcinoma than self-induced vomiting in an eating disorder (Brewster et al. 2015).

65.4 Factors Associated with Increased Smoking Prevalence in Eating Disorders

Nicotine suppresses the feeling of hunger. It has been widely proven that smokers have a lower average body weight than non-smokers. There is an association between the number of cigarettes smoked daily and weight. In particular, moderate and older smokers have a more pronounced “weight control benefit.” Thus, the consumption of nicotine-containing products—especially cigarettes—in eating disorders with a conscious desire for slimness and the use of weight control measures represents a way of appetite and hunger regulation. This can promote motivation to start smoking, maintain it, or foster ambivalence about quitting smoking. Women with an eating disorder showed a significantly higher motivation to smoke compared to a control group with depression. The strongest smoking motives are weight control and stress management. Increased anxiety has been identified as a comorbid factor (Georg and Waller 2005).

Since a large proportion of patients with eating disorders also have other comorbid psychiatric disorders such as anxiety, depression, and personality disorders, nicotine or smoking may also be used additionally as a means of regulating the comorbid disorder of emotion regulation. The multiple functional significance of smoking results in a more intense addiction in these patients.

With regard to typical smoking motives in individuals with eating disorders, for example, in a sample of 102 women with BN, it was found that they used smoking significantly more often to avoid eating or to control their weight.

Compared to control groups with and without mental illness, they relapsed more frequently after achieving abstinence because they had concerns about weight gain or worries about their figure. Comorbid depressive or anxious symptoms were more pronounced in this group. In a non-clinical study on the relationship between smoking and body image, young female smokers showed more bulimic symptoms and concerns about their figure than non-smokers (Kendzor et al. 2009).

65.4.1 Weight Control and Weight Concerns

Numerous studies have addressed the concept of “weight concerns.” Young people with weight problems often develop a regular smoking behavior later on (Saules et al. 2007). Concerns about weight could thus represent a predictor for the onset of smoking, a reason for relapse after achieving abstinence, or an obstacle to smoking cessation treatment (Pomerleau and Saules 2007). Since different variables are examined in relation to “weight concerns” depending on the study, the interpretation of study results and their comparability is difficult. Nevertheless, several conclusions can be drawn from the literature regarding the dimension of “weight concerns.” A high dissatisfaction with one’s own body, pronounced dieting behavior and diet practices that indicate disturbed eating behavior, such as the use of laxatives, purging, or binge-eating, combined with a rather negative affect, are considered risk factors for the onset of smoking as well as for the development of an eating disorder (Pomerleau and Saules 2007). Unhealthy eating behavior is correlated with the use of tobacco products among adolescents (Sutter et al. 2016).

If concerns about weight gain are very high, they pose an obstacle to smoking cessation treatment or lead to a higher likelihood of terminating smoking cessation. The concern about weight gain seems to be a more significant predictor of relapse than the actual increase (Meyers et al. 1997).

Copeland et al. (2016) conducted a study to investigate the factors “drive for thinness” (DT) and “fear of fatness” (FF) and their relationship to smoking behavior in eating disorders. They assumed that these are two different motivations, both playing a role as approach or avoidance goals. Only DT was positively correlated with the number of cigarettes smoked daily, while this relationship was reversed for FF. This might explain the comparatively lower smoking rates in the restrictive type of AN, as only avoidance strategies for weight regulation are used here, and smoking is less necessary as a compensatory strategy for slimming.

A therapeutic focus on “weight concerns” can increase the long-term abstinence rates of smoking cessation. In a therapy study, the group whose treatment was directly aimed at reducing concerns about weight achieved the highest long-term abstinence rates (21% compared to 13% in an intervention group that received additional behavior-related elements for weight control, or a “standard treatment” that achieved only 9%). This illustrates the relevance of changing dysfunctional beliefs regarding the prevention of weight gain, body shape, and dieting, as well as reducing restrained eating behavior in smoking cessation for this patient group (Perkins et al. 2001).

65.4.2 Emotion Regulation

Patients with eating disorders report that, in addition to weight control, smoking provides an even higher motivation for stress regulation (Georg and Waller 2005). In overweight individuals with BED, emotion regulation also appears to play an important role in maintaining BED (Gianini et al. 2013). Since the inclusion of BED in the DSM-5 for research purposes, several scientific studies have examined the relationship between binge eating with loss of control as part of BED (or BN) and dependent behavior. It is discussed whether a subgroup of those affected by binge eating could show a kind of “eating addiction,” such that these individuals could have a generally higher vulnerability

to addiction. There is no clinical consensus on such a concept, but there are indications of similarities in the characteristics of “strong urge or compulsion to consume,” loss of control, and neurobiological reward in the mesolimbic reinforcement system (Schreiber et al. 2013). There is limited evidence for comparable disorder-maintaining mechanisms in BE D and addiction in terms of impaired reward system and impulsivity (Schulte et al. 2016).

65.4.3 Genetic Factors

Some twin studies have already pointed to the role of genetic factors in the association between problematic alcohol consumption and, in particular, BN (Munn-Chernoff et al. 2013). A more recent twin study by Baker and colleagues (2018) on the relationship between eating disorder phenotypes (drive for thinness, bulimia, body dissatisfaction) and substance use in terms of cigarette consumption or illegal drug use only confirmed a significant relationship between smoking and BN as well as drive for thinness. For illegal drugs, a clearer correlation was also found in further studies, with the influence of genetic risk factors playing an etiological role similar to that of problematic alcohol consumption (Munn-Chernoff et al. 2020)

- ▶ **Important** In AN, BN, and BED, smoking is used both as a specific measure for weight control and, presumably due to the psychopharmacological effects of nicotine, as a coping strategy for dealing with negative emotions. The fear of weight gain results in lower motivation to quit smoking.

65.5 Smoking and Obesity

Overall, there are still few studies that explicitly investigate mutual influences between smoking and obesity, just as the influence of smoking

on health risks in eating disorders is poorly researched. Since binge eating in the absence of compensatory behaviors is a risk factor for overweight and the development of obesity, and binge eating or uncontrolled eating behavior is associated with an increased risk of tobacco use, it can also be assumed that the prevalence of tobacco dependence is influenced by obesity. However, people with BED seem to have higher prevalence rates compared to obese people without binge eating. Smoking and binge eating seem to have in common that they are used as coping strategies for dealing with stress and negative emotions. At the same time, obese people with BED have increased lifetime prevalence rates for a number of other psychiatric disorders, such as depression, anxiety disorders, and addiction disorders (White and Grilo 2006). Some studies do not differentiate between overweight ($BMI > 25$) and obesity, so statements must be generalized to both groups for the time being. People with overweight and obesity use smoking both for appetite control and as a means to prevent or counteract further weight gain. Another study also showed that female smokers with overweight/obesity, compared to those with normal weight, had significantly greater fears of gaining weight after quitting smoking. These smokers reported that they would be more likely to smoke in the event of weight gain. In the group of smokers with overweight/obesity, “weight concerns” and the expectation that smoking is an effective means of weight control seem to be important motives for smoking.

A study that examined the mortality risk of both risk factors in 64,120 women and 18,760 men (Freedman et al. 2006) found:

- In men under 65 years of age, the mortality risk in the group with a BMI between 30 and 34.9 was 3.8 times higher and in the group with a BMI of 35+ was 5.2 times higher.
- In women under 65 years of age, the mortality risk with a BMI between 30 and 34.9 was 2.2 times higher and with a BMI of 35+ was 4.2 times higher.

Broken down by cancer and cardiovascular disease mortality, these figures lay at 2.45 and 10.6 for men with a BMI of 30+; 2.7 and 6 for women with a BMI of 30+. The risks for ex-smokers with overweight were significantly reduced compared to smokers with overweight. Therefore, especially in the case of obesity, smoking cessation is an essential factor in reducing morbidity and mortality. Another study, by Udo and colleagues (2016), in obese patients with BED showed among other things that current smokers had higher psychiatric comorbidity, lower physical quality of life, and an increased risk of metabolic syndrome and unfavorable cholesterol levels compared to non-smokers and former smokers. In contrast, former smokers and non-smokers did not differ in this regard, which underlines the possible positive consequences of smoking cessation in patients with BED and obesity or overweight. In a larger population study in Finland, the interaction between smoking status and BMI and the extent of abdominal adipose tissue was investigated. Among women with overweight, a significant correlation between excessive smoking and the extent of abdominal adipose tissue was demonstrated (Tuovinen et al. 2016).

In a recent study on an animal model with obese rats, it was shown for the first time how chronic exposure to cigarette smoke affects various metabolic, pulmonary, intestinal, and cardiac parameters in the overweight rats (Dubois-Deruy et al. 2020). The cigarette smoke altered the fat distribution in favor of an increased proportion of visceral adipose tissue. The respiratory function was further impaired, inflammation in the lung tissue and emphysema were promoted. In addition, the intestinal flora and cardiac parameters were negatively affected.

Conclusion

There is still a need for research regarding the relationships and interactions between smoking and eating disorders as well as obesity. This concerns both the somatic consequences resulting from a joint presence, as well as the epidemiological and

psychological aspects and the associations with other psychiatric disorders. In the case of BED and overweight, smokers show poorer psychosocial and metabolic health.

65.6 Weight Gain Due to Tobacco Abstinence

According to the results of a meta-analysis, women seem to gain slightly more weight after quitting smoking than men (Farley et al. 2012). Heavy smokers tend to approach the body weight of non-smokers more closely. This relationship has not yet been clearly proven for smokers up to the age of 19, while older smokers gain more weight (Prod'hom et al. 2013). Characteristics of eating behavior (binge eating) are also associated with weight gain after tobacco abstinence (White et al. 2010).

A meta-analysis based on 62 studies determined the average weight gain in smokers who had become abstinent without medication and/or (psycho-)therapeutic support (these were usually the control groups of randomized clinical trials). Twelve months after achieving abstinence, 16–21% of participants had lost weight, 37% had gained less than 5 kg, 34% had gained 5–10 kg, and 13–14% had gained more than 10 kg. Tobacco abstinence is associated with an average weight gain of 4–5 kg after one year (Aubin et al. 2012).

The majority of weight gain occurs within the first 3–12 months after quitting smoking (Prod'hom et al. 2013). The number of cigarettes smoked daily appears to be a significant predictor of expected weight gain (Prod'hom et al. 2013). The relationship between initial weight and weight gain is assessed differently; Lycett et al. (2011) found a strong increase with high initial consumption, while Prod'hom et al. (2013) found no relationship.

Various mechanisms are considered to be responsible for weight gain after achieving tobacco abstinence. Nicotine affects energy balance, accelerating heart rate, increasing blood pressure and bowel movements, and thus leading to increased energy consumption. The

basal metabolic rate increases by about 5–10% (equivalent to about 200 kcal/day). After achieving abstinence, a decrease in basal metabolic rate and thus calorie requirements would be expected. Some studies have also observed an increased calorie intake after quitting smoking, which was estimated at 200–300 kcal depending on the study. In addition, changes in the activity of adipose tissue lipoprotein lipase (AT-LPL) and lipolysis are considered as co-contributors to weight gain. Food intake can partially replace the rewarding effects of nicotine in the dopaminergic reinforcement system (Reinholz et al. 2008; Volkow et al. 2008). However, the underlying mechanisms have been predominantly studied in animal experiments, so their influence on weight gain in humans is not yet fully understood (Filozof et al. 2004).

All mentioned factors are used to explain the observed weight gain. The underlying mechanisms are not yet fully understood.

Various interventions have been investigated that should have a favorable influence on weight development. The use of medication support can mitigate weight gain but not prevent it. Regular moderate physical exercise also counteracts greater weight gain and has a positive effect on long-term abstinence.

65.7 Treatment of Tobacco Dependence

Both German (Batra et al. 2015; AWMF 2021) and US guidelines (Fiore et al. 2008) for the treatment of tobacco dependence provide recommendations for psychotherapy and pharmacotherapy, which can only be summarized in excerpts here.

65.7.1 Medicinal Treatment Options

Medicinal treatment options for withdrawal syndrome include substitution treatment with nicotine (patch, gum, tablet, mouth spray, or inhaler) or treatment with bupropion, cytisine or varenicline. Bupropion is an atypical antidepressant

that inhibits the reuptake of dopamine and norepinephrine. In eating disorders (AN or BN), there is a contraindication for the use of bupropion due to an increased likelihood of epileptic seizures observed in these patients. Varenicline and cytisine are partial agonists at the nicotinic $\alpha 4\beta 2$ acetylcholine receptor. The efficacy of these medications is supported by meta-analyses. They increase long-term abstinence prospects by a factor of 1.55 (nicotine replacement) to 2.24 (varenicline) (Batra et al. 2015; AWMF 2021).

65.7.2 Motivational Interviewing and Psychotherapy

Using brief interventions based on the principle of motivational interviewing, smokers willing to quit can be identified and guided to initiate smoking cessation. For smokers who are very ambivalent about attempting to quit, the focus of a brief intervention is on clarifying the possible advantages and disadvantages of abstinence. Brief interventions have a measurable impact on the likelihood of an attempt to quit and can be easily integrated into medical practice or a counseling context. Useful supplements include information brochures, such as those offered free of charge by the Federal Center for Health Education or the German Cancer Aid, or—even better—self-help guides/manuals.

Smokers who cannot quit on their own or as part of brief counseling should be recommended to participate in a behavioral tobacco cessation program. Cessation courses take place in groups of 6–12 people and comprise 6–10 sessions of 60–120 min each. At the beginning of a behavioral cessation treatment, there is an intensive examination of motivation, smoking behavior, and its functionality. Based on this, smoking cessation is prepared, which is usually accompanied by individually adapted medicinal support. After achieving abstinence, various cognitive-behavioral interventions should be used for stabilization and relapse prevention (Batra et al. 2015; AWMF 2021). Adapting these programs for individual treatment with a shorter duration

is quite possible. However, existing treatment guidelines do not specify specific therapy recommendations for patients with eating disorders.

65.8 Tobacco Cessation in Patients with Eating Disorders

The recommendations for evidence-based tobacco cessation treatment, as outlined in the German guidelines for the treatment of patients with mental disorders (Batra et al. 2015; AMWF 2021), can also be applied to patients with eating disorders. In general, the same strategies should be used as for smokers without mental comorbidity. Measures with the best evidence level and highest abstinence prospects include behaviorally oriented individual or group treatments, which should be combined with medicinal support in cases of strong physical dependence. Depending on individual psychological stress factors, strategies for mood regulation, dealing with negative emotions, or strengthening impulse control should be used within the framework of behavioral support.

This also applies to the treatment of patients with severe overweight or obesity. Regardless of this, the health benefit of tobacco abstinence is much higher for this group than a weight gain that may be caused by abstinence. Some authors therefore advocate the use of specific interventions in the treatment of obesity that take into account comorbidity with substance abuse (VanBuskirk and Potenza 2010).

Due to the role of weight concerns in patients with eating disorders, various studies have been conducted to investigate the effect of specific cognitive-behavioral interventions on tobacco abstinence in this group. The results suggest that the best outcomes in terms of smoking cessation can be achieved if, above all, concern about weight gain can be reduced. In a study by Perkins et al. (2001), a cognitive-behavioral program to reduce weight concerns positively influenced smoking abstinence in the 1-year follow-up, to a higher degree than weight control or standard counseling. Two pilot studies

aimed to evaluate a specific intervention for dealing with negative emotions, emotional eating, and coping with fear of weight gain in smoking cessation (“distress tolerance treatment for weight concern”, DT-W; Bloom et al., 2017, 2020). This program is based on acceptance and commitment therapy (ACT) and includes mindfulness-based skills to improve stress tolerance, mindful eating, and self-perception of appetite. It is designed as a group program for women over nine weeks. However, the first randomized trial with 69 participants did not show any advantage of this program. Further research seems necessary in this area.

Behavioral therapy measures, however, showed potential for weight regulation and less weight gain after smoking cessation, as well as—related to this—higher effectiveness of tobacco cessation (Spring et al. 2009; Love et al. 2011). The measures can aim to reduce various problematic excessive behaviors such as binge eating and substance use in general. Specific programs could also be beneficial for patients with BED, as the presence of binge-eating behavior, but not obesity alone, makes weight gain due to smoking cessation more likely.

In the psychotherapeutic treatment of eating disorders, smoking as a means of weight control and emotion regulation should be considered, and patients with strong tobacco dependence may be referred to additional counseling services and support for smoking cessation. As part of the treatment, patients should be informed that weight gain is possible but usually remains within moderate limits. The positive health aspects supported by tobacco abstinence should always be emphasized. The pharmacological support of tobacco cessation with nicotine replacement therapies counteracts weight gain at least for the duration of the drug treatment and often reduces the fear of it (Perkins et al. 2001; Levine et al. 2010; Farley et al. 2012).

The focus of psychoeducation should overall be on a healthier lifestyle, balanced nutrition, regular meals, moderate physical exercise, sufficient sleep, and learning stress management skills (Farley et al. 2012). All the recommendations listed are also components of behavioral

tobacco cessation programs and can be adapted to the specific group. In particular, additional cognitive interventions aimed at restructuring dysfunctional thoughts and irrational beliefs regarding body shape, body image, effectiveness of weight control measures, and diet behavior are conceivable. With regard to binge eating, elements from existing treatment strategies for BED may also be helpful if this behavior should increase after smoking cessation. Due to the importance of smoking for patients with eating disorders, diagnostic screenings have also been proposed to specifically address such patients in smoking cessation programs. The authors of the study conclude that a screening was easy to perform and effective, but its acceptance among patients was low.

Conclusion

Tobacco cessation treatment should pay particular attention to the importance of smoking as a means of weight control and emotion regulation in patients with eating disorders. Often, there is great concern about weight gain due to tobacco abstinence. If the concern about weight gain can be alleviated, higher and more stable abstinence rates can be achieved.

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Impulsivity and Obesity

66

Astrid Müller

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66.1 Impulsivity

The term impulsivity is usually used when impulses cannot be suppressed. This is referred to as reduced inhibitory control. As a result, hasty, poorly reflected, inappropriate actions occur, the long-term consequences of which are not sufficiently taken into account. Impulsive individuals find it difficult to postpone actions that are rewarding in the short term but ultimately negative and harmful in the long term. Here, the interplay between reward sensitivity and a rash-spontaneous impulsiveness plays a crucial role (Dawe and Loxton 2004).

Impulsivity is not only expressed at the behavioral level but also impacts affective and cognitive processes as well as personality aspects. Impulsive people are characterized by

both a high cognitive pace and impaired impulse control (Dawe and Loxton 2004). In the course of strong affective reactions, cognitive distortions, and motor impulse breakthroughs, hasty decisions with negative consequences for the executing person or other people can occur.

As is well known, many mental disorders are characterized by a high level of impulsivity, e.g., substance-related addictive behaviors, behavioral addictions, or bulimic eating disorders. In recent years, several studies have also shown that obesity is associated with increased impulsivity (Gerlach et al. 2016; Giel et al. 2017).

66.1.1 Food-Associated Impulsivity in Obesity

It is assumed that a constantly available over-supply of tasty, industrially processed foods contributes significantly to loss of control when eating, resulting in increased food consumption and thus the development of overweight and obesity. However, this seems to be particularly true in combination with high individual

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impulsivity. This assumption is based, for example, on studies that have found a positive correlation between the consumption of large amounts of food and high total scores in impulsivity questionnaires among people with obesity (Giel et al. 2017).

Imaging studies have shown that visual food stimuli trigger higher activity in brain regions associated with the reward system in individuals with obesity as compared to individuals with normal weight. Likewise, neurocognitive tests of individuals with obesity have demonstrated a strong tendency for spontaneous, rash affective, cognitive, and motor responses to images of high-calorie, industrially processed foods and difficulties in suppressing these impulses (Giel et al. 2017; Schag et al. 2013).

► **Important** Increased reward sensitivity and impairments in specific (i.e. food-related) inhibitory control are considered a plausible explanation for recurrent overeating, which may result in overweight and obesity.

66.1.2 Food-Independent Impulsivity in Obesity

In addition to the highly specific impulsivity associated with food, empirical findings also suggest an increased general impulsivity in individuals with obesity (Gerlach et al. 2016). The latter is not related to food, but is rather to be understood as a persistent personality trait. People with obesity seem to have a higher risk for impulsive disorders.

The results of a longitudinal study with patients before and two years after obesity surgery, for example, showed that the significant postoperative weight loss was not coupled with a reduction in impulsivity scores. The patients reported consistently high impulsivity scores regardless of their weight loss (Ryden et al. 2004).

► **Important** It is likely that impulsivity is a persistent personality trait in most people with obesity.

66.2 Impulsive Disorders and Obesity

66.2.1 Obesity and Binge Eating Disorder

Binge eating disorder (BED) is the most common eating disorder in people with obesity. Extreme overeating in the form of repeated objective binge episodes and loss of control while eating are typical characteristics of BED. Thus, BED is characterized by high food-associated impulsivity.

In addition, numerous studies have consistently found that individuals with obesity and BED report higher scores on questionnaires measuring general, food-independent impulsivity than individuals with obesity but without BED (Gerlach et al. 2016). Furthermore, individuals with extreme obesity and BED not only show increased impulsivity scores in self-report instruments, but they also tend to have stronger affective responses to images of high-calorie, industrially processed foods and show poorer performance in computer-assisted neuropsychological tests measuring inhibitory control and decision-making abilities (Saruso and Pleger 2021). The latter can be interpreted as indicating that cognitive control of action impulses seems to be weaker in individuals with obesity and BED.

It should also be mentioned that individuals with obesity and BED have higher general psychopathology. This not only refers to impulsive symptoms but also includes, for example, affective and anxiety disorders. For these reasons, it is assumed that individuals with obesity do not represent a homogeneous group and that individuals with obesity and comorbid BED seem to represent a distinct phenotype.

- **Important** Individuals with obesity and BED are at risk for other mental disorders.

66.2.2 Obesity and Attention Deficit/Hyperactivity Disorder(ADHD)

In addition to attention problems and hyperactivity, high impulsivity is a typical characteristic of ADHD. The disorder begins in childhood and can persist into adulthood. Empirical data have shown a close relationship between obesity and ADHD (de Zwaan et al. 2011).

- **Important** ADHD is relatively common in children, adolescents, and adults with obesity. Conversely, individuals with ADHD seem to have a higher risk of being overweight and obese.

It is assumed that impulsive, disorganized eating behavior in individuals with ADHD may contribute to their overweight. Similar biological mechanisms of both diseases are discussed, which could explain the high comorbidity. It is assumed that reduced dopamine activity in the reward system plays a significant role in both obesity and ADHD.

66.2.3 Obesity and Self-Harming Behaviors

The literature reports an increased occurrence of self-harming behaviors in individuals with obesity. These are mostly impulsive in nature but can also be compulsive or addictive. This includes, for example, dermatillomania (synonym: excoriation disorder, skin picking), in which skin injuries on one's own body are caused by compulsive, recurring plucking or squeezing (mainly face, arms, legs, hands) (Gallinat et al. 2019). The skin manipulations are compulsive and usually not carried out with the motive of self-harm or punishment. The clinical picture accordingly belongs to the category "Obsessive-Compulsive and Related

Disorders." In addition, many findings indicate a relatively high prevalence of manipulations on one's own body tissue with the intention of self-injury in individuals with mainly severe obesity (e.g., damaging the skin by cutting, scratching, hitting/striking, pinching, biting, or burning) (Müller et al. 2018). In this context, an increase in self-harming behaviors (non-suicidal self-injury, but also suicide attempts) after obesity surgery is assumed, as several register-based cohort studies with large case numbers have found an increase in emergencies and medical treatments due to self-harming behavior after obesity surgery (Müller and Lescher 2019; see Chap. 26). Attention should also be paid to the findings on a possible addiction shift after obesity surgery. This means that patients with pre-operative addiction-like eating behavior (food addiction) may experience a postoperative shift towards harmful alcohol consumption or even alcohol dependence or other behavioral excesses (Ivezaj et al. 2019).

66.3 Conclusion

In the development and maintenance of obesity, not only food-associated impulsivity plays an obviously important role, but also food-independent, general impulsivity.

- **Important** Overlooking impulsive personality traits that underlie both food-associated and food-independent impulsive behaviors can diminish treatment success or reduce its sustainability.

This has implications for clinical work, including both conservative treatment and bariatric surgery. The latter requires patients to make an extreme adjustment and abstain from overeating for emotion regulation. Impulsive patients may find this behavioral change difficult, which may foster the emergence or recurrence of other excessive behaviors. Therefore, the present findings should be taken into account in the diagnosis and treatment of individuals with obesity.

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Obesity and Binge Eating Disorder

67

Sandra Becker

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67.1 Obesity with Binge Eating Disorder

A subgroup of patients with obesity also have an eating disorder. This needs to be detected or diagnosed early on, as sustainable weight loss and long-term weight management are usually only successful if the comorbid eating disorder is taken into account in the treatment. The most common eating disorder associated with obesity is the so-called binge eating disorder (BED), which has now been included as an independent clinical diagnosis in the current version of the two common diagnostic systems (DSM-5 and ICD-11). In BED, on average, at least once a week, there are binge eating episodes

in which—accompanied by a feeling of loss of control—above-average amounts of food are consumed. Affected individuals suffer from the binge eating episodes, accompanied by feelings of guilt and shame. The diagnostic criteria for BED are described in detail in Chap. 5.

BED occurs in the general population with a prevalence of approximately 1–4% (Fichter 2019). However, it is much more common, at about 15–30%, in patients with obesity seeking a weight loss program (Bertoli et al. 2015). Dawes et al. (2016) report that the prevalence of BED among candidates for obesity surgery is 17%. Likewise, the likelihood of having BED increases with the level of the BMI (Da Luz et al. 2018).

Studies on the prevalence of patients with BED and comorbid obesity report prevalence rates of 32–70% (Villarejo et al. 2012; Kessler et al. 2013). Thus, there seems to be a closer association between obesity and BED, although it is still unclear whether BED is a cause or

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rather a consequence of overweight and obesity (Tanofsky-Kraff et al. 2013; Da Luz et al. 2018).

67.2 Etiology of Binge Eating Disorder

The etiology of BED is not yet sufficiently clarified, and no definitive findings are available to date. Current models of the etiology of BED are multifactorial and include factors that are also relevant to the development of other eating disorders, such as anorexia nervosa and bulimia nervosa. Restrictive eating, dissatisfaction with body shape and weight, low self-esteem, dysfunctional emotion regulation strategies, and pressure to conform to a thin ideal are considered central pathological mechanisms underlying eating disorders, disordered eating behavior, and thus BED.

Figure 67.1 summarizes this concept in a multifactorial etiological model of BED (adapted from Munsch 2003). It distinguishes between predisposing, triggering, and maintaining factors. However, a strict separation between these factors is not possible, as various triggering conditions can also become maintaining variables in the course of BED.

Specifically, in BED, two groups of predisposing **risk factors** seem to play a particularly important role:

- on the one hand, factors that generally increase the risk of mental disorders, such as a high prevalence of mental disorders in the family, traumatic childhood experiences, and other critical and stressful life events, such as stress at school, parental separation, or neglect,
- on the other hand, factors that increase the risk of overweight/obesity in childhood (Hilbert et al. 2014).

In addition, patients might have experienced derogatory remarks and teasing in the family regarding body shape, weight, and appearance,

and few family meals (Tetzlaff and Hilbert 2014). Such biographical and interpersonal stressors are more common in patients with BED than in individuals with obesity and individuals with normal weight (Agüera et al. 2020; Ansell et al. 2012).

As immediate **triggering factors**, in addition to acute stressful environmental influences and social factors (food availability, prevailing thin ideal), a lack of affect regulation and personality-related aspects such as low self-esteem and negative body concept play crucial roles. **Maintaining functions** are attributed to irregular, restrictive, and low-carbohydrate but high-fat eating behavior during binge episodes, conditioning effects, and the short-term successful affect reduction of binge eating (Mathes et al. 2009; Haedt-Matt and Keel 2011).

67.3 Specifics of Obesity with Binge Eating Disorder

Patients with obesity and BED differ from patients with pure obesity. In addition to physical consequences, they also have impairments on the behavioral level (binge eating) and on the psychological level, such as increased psychopathology and pronounced concerns about body shape and weight (Sawamoto et al. 2013). Tanofsky-Kraff et al. (2013) also describe a more pronounced body dissatisfaction, lower self-esteem, and overall lower quality of life. A study by Striegel et al. (2012) showed that problems and limitations in the workplace are greater for the group of patients with obesity and BED than for those with obesity but without further comorbidity.

Furthermore, study findings describe that patients with obesity and BED achieve less long-term weight loss in therapeutically guided weight loss programs than patients with obesity but without BED (Wilson et al. 2010). The authors demonstrated that this difference in weight loss is leveled out when the affected patients are introduced to a therapy program that

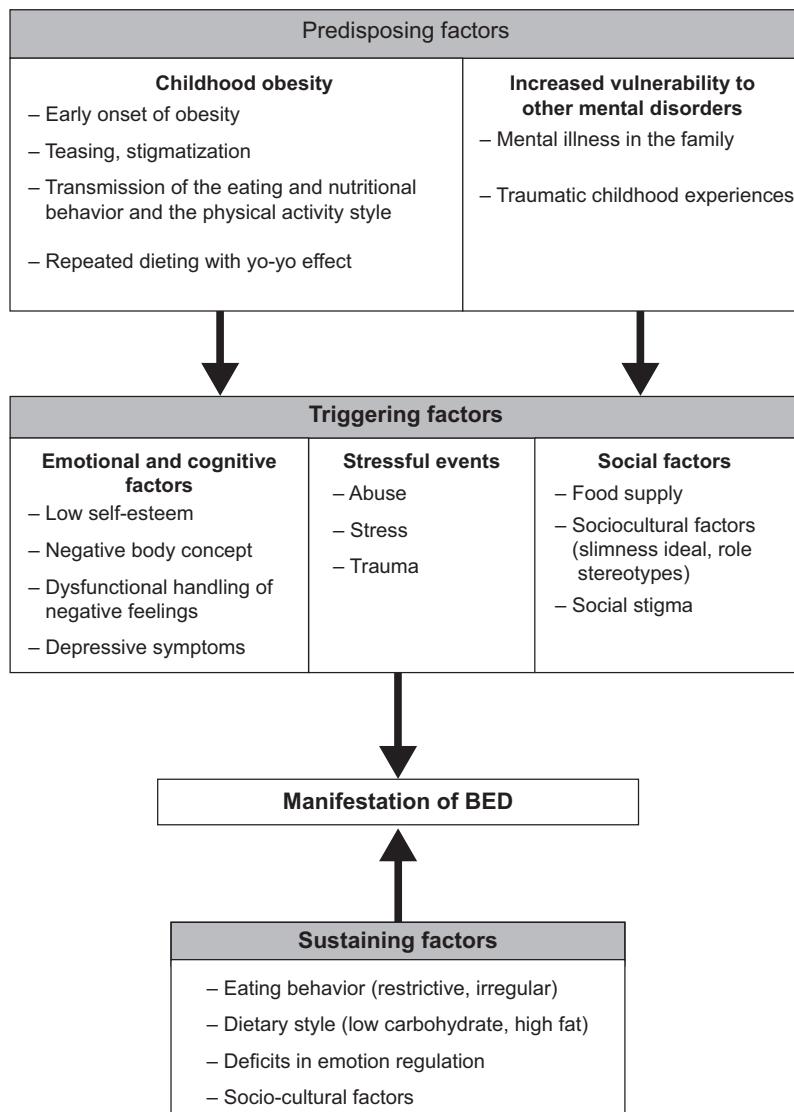


Fig. 67.1 Multifactorial etiology model of BED. (Mod. after Munsch 2003; from Becker et al. 2015; © [2015] W. Kohlhammer GmbH, Stuttgart)

includes specific interventions for the treatment of binge eating and high body dissatisfaction, in addition to the establishment of regular nutrition and exercise.

For this reason, in the psychotherapeutic treatment of patients with obesity who also suffer from BED, disorder-specific interventions such as techniques for emotion and stress regulation to reduce binge eating are indicated.

67.4 Psychotherapeutic Treatment Approaches for Obesity with Binge Eating Disorder

The treatment of this patient group has proven to be insufficient in both pure weight loss programs and BED-specific programs. In the long-term effect (two years after the end of the program),

these patients do not achieve satisfactory reduction of their binge eating in weight loss programs and regain more weight over time compared to patients with obesity but without BED (Wilson et al. 2010). In BED-specific programs, eating disorder-specific symptoms, especially the frequency of binge eating, improve. However, the cessation of BED does not necessarily lead to weight loss in the medium and long term (Agüera et al. 2020). Therefore, it is important to counteract high expectations regarding weight loss in order to interrupt the cascade of binge eating, feelings of insufficiency, depressive mood, and frustration with self-abandonment early on. Therapy concepts for obesity in combination with BED require the combination of elements from various intervention approaches and should include both concepts that address the treatment of the eating disorder or binge eating, as well as those that aim for weight loss (Hay and Mitchison 2019).

67.5 Psychotherapeutic Treatment Approaches for Binge Eating Disorder

The therapy approach that has been studied the most for BED is cognitive behavioral therapy (CBT), which also has the most reliable evidence of efficacy (Hilbert et al. 2019). Therefore, this therapy should be offered to patients as the first choice. There is also evidence for the efficacy of interpersonal therapy (IPT) and to a lesser extent for psychodynamic psychotherapy (Vocks et al. 2011). In addition, there is evidence of efficacy for therapist-guided self-help manuals with CBT treatment elements (Hilbert et al. 2019), so this form of therapy can also be recommended. The content of structured self-help largely corresponds to that of CBT. In their self-help book "Das Leben verschlingen?" (Engl. "Swallowing life?"), Munsch et al. (2018) compiled various work materials that provide information on BED and strategies for overcoming binge eating episodes.

For the psychotherapeutic treatment of BED in obesity, Munsch et al. (2018) published a

practice-oriented treatment manual that, in addition to a theoretical part, consists of a therapeutic guide and is based on current evidence-based results of therapy research for BED. The authors primarily focus on coping with binge eating episodes. Cognitive-behavioral methods such as the development of individual trigger and response control strategies or the processing of dysfunctional thoughts related to one's own body or self are used. Optionally, there are also treatment contents for weight loss and increased physical activity. The flexible treatment structure of the manual can be easily adapted to the individual needs of those affected. In addition to numerous worksheets available for download, case examples are also described, in which the implementation of therapeutic interventions is illustrated.

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Part IX
The Treatment of Obesity



Prevention of Obesity

68

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68.1 Background

A profit-oriented economization of lifestyles and living environments is the basis of our prosperity, but it also influences health risks and the occurrence of diseases. Overnutrition, low physical activity, and inactivity characterize “unhealthy” lifestyles, which are promoted by a diverse range of energy-dense and processed foods, their constant availability and low prices, as well as automation in everyday life and work, digital technologies, motorized individual transport as a common form of mobility, the walkability and structures of residential areas and

cities in the context of cultural, economic, political, and social factors. The population-wide occurrence of obesity, the so-called “obesity epidemic,” results from these interrelationships.

“Unhealthy” lifestyles are risks for the so-called *non-communicable diseases (NCD)* such as obesity, type 2 diabetes mellitus, hypertension, and cardiovascular diseases, cancer fostered by high energy intake, and neurodegenerative diseases. In Germany, *NCD* are currently responsible for about 91% of all deaths (Effertz et al. 2015; NCD Alliance 2017). Worldwide, about 2 billion people are affected by obesity, with the highest prevalence observed in industrialized nations and among the age group of 40- to 65-year-olds (GBD 2017). In wealthy countries, there is an “inverse” social gradient: people from educationally and economically disadvantaged groups are most often obese (Marmot and Bell 2019). Obesity accounts for approximately 3.4 million premature deaths per year and is responsible for 3.8% of the global disease burden (GBD 2017). The loss of “disease-free” years of life amounts to 2.7 (obesity

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grade 1) or 7.3 years (obesity grade 2 and 3; Nyberg et al. 2018). However, it is unclear to what extent a high BMI itself or the behavioral patterns leading to a high BMI increase disease risk. Lifestyles also determine mortality for cardiovascular diseases independently of BMI (Foster et al. 2018).

- ▶ **Important** The prevention of obesity is an important strategy for avoiding personal and societal disease burdens.

Nationally and internationally, there are now numerous overviews, position papers, proclamations, action plans, and programs that advocate for the prevention of obesity through “healthy” lifestyles and the creation of health-promoting living conditions to support them (Swinburn et al. 2011, 2019; Lobstein et al. 2015; WHO 2018a, b). Currently, obesity is a topic on the agenda for future development to reduce premature mortality; a sustainable development goal is to reduce its prevalence by 33% by 2030 (UN 2015). These global “promises” have not yet led to measurable successes.

The “obesity epidemic” is aggregated with simultaneously and globally observed epidemics of underweight and the endemic effects of climate change (Swinburn et al. 2019). This expanded view allows for a new conceptualization of “obesity” as part of a so-called “syndemic.” Given the interactions between these epidemics, the prevention of obesity does not appear to be simple. Since the “obesity epidemic” is linked to the other epidemics and these epidemics reinforce each other, there can be no prevention of obesity on its own.

- ▶ **Important** Obesity is associated, as part of a syndemic, with problems of malnutrition, environmental damage, and climate change. The problems occur simultaneously and promote each other.

From a *public health* perspective, the population-wide occurrence of obesity is “collateral damage” of an excessive profit-oriented

economization of lifestyles and areas of life (e.g., eating and drinking) while simultaneously losing a common everyday culture. Against the background of this fundamental assessment, the previous strategies and measures of obesity prevention aimed at individuals or specific population groups are oversimplified and have therefore not really been successful.

Prevention routinely conceives of an “opposite”, at which its strategies and measures are directed. Thus, obesity prevention measures, for example, address inequalities in education, income, and opportunities for health, the strong influence of companies on political decision-makers (e.g., lobbying by the food industry and trade), the prioritization of commerce and consumption for the success of a society, as well as the social, political, socioeconomic, and societal “drivers” that explain prosperity, but also its negative effects on health, climate, and the environment.

In recent decades, various strategies and measures of obesity prevention have been attempted. While so-called “*downstream actions*” (e.g., measures aimed at individuals for information and education) were initially favored, in view of the “syndemic,” the concern is now with so-called “*upstream actions*,” i.e., a reorientation of structures and central systems of agriculture and nutrition, transport and traffic, urban planning and land use, media and digitization, leisure and tourism. This involves local and regional, national, and global solutions. In this context, a largely industrialized food system, which produces market-oriented and profit-oriented highly processed, energy-dense, sugar- or salt-containing foods from cheap and mass-produced agricultural products and adds taste-enhancing or appetite-stimulating additives, moves to the center of a societal and political discussion about “obesity prevention.”

- ▶ **Important** Currently, obesity prevention measures address systems of agriculture and nutrition, transport and traffic, urban planning and land use, media and digitization, leisure and tourism.

Creating a “healthy” society is the result of an intention and a collective effort, which must be guided taking into account various interests, institutions, and ideas. So far, no area of our society, no professional group, no interest group, and no municipality, not even any country in the world, has been able to successfully address the complex and interconnected causes of obesity in terms of prevention. However, the problem does not only concern society, companies, interest groups, politics, or experts: it is also about personal concern, meaning ourselves. Because: There are no real illusions concerning ourselves in the face of the quite plausible and desirable idea of a “healthy society”; we would all wish for the “insight into man’s active-powerless proportionality” (Strauss 2020). The future of obesity prevention is the overcoming of ambivalent attitudes and behavior based on this insight.

The success of prevention is therefore not solely based on the “opposite”; it is first and foremost up to us to use our extensive knowledge and change ourselves. This requires a high degree of willingness to understand and cooperate in the interaction of society (Habermas 2019). Only emancipation from the current conditioning factors of our actions and regaining control over living conditions and lifestyles promise a better future.

- ▶ **Important** The success of prevention is based on regaining control over our living conditions and lifestyles.

68.2 Concepts and Efficacy of Measures for Primary Prevention of Obesity Relating to Lifestyle and Living Environment

The need for prevention arises from the prevalence of overweight and obesity, as well as “unhealthy” lifestyles, the living environments that promote them, and the resulting diseases. Prevention aims to improve people’s lifestyles (behavioral prevention) and to bring about changes in living environments that enable “healthy” lifestyles (contextual prevention).

The prevention of obesity takes place on several levels of politics, living environments, socioeconomic conditions, and individual sensitivities; it is pursued through local, regional, national, and global strategies; obesity prevention is a strategy that accompanies various life stages. Children and adolescents are an important target group to prevent the early manifestation of risks and symptoms of NCD. Most of the previous experiences in obesity prevention concern this age group.

68.2.1 Strategies for Behavioral and Contextual Prevention

Behavioral prevention attempts to increase the “chances” of health by imparting knowledge and improving competencies (Müller 2013; Weihrauch-Blüher et al. 2018). In contrast, contextual prevention aims at changes in the politically, ecologically, economically, socially, and structurally characterized living environments that co-determine lifestyles and the “chances” of health. Contextual prevention concerns the so-called “obesogenic environment”, addressing all influences of the living environment and the “drivers” present there, which can promote the development of obesity.

In *public health* science, a distinction is made between “universal”, “selective”, and “targeted” prevention (IMO 1997). “Universal prevention” (also referred to as health promotion or primary prevention) is aimed at all people, regardless of their health and nutritional status. “Selective prevention” targets so-called “risk groups” (e.g., normal-weight children of obese parents who have a high risk of becoming overweight themselves), whereas “targeted prevention” addresses individuals with already manifest obesity or related diseases. It includes secondary or tertiary prevention measures.

The target variables of obesity prevention are the behavioral patterns and their determinants and causes that determine the risk of becoming obese. Primary prevention of obesity should include both behavioral and contextual prevention measures. The latter requires a fundamental

political orientation of the health system towards the prevention of chronic diseases; decision-makers should assign high value to health in all policy areas. Prevention measures are carried out within society, taking into account unequal health opportunities, and aim for comprehensive effectiveness.

The “Global Action Plan on Physical Activity 2018–2030” adopted by the WHO in 2014 (WHO 2018b) exemplifies the political guidelines of a structural prevention. It includes

- the implementation of national or regional campaigns that raise awareness of the health, social, economic, and environmental benefits of regular physical activity and less sedentary activities,
- new structures in urban and transport planning such as pedestrian and bicycle networks that create a movement-friendly environment and thus promote the extent of mobility, and
- political commitment to more physical activity and less sedentary activities through fundamental advocacy and orientation in various policy areas.

Similarly, the “European Action Plan on Food and Nutrition 2015–2020” (WHO 2015) addresses recommendations for creating so-called “healthy food environments” as measures of consumer health protection. Demands on politics include restrictions on the marketing of energy-dense and highly processed foods, better labeling and health assessment, and compliance with standards of “healthy” nutrition, e.g., for meals served in daycare centers, schools, canteens, hospitals, and nursing homes.

Political strategies for the prevention of obesity are initially targeted. These concern advertising bans for “unhealthy” foods, e.g., for so-called “children’s foods” and “junk food” (= energy-dense foods with a high proportion of fat, sugar, or salt), as well as fiscal measures, e.g., the introduction of so-called “sugar” or “soft drink” taxes, which affect their production and sale. These strategies create social

framework conditions that promote awareness of health and consumption and could improve the success of behavior prevention aimed at strengthening individual health competencies in “settings,” e.g., schools, training centers, and companies (Müller 2017, 2019).

In view of the “syndemic” of epidemics, strategies and measures are being sought that address both the global occurrence of overweight and underweight as well as climate change and environmental damage. For example, a reduction in the consumption of meat and sausage products by consumers, brought about by taxes, fewer subsidies, appropriate labeling, and social marketing, could both reduce the risks of obesity and NCDs and benefit the environment and climate as a result of a correspondingly changed land use.

- **Important** Obesity prevention is not possible in isolation: In view of the syndemic of obesity, malnutrition, climate, and environmental damage, measures are necessary that address the causes of the causes, i.e., the common causes of the simultaneously occurring, interconnected, and mutually conditioning problems.

68.2.2 How Effective are Measures of Behavioral and Structural Prevention of Obesity?

Scientifically reliable data on behavioral prevention of overweight and obesity are currently only available for children and adolescents. These are presented in detail in a current Cochrane review (Brown et al. 2019). The interventions addressed nutrition, physical activity (exercise and sports), and inactivity (TV and media consumption) together or separately. In most studies, body weight was examined as an “outcome” variable. Based on 153 randomized controlled trials and follow-up periods of up to more than two years, the authors draw the following conclusions:

- In the age group of up to 5 years, interventions targeting nutrition and physical activity have moderate effects on nutritional status; on average across all studies, the difference in BMI between the intervention and control groups was -0.07 kg/m^2 .
- For children aged 6–12 years, small but positive effects were found after increasing physical activity: The difference in mean BMI between the intervention and control groups was -0.10 kg/m^2 ; in contrast, measures addressing nutrition or both nutrition and physical activity were hardly successful.
- Similar results were shown for older children and adolescents, with small effects of physical activity-focused interventions observed, while nutritional interventions remained largely ineffective.
- Obesity prevention has no adverse side effects. For example, the development of eating disorders is not promoted, and preventive measures do not increase social inequalities.

Educational measures of behavioral prevention in *kindergartens* and *schools* had positive effects on nutritional knowledge and health literacy, while the incidence of overweight remained almost unchanged. However, the effects were selective: Over observation periods of eight years, positive effects were observed in children of normal-weight parents and children from socially better-off families, while children of overweight parents and children from socially disadvantaged families did not benefit from the measures (Plachta-Danielzik et al. 2007, 2011a, b).

Interventions in families of children with overweight resulted in small improvements in health-relevant behavior and a lower increase in BMI compared to controls (Langnäse et al. 2004). However, there were significant differences between children from families with low and high socioeconomic status: Children with overweight from educationally and economically disadvantaged families showed an increase in BMI despite intervention, while a decrease in BMI was observed in children from socially better-off families. Apparently, children with a low socioeconomic status cannot be reached even

through social outreach measures. Preventive measures in families with a migration background appear to be almost ineffective, but this has not yet been systematically investigated.

Prevention and treatment of already overweight and obese children and adolescents have only small and hardly sustainable effects on lifestyle and body weight (Al-Khudairy et al. 2017; Colquitt et al. 2019; Mead et al. 2017).

Municipal initiatives such as the program against overweight and obesity carried out in France (“*Ensemble, prévenons l’obésité des enfants*”, *EPODE*) follow the so-called “capacity-building” approach,¹ which involves various local stakeholders such as teachers, doctors, representatives of retail, catering, food industry, and media. Twelve years after the establishment of the measure, the prevalence of overweight in the model regions had decreased from 11.4 to 8.8%, while it had increased in the comparison regions from 11.0 to 17.8% (Borys et al. 2012). However, the evaluation of the data and the robustness of the study design were questioned. In the meantime, the program has been extended to ten additional regions with a total of 167 cities in France and to 17 other European and non-European countries. Scientific monitoring and continuous publication of the results of *EPODE* have not yet taken place.

Similar results were found in the municipal prevention program “*Be Active, Eat Well*” in Australia (Sanigorski et al. 2008). Three years after the intervention, the age-dependent increase in BMI of the children was lower compared to a neighboring region, while the prevalence and incidence of obesity remained comparable. The municipal initiative “*Shape Up Somerville: Eat smart, Play Hard*” founded in the US city of Somerville also involved collaboration between parents, schools, city administration, food industry, and advertising industry. Three years after the start of the program, the

¹The term *capacity building* refers to a process by which individuals and organizations acquire the skills, knowledge, and equipment they need to competently perform their tasks.

BMI in the intervention group was slightly lower compared to a control group (Economos et al. 2007). In Germany, the Leipzig project *Grünaau* is so far the only scientifically accompanied municipal initiative for the prevention of obesity, but its evaluation has not yet been completed (Gausche et al. 2014).

The joint consideration of these initiatives suggests that “municipal” prevention of obesity is somewhat more effective than measures of behavioral prevention that focus exclusively on children in daycare centers and schools or on families. All preventive measures encounter “barriers” in the living environments, and the accessibility of socially disadvantaged groups is poor.

- ▶ **Important** Behavioral prevention measures have only a small impact on the incidence and prevalence of obesity.

Political measures for the prevention of overweight include risk group-targeted measures (“*focused policy*”; e.g., programs for “overweight families” or migrants), measures that facilitate or promote consumer decisions for “healthy” alternatives (“*enabler policy*”; e.g., campaigns for healthy nutrition and appropriate food labeling), and regulations that reinforce these measures (“*amplifier policy*”; e.g., taxes on “unhealthy” foods, limitation of price promotion and subsidies). The justification for political intervention in the market is seen in market failure: External effects of high productivity and high profits of companies (e.g., in the food sector) have a long-term negative impact on the health of the population, causing high societal costs.

The population-wide effectiveness of “political” proportionate prevention (such as advertising bans for “children’s food” or a tax on “junk food” and “soft drinks”) has so far been predominantly studied in middle-income countries (such as Mexico and Chile). Observational studies suggest an influence of higher prices on consumer behavior: a 10% price increase can reduce

the consumption of soft drinks by 7% (Afshin et al. 2017). The impact of this effect on obesity and its sequelae, as well as the transferability of these results to wealthier countries, has not been systematically investigated. Higher prices particularly affect people from socially disadvantaged groups, but given the socially uneven distribution of disease risks, the benefits of these measures are highest in the lower socioeconomic groups.

“*Upstream actions*” require mobilization of civil society to ensure broad support for political and systemic change. For example, the introduction of a “soft drink tax” in Mexico was preceded by a multi-year educational campaign, which was supported by an alliance of numerous organizations, interest groups, and physicians. Scientific evidence for the efficacy of “*upstream actions*” is difficult to provide; there is no convincing *experimental setting* for measures aimed at “systems.” This fact contributes to restraint, half-hearted commitment, and ultimately inadequate responses to the “obesity epidemic” on the part of those responsible, experts (including physicians), and political decision-makers.

Acceptance and implementation of all preventive measures are hindered by the fact that there is no “mission” (or vision) for health “before” medicine in politics and society. “Universal prevention” affects areas outside of medical care, the importance of which for health is not always clearly defined and can also be assessed differently from one individual to another. It should also be taken into account that preventive measures can “compete” with other societal concerns (e.g., consumption-dependent economic growth and, related to that, jobs and prosperity).

- ▶ **Important** Proportionate prevention measures promise success, but this has not yet been proven and, strictly scientifically speaking, cannot be well proven according to the current paradigms of obesity research. Proportionate prevention requires alternative research paradigms.

68.2.3 What are Suitable Times for Prevention of Obesity in Children and Adolescents?

Overweight and obesity can develop at any stage of life, but childhood and puberty are considered particularly critical life stages that justify early and universal prevention (Weihrauch-Blüher et al. 2018). Longitudinal data show a high spontaneous remission of overweight in the first years of life (von Kries et al. 2012). In contrast, the persistence of overweight and obesity from the age of 6 is high. This suggests starting preventive measures before or at the time of school entry. Early-onset obesity has a high persistence into adulthood. Since the prevention of obesity is a lifelong task, it should not be limited to children and adolescents.

68.2.4 What are Suitable Settings for Obesity Prevention?

A target group-specific approach to health promotion is possible in the *settings* of daycare centers, schools, medical care facilities, companies and workplaces, retail, adult education centers, sports clubs, consumer health protection institutions, and health insurance companies. All *settings* have a common anchorage in the municipalities, where people can be reached in their everyday living conditions. Municipal measures for the prevention of overweight are complex, and the evaluation of complex measures for behavior change has no external validity.

The syndemic occurrence of climate change and obesity requires changes in global and national agricultural and food systems through appropriate policies that go beyond previous experiences with prevention measures. A future transformation of health and food systems aimed at these goals requires extensive regulations and interventions, which, to be successful, must take into account the cultural, economic, ecological, political, and social contexts of society.

- **Important** Successful prevention of obesity requires a societal change characterized by a transformation of health and food systems.

68.3 Prevention of Obesity—What's Next?

In view of the high prevalence of obesity in all population groups today, as well as the lifestyles and living environments that foster it, behavioral and environmental preventive measures are necessary. Since previous strategies and measures for obesity prevention have been only partially successful, it seems promising to focus on living environments, structures, and systems, i.e., away from the obvious “causes” of everyday actions in people’s lives and towards the “causes of causes,” i.e., the spatial, political, economic, cultural, and social conditioning factors of overweight (Müller 2017, 2019). A *setting-based* approach in municipalities, which in turn is supported by a societal, cultural, and political “climate” conducive to the health of people and the environment, is a concrete challenge (Müller 2019).

A future “prevention of obesity” requires the acceptance of limits to previous thinking and action and going beyond them:

- ***The previous “solutions” are not solutions:*** There is currently no sufficiently effective and sustainable measure for the prevention and treatment of overweight. The possible effects of environmental prevention have not been well studied so far, and they are scientifically not reliably comprehensible.
- ***We need an alternative obesity research:*** A focus on the “paradigm of energy balance” as well as possible biological causes of obesity, up to the concept of personalized nutrition, does not provide a basis for its prevention. Modern progressive thinking has created a false consciousness of a new beginning and

future solutions to current medical problems. Biomedical research is not the “unifying” center of a solution-oriented obesity research; it rather represents a “narrowing.” Future investigations of obesity and its sequelae should address the “causes of causes” (e.g., the social determinants of health) as well as the “causes of the causes of causes” of obesity, i.e., the effects of cultural, economic, ecological, and political coexistence. This approach promises new and successful approaches to obesity prevention.

- **Important** Obesity research and its actors have become part of the obesity problem today. Thus, successful prevention of obesity also requires the emancipation of scientists.

- **A rethinking in health policy is necessary:** Prevention should be at the center of future health policy.
- **We are the solution:** The high prevalence of overweight can be considered a normal biological adaptation to prosperity and abundance. In this sense, the “obesity epidemic” is trivially explained, as it was and still is. There are links between it and the current problems of “environment” and “climate.” The common “driver” of the “syndemic” is a profit-oriented economization of lifestyles and living environments, coupled with a loss of “everyday culture.” In contrast, the current health, social, economic, ecological, and political problems show the limits of prosperity and consumer behavior. Between possible regulations and rules by politics on the one hand and the vision of a “healthy” society on the other hand, the idea of the “self-empowerment of communicatively socialized subjects” by the philosopher Jürgen Habermas is brought to mind. In “emancipation”, he sees “the liberation for the autonomous use of reason, but at the same time also the compulsion to learn to master the rapidly growing contingencies of self-generated social complexity by one’s own efforts” (Habermas 2019, p. 71 f.).

► **Important** Emancipation from the social, economic, ecological, and political conditioning factors of our actions is liberation, which creates possibilities to successfully address the current problems of health, environment, and climate.

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Treatment of Obesity in Childhood and Adolescence

69

Martin Wabitsch

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Meta-analyses of published study results on the therapy of overweight and obesity in children and adolescents show that there are effective therapy programs (AWMF guidelines/Wabitsch and Moss 2019). However, practical experience teaches us that these programs and the underlying treatment concepts are only accepted by a minority of those affected.

The treatment success of effective therapy programs can vary greatly between individuals. In addition, a dependency of treatment success on the treatment center offering the therapy is known (Reinehr et al. 2009).

It is therefore recommended to further evaluate and gradually improve current therapeutic efforts. The following explanations summarize the current state of knowledge and the recommendations of professional societies,

which were developed on the basis of existing study results and the expertise of a multidisciplinary working group.

69.1 Indication

The indication for the treatment of a child or adolescent with increased body weight depends on the existing functional impairments, somatic comorbidity, psychosocial impairment, and possibly existing psychiatric sequelae.

Every child or adolescent with obesity (BMI $> 97^{\text{th}}$ percentile, Fig. 69.1) should be given the opportunity for treatment. In children and adolescents with overweight who have a BMI between the 90th and 97th percentile and a present sequelae of overweight requiring treatment, the underlying overweight should also be treated. If there is another serious illness (e.g., as part of a hereditary disease), a very specific therapy is usually required. Guidelines for the indication and implementation of obesity treatment in children and adolescents have been published by the Working Group on Obesity in Childhood

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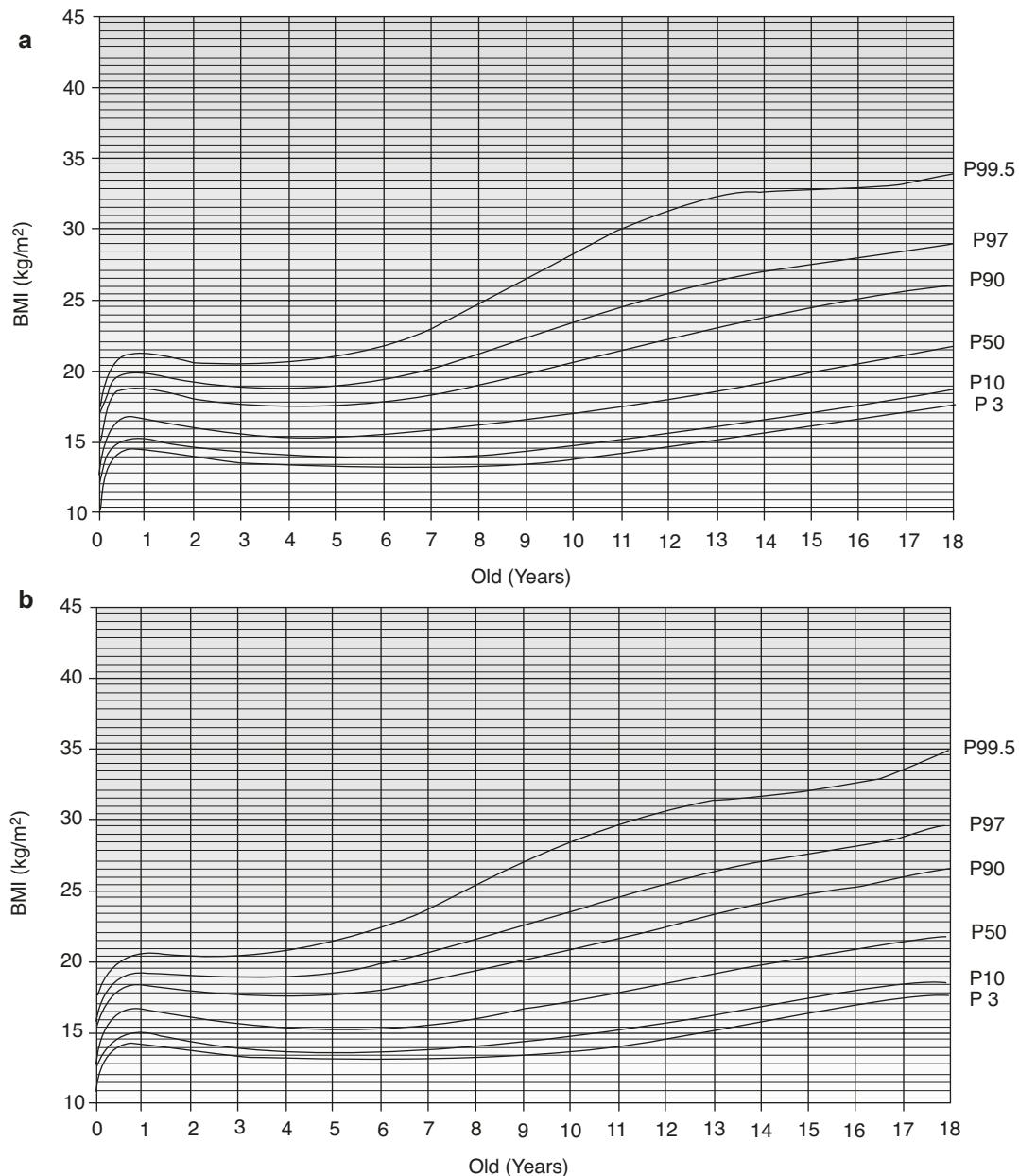


Fig. 69.1 Percentile curves for BMI for children and adolescents in Germany. **a** boys and **b** girls aged 0–18 years. (Kromeyer-Hauschild et al. 2001, 2015)

and Adolescence (<https://adipositas-gesellschaft.de/aga/>). In addition, the legal framework conditions for the financing of education programs are set out in a consensus paper “Patient Education Programs for Children and Adolescents with

Obesity”, published by the Federal Ministry of Health (<https://adipositas-gesellschaft.de/aga/>).

It is particularly important to assess the patient and their family's motivation and capability for therapy. This assessment is

elegantly solved in the obesity education program “Obeldicks” (Reinehr et al. 2005). Patients who are to participate in the therapy must first regularly attend a sports program for several weeks. Only when they have done this and the parents show a willingness for behavioral change are the affected children included in the education program, which then runs for almost a year. Accordingly, this education program also has above-average medium-term success rates.

If sequelae of obesity in children and adolescents are already present, a significant weight loss is usually required. If this is not successful, the treatment of comorbidity of obesity in children and adolescents poses a new challenge (hypertension, impaired glucose tolerance, metabolic syndrome, fatty liver disease, orthopedic diseases).

69.2 Treatment Goals

In the treatment of obesity, the physiological basis of body weight regulation must be taken into account. Therefore, the goal of treatment is not weight loss, but the stabilization of a reduced body weight at a lower level (in children and adolescents, the relationship to body height must always be considered) and thus the stabilization of a new energy balance. Rapid weight loss as part of short-term diets is rather disadvantageous (effect of “weight cycling”). Obesity in children and adolescents is a chronic disease that requires long-term therapy.

Treatment goals for children and adolescents with obesity

- Long-term weight loss (i.e., reduction of fat mass) and stabilization
- Improvement of obesity-associated comorbidity and associated risk factors
- Improvement of the patient’s current eating and exercise behavior, involving their family, learning problem-solving strategies, and ensuring long-term

maintenance of achieved behavioral changes

- Avoiding unwanted therapy effects
- Promotion of normal physical, psychological, and social development and performance

69.3 Approach and Treatment Components

The therapeutic approach is based on the treatment goals. A change in the body’s energy balance should be achieved by reducing energy or fat intake (dietary change), e.g., based on the optimized mixed diet, and by increasing energy expenditure (increasing physical activity). This usually requires a long-term therapeutic measure (e.g., behavior therapy, family therapy), involving the people in the child’s or adolescent’s immediate social environment. An interdisciplinary approach is necessary, preferably coordinated by the pediatrician or general practitioner, with the support of psychologists, nutrition professionals, and sports therapists. In addition to the need for knowledge transfer, changes in eating and exercise behavior should be achieved in small, manageable steps for the patient. The aim is to create problem awareness, increase motivation, consolidate learned new behaviors, train self-control, and develop relapse prevention strategies. Once sufficient behavioral changes have been stabilized, the therapist’s supervision of the patient can be relaxed. However, regular supervision is necessary for many years to continue monitoring the maintenance of new behaviors and to counteract relapses in a timely manner.

69.3.1 Education Programs

Promising education programs for children and adolescents with obesity include a combination of the following five modules (Fig. 69.2):

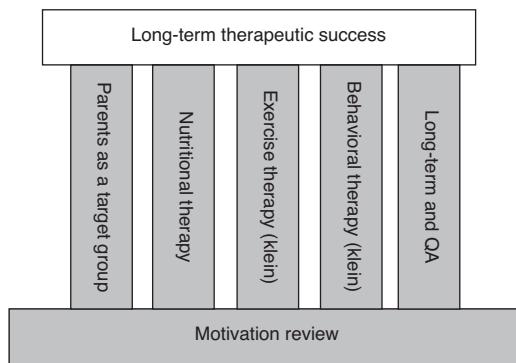


Fig. 69.2 Treatment components of a treatment concept for children and adolescents with obesity

- Nutrition
- Exercise
- Behavioral therapy
- Involvement of parents or caregivers, taking into account the age of the child
- Long-term care

69.3.1.1 Nutritional Therapy

Included are knowledge transfer, counseling, and practical exercises for parents and children on dietary changes, taking into account the DGE recommendations. It is recommended to reduce daily calorie intake by about 30%. This is best achieved by reducing the fat content and increasing complex carbohydrates, and especially by avoiding high-calorie snacks (“snacking”) and energy-rich or sugary drinks.

69.3.1.2 Exercise Therapy

A change in behavioral and lifestyle habits with increased physical activity in everyday life is necessary; structured training and sports sessions alone are not sufficient. Increasing physical activity in everyday life and, above all, reducing television and computer consumption are important. It is recommended to reduce daily television time to one hour.

69.3.1.3 Behavioral Therapy Methods

These are based on the assumption that nutrition, eating, and exercise habits can influence body weight and that the corresponding behaviors can be modified in the long term. Regular

weight checks and self-monitoring of nutrition, eating, and exercise habits are necessary to start treatment. Small, achievable steps should be aimed for in behavior change to avoid frustrations.

Stimulus control techniques, positive reinforcement, reinforcement and reward systems, modeling, and relapse prevention, as well as avoiding prohibitions, are essential components of behavioral therapy. Positive requests are superior to prohibitions.

Self-observation, self-assessment, and voluntarily controlled behavior change require intellectual abilities and thus show the limits of behavioral therapy. Young children and children with mental disability are not accessible to this form of therapy.

69.3.1.4 Involvement of Parents or Caregivers

Parents are role models for their children's nutrition, eating, and exercise habits. Controlled, randomized trials have consistently shown that significantly better results can be achieved by involving parents.

Programs that only target children and do not involve parents are less likely to be successful. For younger children, parent education alone is sufficient to modify children's eating and exercise habits and achieve weight control.

For adolescents, it may be sufficient to treat only the affected individuals.

69.3.1.5 Long-Term Care

Behavioral changes can only be achieved through long-term patient care. Education programs should be designed for at least six, preferably twelve months. Subsequently, further care of the patient with relapse prevention strategies is required.

69.3.1.6 Group vs. Individual Therapy

Group therapy can help build a motivational group atmosphere. Participants benefit from the interactions. Due to the variable individual needs of the person and the individual daily routines of a family, individual education sessions are additionally required.

69.3.1.7 Prognostic Factors for Successful Treatment

The most important influencing factor is the motivation and willingness for behavioral changes of the child and their family. In addition, better results seem to be achievable for boys, younger children, and children of normal-weight parents. The weight change of the parents closely correlates with the weight change of the children.

- Formation of gallstones
- Decrease in growth rate (this is most likely a normalization of accelerated linear growth)
- Psychological destabilization (e.g., impairment of self-esteem) due to dealing with increased body weight
- Excessively rapid weight loss can lead to the yo-yo effect

69.3.2 Other Therapies

Drug and surgical therapies are indeed successful in adolescents, but there are not yet sufficient long-term data, so these procedures should only be used by specialists in cases of compelling indications (Wabitsch et al. 2012; AWMF-Guidelines/Wabitsch and Moss 2019).

69.3.3 Possible Side Effects of Treatment

The treatment can have undesirable side effects, as with other treatments, and therefore requires medical supervision. The assessment of side effects in relation to the continuation of treatment must lie in the decision of the treating physician.

Side Effects of Obesity Treatment in Children and Adolescents

- Development of eating disorders
- Development or exacerbation of orthopedic complications

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Family-Based Approaches to Treatment

70

Susanna Wiegand and Martina Ernst

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70.1 Introduction

70.1.1 Family Contribution to the Development of Obesity

70.1.1.1 Genetic Contribution vs. Lifestyle

Since obesity and its associated diseases tend to cluster in families, it is reasonable and necessary to primarily use family-based treatment approaches. If one or both parents are obese themselves, the statistical risk for the development of obesity in their children is significantly increased. This constellation of an “obesity family” often leads to experiences of stigma.

Therefore, important for building a therapeutic relationship with the affected child or adolescent and their family is the assessment of the **genetic contribution** to weight development in relation to the contribution of **family lifestyle** and **environmental conditions**. Neither the common belief in a difficult-to-influence genetic predisposition (“There’s nothing you can do, it runs in our family!”) nor the primary assumption of an unfavorable family lifestyle (“Nothing comes from nothing—they’re all too fat!”) is helpful in this context. Reviews on the course of lifelong weight development indicate a genetic predisposition contribution of about 40–70% to individual weight development (Golden and Kessler 2020). These overviews are mostly based on twin and adoption studies as well as longitudinal epidemiological data from large cohorts, such as the Framingham cohort. So far, >100 risk genes for the development of obesity have been identified. Therefore, it can be assumed that the regulation of body weight is based on a very complex genetic network. Interestingly, studies in childhood and adolescence show a higher

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genetic contribution to weight development than studies in adulthood (Silventoinen and Kaprio 2009). This fact is relevant for therapy, as the comprehensible communication of this information is experienced as relieving by most parents. In the key situation of an initial consultation, this can lead to both a relief of feelings of guilt (“Genes do play a role!”) and an assumption of responsibility (“You can still do something!”; Sect. 70.3.3).

For a long time, human behavior was considered to be almost exclusively learned. This paradigm has been partially modified in recent years, as developmental psychological studies in particular suggest that behavioral and personality traits in humans are also partly genetically determined (DiLalla et al. 2012). Especially in the early phases of child development, however, weight-relevant behavioral areas such as nutrition and physical activity are also influenced by the example of parents and possibly siblings as part of early childhood imprinting. Therefore, in cases of early-onset obesity, parents or other legal guardians are the primary target group for obesity education.

- ▶ **Important** Obesity in childhood and adolescence is determined by the interaction of genetics and lifestyle factors. The cause is a long-term positive energy balance, meaning less energy expenditure than intake.

70.1.1.2 Influence of Social Status and Migration Background

Obesity in children and adolescents is not equally distributed across all population groups. Rather, families with **low socioeconomic status** and families with a **migration background** represent particular risk groups (Röbl et al. 2013). Children from families with low socio-economic status have an approximately 3-fold increased risk of being obese, while children from families with a migration background have a 2-fold increased risk. The hypotheses for possible causes are diverse. Overall, these groups

are less well reached by the healthcare system. Families with a migration background seek treatment only when the extent of overweight and comorbidity is more severe (Dannemann et al. 2011) and also perceive their ability to actively contribute to their children’s health as lower than families without a migration background (Sect. 70.3.2). Families from educationally disadvantaged backgrounds exhibit less health-promoting behavior, particularly with regard to food selection, media use, and active leisure activities. Therefore, family-based treatment approaches for obesity in children and adolescents must absolutely take into account the respective psychosocial conditions.

70.1.2 Basic Principles of Family Therapy for Chronic Diseases

When a child or several family members in a family are affected by obesity, systemic aspects must form the basis of the treatment. The social system of the family, with its interaction processes, is at the center of the intervention. The primary goal is not only to improve the (health) condition of the affected family member. In line with the basic assumption of a biopsychosocial origin and maintenance of obesity, the relationships, interactions, and interaction patterns between individual family members in the context of the chronic disease are examined in particular. Over time, the chronic disease may have established itself in the system like an additional family member, demanding the attention of all family members and causing specific interaction disorders. The aim is to achieve an improvement in well-being and an expansion of action competencies for all family members through improved communication, mutual understanding, insight into typical conflict patterns, and better conflict resolution strategies. The therapeutic attention is focused “on the design of a supportive living environment to create conditions in which children and adolescents can develop appropriately” (Rotthaus

2001). The usefulness of this seemingly unusual treatment approach for obesity therapy becomes clearer when considering the enormous everyday disruptive effect of a chronic disease within a family (in this case, a child with obesity and possible secondary diseases). This is particularly relevant when therapeutic measures have noticeable effects on family habits and structures, e.g., a change in the food and drink offerings or changes in media use and family exercise habits.

A systemic perspective also benefits single parents. 19% of children in Germany live with only one parent in the household (Federal Statistical Office 2018). The partial or complete absence of a parent is even more common in families with an obese child (36% in a clinical cohort; own data), often in combination with a low socioeconomic status. Especially for the sustainable implementation of behavioral changes in the family environment, which often become necessary during obesity therapy for children and adolescents, this atypical parenting situation poses an additional challenge for a family-based approach. Differences in everyday life design and parenting style often contribute to parental separation. For a successful change in nutrition and/or exercise behavior in families with separated parents, elements of couple therapy can be helpful, which also helps these parents understand themselves as responsible parenting couples and enables coordinated work on the concrete behavioral level.

A systemic approach in the treatment of obese children and adolescents does not only mean considering the direct family environment (parents, siblings), but also involving all persons who are responsible for the respective patient (grandparents, other caregivers). Particularly in the grandparent generation, there are often differing views on normal body weight, healthy nutrition, and educational issues. If grandparents are regularly entrusted with the care of a patient, they are therefore included in the consultation.

70.2 Family-Based Treatment Approaches

70.2.1 Family Imprinting in Infancy and Preschool Age

70.2.1.1 Nutritional Behavior

In infancy (2nd/3rd year of life) and early childhood (preschool age; 4th–6th year of life), the essential foundations for later behavior are laid. This also includes the weight-relevant areas of nutrition and physical activity. In these early developmental phases, parents play a crucial role. For infancy, there is a significant negative association between long breastfeeding duration and the risk of being overweight or obese in primary school age. However, interpreting these data is difficult, as long breastfeeding duration is itself associated with, for example, higher socioeconomic status and better health behavior (Koletzko et al. 2020). A protective effect of breastfeeding is suggested, for example, by the fact that, in contrast to formula feeding, the infant can largely self-regulate food intake, or that breast milk is lower in protein but contains, among other things, leptin and thus may have a direct effect on appetite regulation. In any case, taking a breastfeeding history (and also sleep behavior) is part of the initial conversation, even in the treatment of older children with obesity, as this can also provide clues about attachment behavior.

In infancy and pre-school age, children largely follow the example of their parents. In the following, portion size and food selection are considered separately: Directive behavior regarding the amount of food, both in the sense of urging to continue eating (overeating) and in the sense of restriction, increases the risk of overweight. In particular, parents with obesity and/or eating disorders often have a harder time assessing their child's needs. The lowest risk of becoming overweight is found in children who

can freely choose their portion size and meal duration—provided there is a diverse healthy food supply and unhealthy snacks are not constantly available in the household. Children's sense of taste is developing, and differs substantially from that of adults. Children primarily prefer sweet and salty foods and avoid sour and bitter ones. Over time, sense of taste and food preferences differentiate, also depending on the family's offerings (Rohde et al. 2020). New taste qualities should be offered repeatedly in small amounts and without coercion. If sweet and/or salty snacks are constantly available, this not only disrupts self-regulation (risk of "overeating") but also prevents the differentiation of taste and thus the expansion of the food spectrum. The healthiest food choices are made by children whose parents non-directively provide a healthy, diverse range of minimally processed foods and eat together with their children in a structured environment.

70.2.1.2 Physical Activity Behavior

Not only nutrition, but also physical activity behavior is sustainably shaped during early childhood and preschool age. However, it is methodologically difficult to directly measure physical activity in this age group, as many systems (e.g., accelerometers) are not designed for this purpose. Therefore, parameters are usually recorded in questionnaires. The data are quite clear: Active parents have active children. For example, in the Framingham Children's Study, the probability of active play and leisure behavior in children with two active parents was 5 times higher than in children with inactive parents (Moore et al. 2003). This observation has also been confirmed in more recent studies. Families living in an environment with good access to playgrounds or natural areas (forest, meadows) are overall more physically active than families in less favorable living conditions (James et al. 2020).

70.2.1.3 Media Consumption

Promoting physical activity in early developmental stages is also made more difficult by

increasing media consumption starting from early childhood. Media consumption (TV, mobile phone, tablet) is generally associated with physical inactivity and has a negative impact on weight development, as well as on motor, mental, and psychosocial development. If developmental milestones (e.g., standing on one leg) are not reached within physiological development windows without causal pathological reasons, but due to a lack of movement opportunities or stimuli, this has lasting effects on further developmental progress. Long-term studies show a correlation between television viewing duration in early childhood and achieved educational level in adulthood, even when adjusted for factors such as socioeconomic status and BMI (Hancox et al. 2005). In a large cross-sectional study (<250,000 children and adolescents, 35 countries), maternal smoking also had a statistical effect on weight in addition to media consumption (Mitchell et al. 2018).

70.2.2 Importance of Parenting Skills for Treatment

Currently, there are no pharmacological treatment options available for children and adolescents with obesity (with the exception of rare monogenic forms; e.g., leptin receptor mutations). Long-term reduction of energy balance during the treatment phase and normalization during the maintenance phase can only be achieved through sustainable behavioral changes. This requires not only a health-promoting family environment but also parents or guardians who are able to positively support children (and adolescents) with obesity during the difficult phase of behavioral change. The importance of role modeling in the areas of nutrition and physical activity has already been discussed. In addition, the parenting skills of parents are another basic prerequisite.

Parents of obese children are not only concerned about the health consequences but also, and especially, about the social consequences of obesity. However, they perceive their ability

to influence this as rather limited (Schwimmer et al. 2003). In therapeutic work with families, the following **problem areas** can be identified.

70.2.2.1 Inconsistent parenting style

In families with unsuccessful therapy attempts or renewed weight gain after inpatient weight loss, problems in the implementation of rules and prohibitions are frequently observed. The rules can be unrealistic (e.g., “No eating after 6 pm!”) or overwhelm the child’s personal responsibility (e.g., “No sweets from pocket money!”). Prohibitions are pronounced but not implemented in one’s own behavior (e.g., “I need my cola!”). Rigid rules and prohibitions in this constellation have either only a very short-term, sometimes even opposite effect on the family’s eating and/or exercise behavior. In addition, parents may be insecure in their role, up to a “role reversal.” For example, there is an expectation from parents that after inpatient weight loss, the child should introduce a healthy diet in the family, as learned in the clinic. In the outpatient setting, obesity therapy should also lead to the child subsequently “learning/knowing what is healthy.” The basis for family-based treatment in these constellations is first and foremost **general parenting counseling** in conjunction with realistic goal planning regarding the desired behavior change. In particular, parents with negative experiences need a positive expectation of change (e.g., “I can do it!”). Therefore, the first therapeutic agreements must be extremely small-scale to allow positive experiences to follow the positive expectation (e.g., “I managed not to buy any more iced tea!” or “Drinking only water works well!”).

Rodenburg et al. describe five parenting style clusters that affect both nutrition and physical activity and either lead to rather unhealthy (a) or rather health-promoting (b–e) family habits (Rodenburg et al. 2013):

- a) High presence of electronic media and unhealthy foods,
- b) Family rules on nutrition and physical activity,
- c) Low accessibility of unhealthy foods,

- d) Positive structure regarding healthy eating and exercise behavior,
- e) Positive attitude towards sports activities and fruit consumption.

The “healthy” clusters were associated with a higher educational level while the unhealthy cluster was associated with a lower educational level. Large longitudinal studies have also revealed a relationship between an unfavorable BMI course and family context factors, such as a lack of everyday structure (Dos Santos et al. 2020).

70.2.2.2 Limited Parenting Ability Due to Mental Illness

When a parent has a somatic illness there is no doubt about the need for additional support. This is less clear for parents with mental health problems and psychiatric disorders. To our knowledge, there are no data specifically on families with children/adolescents with obesity. Preliminary results of our own studies show an increased risk for an unfavorable therapy course in cases of maternal depression, anxiety or eating disorder, as well as addiction (also non-substance, such as gambling) of a parent. The systemic effects of a parent’s psychiatric disorder are particularly serious, as they are often associated with a loss of emotional stability and everyday structures. It is quite possible that the child with obesity is noticeable as an index patient, but in a systemic sense, the (previously unrecognized) psychiatric disorder of a parent is the cause.

70.2.3 Effects of Everyday Structure

A long-term positive energy balance is also the cause of overweight/obesity in children and adolescents. Energy homeostasis is significantly influenced by various circadian-regulated processes. **Hunger and satiety**, as well as the **sleep-wake rhythm**, play a major role in maintaining a normal body weight. For example, children who do not eat breakfast but eat more in the second half of the day have an

unfavorable weight course (Vilela et al. 2019). A disturbed circadian rhythm (e.g., due to lack of sleep and/or nighttime media consumption) is associated with increased energy intake and, as a result, an unfavorable weight course. Both the endocannabinoid system and the leptin-melanocortin signaling pathway potentially play a role in pathophysiology (Broussard and Van Cauter 2016). In adolescents with obesity, short sleep duration leads to less melatonin secretion and has a negative impact on mood and health behavior (Simon et al. 2020).

In addition, there seems to be an evening hunger phase, followed by low morning appetite, which is not significantly influenced by eating or sleeping (Scheer et al. 2013). It is conceivable that these effects are additive and that in children/adolescents with obesity, lack of sleep or an unfavorable sleep-wake rhythm and irregular meals contribute to a disproportionate weight gain. Especially for adolescents, the situation on school days is particularly difficult, as puberty development leads to a physiological shift in spontaneous sleep time to later hours, and a regular school start at 8 a.m. results in a significant sleep deficit with corresponding negative effects on metabolic regulation (Foster et al. 2013). This phenomenon is also referred to as **social jetlag**.

In a meta-analysis of structured physical activity programs for children and adolescents with obesity, energy intake was found to be reduced despite an increase in physical activity (Schwartz et al. 2017). The exemplary studies presented underline the importance of regular meals, active leisure activities, and an age-appropriate sleep-wake rhythm for the prevention and treatment of obesity in children and adolescents.

70.3 Problem Areas of Family-Based Approaches

70.3.1 Psychosocial Stress Situations

In addition to the already described situation of a psychiatric illness of the parents (Sect. 70.2.2),

other psychosocial stress situations also impede successful obesity treatment in children/adolescents. Long-term unemployment in the affected families not only leads to direct financial difficulties, but also to a loss of social integration and daily structure. In families with unemployed parents, less medical care is also utilized (e.g., vaccinations and check-ups). This can result in relevant health disadvantages. In general, considering the psychosocial and family overall situation is a basic prerequisite for realistic therapy planning, especially in family-based obesity treatment (Wiegand and Kühnen 2020).

70.3.2 Specifics in Families with Migration Background

The cultural influences on family life are very diverse and are shaped on the one hand by origin and biography and on the other hand by previous experiences in the host country. Therefore, an individual consideration is always necessary. In the following, some aspects of the care of traditionally oriented families from the Muslim cultural area are presented by way of example (Wiegand and Babitsch 2013):

Family structure The father, as the male head of the family, usually represents the family externally, whereas household management falls within the area of competence of the mothers. Treatment measures must therefore be approved by the father, but the concrete implementation should be discussed with the mother. Occasionally, personal role understanding must take a back seat in order to establish a constructive level of conversation. For a good start to the conversation, it is also helpful to familiarize oneself with the respective greeting rituals (e.g., handshake yes/no).

Customs and traditions Meal frequency and daily structure in many families with a migration background often still follow the customs of the country of origin. For example, in many southern countries, there is no breakfast as a regular meal, and many families find it difficult to introduce

it. On the other hand, there is often a joint warm family meal in the afternoon or evening. If the child already receives a warm meal at school, a positive energy balance can be the result.

Values A car and electronic devices can have a high social status if they are in strong contrast to the standard in the country of origin. Therefore, it is sometimes difficult to implement sending children to school on foot or removing the television/computer from the children's room. Sports activities are more accepted for boys in traditional families than for girls. Advice on active leisure activities must take into account the experiences and resources of the families. Especially mothers often cannot ride a bike or swim. Occasionally, there are special courses that have a lasting effect on the leisure behavior of families.

Hospitality "The commandment of full cupboards" states that a family should always be prepared to receive guests. This includes stocking up on special foods and drinks, such as soft drinks in families who do not drink alcohol for religious reasons. This offer can have a therapeutically unfavorable effect if, for example, there is a control problem with soft drinks.

The examples mentioned are intended to illustrate that treatment planning requires both knowledge of the cultural specifics of the country of origin and the ability to provide culturally sensitive advice.

70.3.3 Resource-Oriented Treatment Strategies

In the practical implementation of obesity therapy for children and adolescents, the long-term implementation of stable behavioral changes can only be achieved if the **multi-professional treatment concept** takes into account the previous experiences and the **resources of the family**. Especially when unsuccessful therapy attempts have already been made in the past, the joint development of a therapeutic assignment is necessary. After clarifying the basic motivation, a joint analysis of the weight-relevant

areas based on the general recommendations (for normal-weight children/adolescents) of the respective professional societies has proven successful. The recommendations were transferred to a "target value worksheet," which contains very simple recommendations and, in the original version, also includes pictograms for better understanding (Fig. 70.1). Together with the patient and family, a self-assessment for problem analysis is carried out using a traffic light system (Fig. 70.2; see also Ernst and Wiegand 2010). This is then the basis for agreeing on initial behavioral changes.

Especially for families with many failed attempts in the past, a very small-step approach is necessary to enable them to experience a positive change as a (re-)entry into a successful treatment process. Therefore, problem analysis and realistic assessment of the family's resources by a multi-professional team are indispensable prerequisites for planning family-based obesity treatment for children and adolescents (for further information, see Ernst and Wiegand 2010). In cases of insufficient resources and/or unsustainable basic motivation, a classical obesity therapy with a behavioral therapeutic approach is not meaningful and can even make long-term care more difficult due to further negative experiences. In these cases, the basic conditions for treatment must be created first, e.g., through social counseling, assistance in parenting (family assistance and/or social-pedagogical individual case assistance), or initiation of psychotherapy for the parents.

- **Important** In cases of difficult family constellations and insufficient resources, obesity treatment in childhood and adolescence is often a lengthy process that requires multi-professional teamwork.

Examples of Risk Constellations

- Children with special educational needs and/or significant school problems
- Parents with long-term unemployment and/or severe economic difficulties

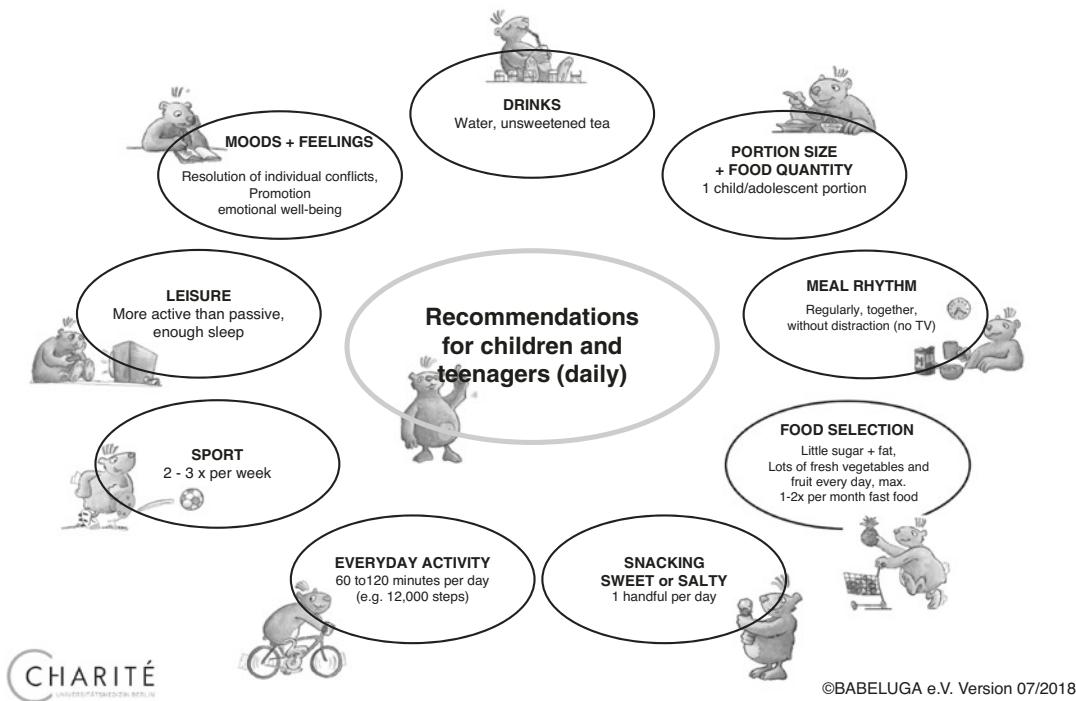


Fig. 70.1 Target construction sheet

- Parents with addiction problems (substance/non-substance)
- Parents with mental health problems or psychiatric disorders (even if suspected)
- Separated parents with differing parenting ideas and a lack of a central focus for the child

70.4 Conclusion and Implications

All reviews and meta-analyses on the therapy of obesity in children and adolescents over the past 15 years emphasize the need for a multi-professional treatment and especially the need for family-based concepts (Sung-Chan et al. 2013; Colquitt et al. 2016; Mead et al. 2017; Al-Khudairy et al. 2017). The treatment reality

in Germany currently looks different, although all those involved are aware of the importance of parent education. Outpatient obesity programs are not available in many regions (often due to a lack of cost coverage by health insurance), so either no treatment or primarily inpatient treatment is chosen. These mostly remote facilities can only inadequately implement parent education, so the transfer of initiated behavioral changes into the family's everyday life often fails and rapid weight regain follows. This psychologically and metabolically extremely unfavorable effect could be avoided by accompanying, local parent education and subsequent outpatient follow-up care for the child/adolescent. Such a "treatment chain" is a matter of course for other chronic diseases, but has not yet been established for obesity in children, despite being essential.

Name: _____
Date: _____

babeluga_eV

The worksheet features a central cartoon bear with the word "Weight" written on its back. Surrounding the bear are several oval-shaped bubbles containing text:

- Drinks
- Moods + feelings
- Leisure media, hobbies, sleep
- Regular sport
- Everyday activity
- Snacking sweet or salty
- Food selection, Food fast food
- Meal rhythm, eating in between meals
- Portion size
- Confidence
- Wish
- I can do it

A black traffic light icon is positioned above the bubbles.

Current construction site theme: _____

Explore & try out: _____

Weight history

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CHARITÉ

Fig. 70.2 Construction site worksheet. (From Ernst and Wiegand 2010; with kind permission of Huber-Verlag)

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Fad Diets and Commercial Programs

71

Andreas Fritzsche

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Nutritional therapy for obesity aims to achieve weight loss. This is to be achieved by ensuring that energy intake (calorie intake) is lower than energy expenditure. The diet is a central component of obesity therapy.

Nutritional therapy for obesity— guidelines

In the guidelines of the German Obesity Society from 2014, the following basic aspects of nutritional therapy for obesity are recommended. It is important to note that no special diets are recommended here, but rather general advice on individualized dietary recommendations is given.

- People with obesity should receive individualized dietary recommendations that are adapted to therapy goals and risk profiles.
- People with obesity should be offered nutritional counseling (individual counseling or in groups) as part of their medical care.
- The patient should be comprehensively and understandably informed about the goals, principles, and practical aspects of the dietary change.
- The personal and professional environment of the person concerned should be included in the nutritional counseling and dietary change.

71.1 Requirements for a Diet

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The so-called weight loss diet, with the aim of a negative energy balance, should only be applied for a limited time according to the recommendations of professional societies. For sustainable

obesity treatment, a permanent change in diet and lifestyle is necessary.

It becomes clear that the same requirements should apply to diets for the treatment of obesity as for the testing of drugs. These requirements are not met by most (fad) diets.

Quality features of an obesity diet

- Efficacy in terms of weight loss should be tested in a clinical study (controlled, randomized prospective design)
- Efficacy should also be proven in the long term (follow-up after more than one year)
- Efficacy should also be given in terms of reducing symptoms of obesity-related sequelae (e.g., diabetes mellitus, lipid metabolism disorder, cardiovascular diseases)
- Side effects (physical and psychological) should be investigated
- Side effects should be low
- Costs should be appropriate

► **Important Requirement:** Weight loss diets should be subject to the same requirements (clinical trials) as drugs.

The current guideline for obesity therapy recommends that patients should be advised on dietary forms that lead to an energy deficit over a sufficient period of time and do not lead to health damages.

71.2 Classification of Diets for Weight Loss

A multitude of diets and weight loss programs are offered; their number is overwhelming even for experts. The following classification of different diet forms is arbitrary, as most diets include several of the listed aspects.

Diets for weight loss

- Mixed diet
- Diets that favor certain food components
- High-protein diet
- High-carbohydrate diet
- High-fat diet
- High-fiber diet
- Low glycemic index diet
- Food combining
- Diets that require a specific daily rhythm
- Intermittent fasting
- “Worldview diet”
- “Regional” diet
- Formula diet
- Internet diet

Examples of mixed diets are the “Brigitte Diet” and the “Ich-nehme-ab-Programm” (I’m losing weight program) of the German Society for Nutrition. High-protein diets include the Hollywood, Mayo, or Sears diets, while high-carbohydrate diets include the rice or potato diet and the 7-day grain or bran cure. The most famous representative of the high-fat diet is the Atkins diet. A diet that includes a low glycemic index is the Glyx diet. Food combining is promoted by Hay or offered in the “Fit-for-life program”. Diets that observe a specific daily rhythm include intermittent fasting, which usually involves an 8-hour eating period and a 16-hour fasting period. This also includes methods such as dinner canceling or the 5:2 diet (5 days of eating, 2 days of fasting). Diets that require a specific worldview include the anthroposophic diet, vegetarianism, the blood type diet, or macrobiotics. In the broadest sense, religious fasting and Ramadan nutrition are also included. Regional diets include the Mediterranean diet or the Eskimo diet. Formula diets are offered as “Herbalife” or integrated into programs such as the “Optifast program”. Increasingly, diets are also offered on the internet, with weight loss seekers being supported in internet forums and email services.

We deliberately refrain from describing the individual diet forms in more detail here. New diet trends are constantly being created, which are then explained by nutrition docs and nutrition experts in various media. Certain characteristics of a diet should arouse skepticism and lead to the diet not being applied.

The following statements about a “diet” should be treated with caution and the product should be discouraged.

Negative Signs

- High costs for the diet
- Money back in case of non-success
- A quick success is promised (10 kg in 3 weeks!)
- You can continue to eat whatever you want alongside the diet
- Before-and-after success pictures of individuals
- Connection with the name of the “inventor” of the diet (“Professor XY Diet”)
- Connection with religious and ideological messages
- No scientific evaluation—mysterious mechanisms of action

71.3 Evaluation of Diet Programs

The efficacy of diet programs should be tested in clinical studies with regard to weight loss, effects on metabolism, and side effects. There are surprisingly few studies on this topic that meet the requirements of evidence-based medicine.

A recently published study of meta-analyses and clinical trials found that low-calorie diets compared to higher-calorie diets result in short-term weight loss over less than half a year. However, the benefit decreased in the long term (Chao et al. 2021).

A meta-analysis examined the question of whether a high-fat diet (low-carb) is superior to a low-fat, high-carbohydrate diet (low-fat) in

terms of weight loss. Five studies with a duration of 6–12 months on this topic were analyzed (Nordmann et al. 2006). The initial weight loss after 6 months was somewhat stronger in high-fat diets (derived from the Atkins diet) without calorie restriction (difference of 3 kg). However, after one year, the weight loss was comparable to the weight loss achieved by low-fat, calorie-reduced diets. Furthermore, so-called low-fat diets show lower LDL cholesterol levels, while low-carb diets are associated with higher HDL cholesterol and lower triglyceride levels.

Another question investigated in several high-quality prospective, randomized controlled trials is the effect of diets with a low glycemic index or low glycemic load. The glycemic index evaluates a food based on its effect on blood sugar elevation and normalizes this value to the blood sugar increase caused by the same amount of glucose. The glycemic load is calculated from the product of the glycemic index and carbohydrate content of the food. High-fiber diets, as well as high-fat diets, can be included in these diets. A meta-analysis on this topic was conducted by Thomas et al. (2007). Six studies with a duration of five weeks to six months were found, which compared a low glycemic index diet with a control diet. The meta-analysis concluded that diets with a low glycemic index lead to greater weight loss than control diets (mean difference 1.1 kg). In addition to the short study durations, the low cumulative number of participants of 160 when summarizing all studies is noteworthy and limits the meaningfulness of the meta-analysis.

Commercial weight loss programs are sometimes associated with considerable costs for the participant. A review has dealt with examining the components, costs, and efficacy of such commercial programs and also organized self-help programs in the USA. The works of Tsai and Wadden (2005) and an update by Gudzune et al. (2015) also include programs offered in Germany, such as “Weight Watchers” or the “Optifast” program. The overview included 45 studies. A disadvantage of some studies is that they often represent the so-called best-case scenario, as only people who successfully complete

the program are evaluated. For example, weight losses of 15–25% of the initial body weight are achieved with the “Optifast” program. The “Optifast” program, in particular, is associated with high costs. In contrast, the “Weight Watchers” program achieves a weight loss of 2.6% of the initial body weight after one year in meta-analyses (Gudzune et al. 2015). Good controlled studies on commercial programs are rare.

- **Important** It is astonishing how few high-quality studies exist on weight loss diets. Most diets are completely untested and cannot be scientifically evaluated. Commercial programs are also insufficiently tested.

In conclusion, the recommendations of the S3 guideline of the German Obesity Society from 2014 state that the composition of a weight loss diet in terms of the main nutrients fat, carbohydrates, and protein is of secondary importance. It does not matter whether a “low-fat” or “low-carb” diet or a protein-focused diet is chosen for weight loss: ultimately, the achieved energy deficit (recommendation 500 kcal/day) counts. Much more important is that the diet suits the person. People who want to lose weight should no longer be forced into strict schemes.

71.4 Individualized Nutrition

The optimal diet for a person is an individual diet that maintains or restores them to a balanced and normal weight and optimal health. Such a diet takes into account individual genetic conditions and individual environmental resources. Furthermore, lifestyle must be changed; an isolated change in diet usually remains unsuccessful.

Treating all people with overweight or obesity with a specific diet form is not appropriate. “One size fits all” inevitably fails. Individual genetic conditions are not taken into account in

such an approach. The research field of nutritional genetics (“nutrigenomics”) is developing rapidly, and in the future, diet forms could be available that are tailored to the individual for optimal weight loss. So far, however, mostly pilot studies or “proof-of -concept” studies have been published on this topic. Until there is more evidence, individual nutritional counseling for weight loss is preferable, taking into account the possibilities, wishes, and needs of the individual with overweight or obesity. Long-term motivation through self-help groups can support the effectiveness of nutritional counseling.

Conclusion

Fad diets and commercial programs for the purpose of weight loss are numerous. In contrast to their strong presence in the media and frequent use by the affected individual with overweight/obesity, the efficacy and side effects of these diets are inadequately studied, with few exceptions.

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Nutritional Therapy for Obesity

72

Hans Hauner

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72.1 Introduction

Weight gain and obesity are the result of a long-term positive energy balance. Among a variety of influencing factors, including genetic predisposition, excessive nutrition and decreased physical activity are the two decisive determinants. Of the conservative therapy components, an energy-reduced mixed diet is considered the most effective measure for reducing body weight. If it is possible to successfully reduce energy intake, weight loss can be achieved in a simple and safe manner.

A long-term change in eating habits is difficult, as it involves early learned and long-practiced behaviors that also fulfill the hedonic

needs of the individual. Therefore, only through conscious and stable changes in eating behavior can a reduction in energy intake be achieved. In addition, the body has effective adaptation mechanisms that counteract weight loss and aim to stabilize body weight (Holzapfel and Hauner 2011). This makes it understandable that nutrition therapy is a major challenge and success depends crucially on the recommendations being feasible for and accepted by the patient in everyday life. This requires a therapy concept tailored to individual needs. With a rigid plan – as was often the case in the past – success is hardly to be expected.

Despite these problems, there is extensive experience based on a large number of studies on how nutrition therapy can be designed in terms of content to prevent or treat obesity. The most important concepts will be discussed in more detail below. In this context, it should also be noted that most people who want to lose weight initially search for diets themselves and usually aim for rapid weight loss, not least

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due to the very limited range of serious therapy offers available.

Research findings on the effects and risks of the various forms of nutrition therapy for people with obesity have increased significantly in recent years. This has also led to the evidence-based treatment corridor becoming wider. Until the turn of the century, the dogma of a fat-reduced diet as the most effective dietary intervention for lowering body weight was dominating. There were hardly any data available for other concepts, and the personal needs and wishes of the patients received little attention.

It remains unchanged that for the vast majority of people with obesity, the combination of dietary change, increased physical activity, and behavior modification is the most sensible intervention. In a recently published meta-analysis, this combination proved to be significantly more effective than nutrition therapy alone. This chapter focuses on the various options for nutrition therapy for obesity, based on randomized controlled trials.

72.2 Basic considerations for nutrition therapy

The goal of nutrition therapy is the long-term reduction of energy intake in order to achieve a negative energy balance and permanently lower body weight. It should be noted that any weight loss also leads to a proportional loss of fat-free body mass (lean mass). With a weight loss of 10 kg, in addition to the desired reduction in fat mass by about 7 kg, there is a reduction in fat-free body mass by about 3 kg. In this case, the basal metabolic rate decreases by up to 550 kcal/day (Leibel et al. 1995). This means that weight loss can only be maintained in the long term with appropriate energy restriction. If the previous diet and energy intake are resumed, body weight will inevitably increase again. This phenomenon is called the “yo-yo” effect and reflects the physiological adaptation to the energy balance.

When considering and evaluating therapy options, it is extremely important to be aware of

the trends in the eating habits of the population, which nowadays significantly influence the risk of developing obesity. These are increasingly characterized by terms such as energy density, portion size, and snacking. These aspects are of high practical relevance and must be included in nutritional counseling. These aspects will therefore be briefly discussed in the following.

Trends in nutritional behavior that promote weight gain

- High energy density of modern foods
- Inappropriate portion sizes
- Constant availability of “convenience” and fast food
- Growing range of fast food options (fast food restaurants, bakeries, butcher shops, pizza delivery services, snack stands, etc.)
- Continuing trend towards “eating out” and take-away/food delivery
- Growing range of energy-rich beverages

The term energy density refers to the energy content of foods and dishes, relative to the amount of food. In the context of obesity, it is significant that the consumption of foods and dishes with high energy density has increased considerably in recent decades. The energy density of many modern foods and fast food meals is 200–300 kcal per 100 g of solid food, which is about twice as high as traditional, mostly plant-based dishes. Since stomach filling and stretching generate important satiety signals, more calories are usually consumed when eating energy-dense foods before food intake is terminated by such satiety signals. It is suspected that the human gastrointestinal regulatory system cannot adequately respond to the high energy density of modern food, resulting in “passive overconsumption” with the consequence of weight gain and obesity. The energy density of foods and dishes is closely associated with fat intake and total energy intake (Prentice and Jebb 2003).

In recent decades, there has been a continuous increase in portion sizes, especially for fast

food products, including sugary beverages. The pricing in retail also contributes to the fact that more cost-effective large packages are preferred. It has been repeatedly shown that the effective energy intake increases with the portion size and thus the risk of weight gain increases. Controlling portion size accordingly leads to a lower energy intake (Rolls et al. 2006).

Another modern phenomenon is described by the term “snacking”. Food offers are now available almost everywhere and at any time of the day (“toxic food environment”), so people are constantly tempted to consume mostly energy-dense “convenience products”, making it difficult not only to maintain a balanced but also an energetically appropriate diet. A recent American analysis of eating habits found that the further increase in energy intake between 1994 and 2006 was mainly due to the increase in eating occasions, while energy density and portion size had not changed significantly during this period (Duffey and Popkin 2011).

These ongoing changes in the food supply and in the eating behavior of the population must therefore be taken into account in the nutritional therapy of obesity. In addition, the wide range of food and dishes available in retail and gastronomy leads to a growing heterogeneity in individual nutritional behavior. “Eating out” or take-away/food delivery is also becoming increasingly important, as many people no longer want to prepare their meals themselves and instead make use of the large selection of mostly energy-rich “convenience” and “fast food” products.

72.3 Possibilities of Nutritional Therapy

In the following, various concepts for nutritional therapy will be presented, for which there are good scientific data today. The concern is always with which therapy is medically appropriate in the individual case and best meets the possibilities and needs of the person concerned.

Evidence-based nutritional medical concepts

- Fat reduction alone
- Energy-reduced mixed diet (energy deficit 500–600 kcal/day)
- Low-carbohydrate diet forms
- Significantly energy-reduced diet forms (energy intake of approx. 800 kcal/day)
- Meal replacement strategy with formula products

72.3.1 Fat Reduction Alone

Older studies have convincingly shown that even with sole fat limitation, a moderate weight loss can be expected. With unchanged intake of carbohydrates and protein, a reduction of daily fat intake to about 50–80 g leads to a decrease in energy intake by 200–500 kcal/day. This concept has the advantage that it is didactically easy to explain and only requires attention to the amount of fat. A meta-analysis showed an average weight loss of 3.2 kg, but the weight loss can be significantly higher with a high BMI (Astrup et al. 2000).

72.3.1.1 Moderately Energy-Reduced Mixed Diets

The fat-reduced mixed diet with an energy deficit of 500–600 kcal/day remains the standard recommendation in most guidelines (SIGN 2010; NICE 2014; DAG 2014). The intake of all nutrients is moderately limited. The most important single component is the reduction of fat consumption, so it is primarily a fat-reduced diet. Mathematically, this corresponds to an energy saving of about 3500 kcal/week and thus an average weight loss of about 500 g/week. Over a year, a weight loss of an average of 5–6 kg can be expected. This diet has the advantage that it is practically side effect-free and safe. It does not require a large amount of supervision and can be recommended as a long-term nutrition concept.

Evaluation of Weight Loss Programs for Obesity Weight loss in a program is usually given as the average weight loss of all participants. In the evaluation, it is also required that dropouts be taken into account in the presentation of the results, either within the framework of an LCOF (“Last Observation Carried Forward”) or a BOCF (“Basal Observation Carried Forward”) analysis, which often makes the average results look quite modest with a high dropout rate.

However, this overlooks the fact that participants with good compliance (about one third) lose significantly more weight on average and maintain this success better beyond the intervention period (Holzapfel et al. 2013), while participants with poor compliance (also about one third) usually do not reduce their body weight at all. For this reason, studies often report the proportion of participants with more than 5% or more than 10% weight loss compared to their initial weight. Nutritional therapies are considered successful if more than 50% of participants achieve a weight loss >5% or more than 20% of participants achieve a weight loss of more than 10% over a one-year period (Hauner et al. 2000).

72.3.2 Low-Carbohydrate Diets

For 20 years, low-carbohydrate and fat- or protein-liberal diet forms (“low-carb”) have been heavily promoted. The initial reduction in carbohydrate intake leads to a substantial energy deficit and thus rapid weight loss. This deficit is only partially compensated by the allowed higher consumption of fat and protein, so that a considerable energy deficit remains. Therefore, in most comparative studies, initially, a greater weight loss is observed than with conventional fat-reduced diets. However, by one year, a convergence of weight loss is observed (Mack and Hauner 2007; Johnston et al. 2014).

The term “low-carbohydrate diet” is not yet clearly defined, so carbohydrate intake varies between 20 g per day (in the Atkins diet) and 40% energy depending on the concept. While moderate carbohydrate restriction is justifiable,

extreme forms are discouraged due to various risks (Mack and Hauner 2007). A sufficient intake of dietary fiber, especially from vegetables, should be specifically targeted, and excessive intake of saturated fats should be avoided, which is very difficult under German dietary habits.

72.3.3 Protein-Rich Diets

Particularly noteworthy in connection with low-carb diets is the importance of increasing the protein content. A meta-analysis of intervention studies concluded that protein-rich diets (20–30% of energy intake) on average allow for slightly greater weight loss than diets with normal protein amounts (approx. 15% of energy intake) (Krieger et al. 2006). This is attributed to the stronger satiating effect of a protein-rich diet. However, this diet also has certain disadvantages, such as an increase in urea and uric acid, an increased risk of kidney stones, and generally higher kidney stress (Mack and Hauner 2007).

Recent cohort studies also suggest that high consumption of animal protein increases the risk of type 2 diabetes (De Koning et al. 2011) and—possibly due to the increase in LDL cholesterol—cardiovascular diseases (Noto et al. 2013).

72.3.4 Significance of Macronutrient Composition

In recent years, several major studies have been conducted on the extent to which the macronutrient composition (carbohydrates, fats, proteins) of different diets influences weight loss. These studies unanimously showed that ultimately, the energy deficit is crucial and determines weight loss. Under hypocaloric diets with different macronutrient compositions, no relevant differences were found regarding the improvement of risk factors and the sensation of hunger and satiety. However, weight loss was closely associated with therapy adherence (Sacks et al. 2009).

These findings make it clear that ultimately, it always depends on the energy balance. At the same time, in practice, this means that individual preferences for foods and dishes can be taken into account to achieve this energy deficit. By skillful and conscious food selection, lower-energy preparation, and increasing the proportion of plant-based foods, an energy saving of 500–600 kcal/day can be achieved without restricting the amount of food. Competent and flexible nutritional counseling is required, which takes into account the patient's eating habits. The corridor for the composition of macronutrients is thus relatively large, and a tailor-made therapy according to the wishes of the affected person is usually quite feasible.

Principles of Moderately Energy-Reduced Nutrition Therapy

- Nutrition information and education, including nutrient tables/apps
- Careful planning of buying foods and restaurant visits
- Reduction of energy intake by 500–600 kcal/day
- Less fat-rich foods and low-fat preparation methods
- Plenty of vegetables, salads, fruits, whole grain products
- Higher protein intake if desired and with intact kidney function
- Exclusively calorie-free beverages (low-caloric sweeteners if desired)
- Distribution over 2–3 meals/day
- Avoid snacks as much as possible
- Prepare food as much as possible and reduce “fast food”

72.4 Very Low-Calorie Diet

If a rapid and larger weight loss is desirable for medical reasons, very low-calorie diets can also be used for a limited time, which allow a drastic energy deficit. For this purpose, “formula diet” products are usually used, which are

industrially produced, defined nutrient powders, mostly based on whey. A daily ration with an energy value of usually 800 kcal is provided. These products contain defined amounts of protein (“essential protein requirement” of 40–50 g/day), essential fatty acids, carbohydrates, vitamins, and minerals to ensure the minimum requirement of critical nutrients. In Germany, numerous formula products are distributed through pharmacies, supermarkets, and direct sales. These are now used either as part of a meal replacement strategy or a time-limited, very low-calorie diet (“formula diet”).

72.4.1 Meal replacement strategy

Initially, two main meals are replaced by a formula product, and the third, “normal” main meal should be balanced and not exceed an energy content of 500–600 kcal. After achieving the desired weight loss of about 10 kg after 6–12 weeks, only one main meal is replaced by a formula product to maintain the new weight. The patients decide for themselves which main meal is replaced and thus manage their own weight. With this strategy, a stable weight loss can also be achieved in the long term. In a meta-analysis, weight loss under meal replacement therapy was even slightly greater compared to usual moderately energy-reduced cost diets (Astbury et al. 2019).

72.4.2 Very low-calorie diets

With formula products, an extreme energy deficit can be ensured for a limited time—usually 4–12 weeks—while simultaneously ensuring the intake of essential nutrients to achieve rapid and greater weight success. With a daily energy intake of 800 kcal, it is important to ensure an adequate amount of fluid of about 2.5–3 liters/day. The expected weight loss is in the range of 1.5–2.5 kg/week.

This diet form is popular among many dieters because of the rapid weight loss and is especially suitable for individuals with a BMI of

$\geq 35 \text{ kg/m}^2$. The concept is also easy to implement because it completely deviates from the usual eating habits and, as a result of the high production of ketone bodies usually leads to a rapid dampening of the feeling of hunger.

However, this drastic calorie reduction is not without risk and requires close medical supervision, especially for patients with comorbidities. Side effects such as dizziness due to a drop in blood pressure, nervousness, concentration problems, freezing, and constipation are common. Formula diets should not be used for pregnant and breastfeeding women, children and adolescents, very elderly people, individuals with a BMI $<30 \text{ kg/m}^2$, and those with severe acute or severe chronic diseases (Wadden et al. 1990).

Formula diets should always be combined with increased physical activity, especially to reduce the loss of fat-free body mass. It is essential to practice a new eating behavior with normal food and reduced energy content after completing the formula diet. Nevertheless, a certain increase in body weight cannot be avoided in the following months even under optimal conditions. Depending on the situation, a formula diet can be repeated for a defined period.

72.4.3 Intermittent Fasting

In recent years, various forms of intermittent fasting for weight loss have become popular and scientifically studied. The two most common forms of intermittent fasting are the 2:5 fasting with 2 fasting days per week with $<25\%$ of the usual energy intake and 5 days with iso-caloric nutrition, and the concept of “alternate-day” fasting, in which fasting days with $<25\%$ of the usual energy amount and days with any energy intake alternate consecutively.

Another form is time-restricted eating, in which the time for daily energy intake is usually limited to 8 hours and fasting occurs for the remaining 16 hours. Comparative studies with continuous energy restriction exist for these fasting types. No differences were found in terms

of weight loss or changes in cardiometabolic parameters (Rynders et al. 2019).

Thus, intermittent fasting can also be considered an evidence-based option for weight loss. The disadvantage is that these are restrictive concepts and experiences over longer periods are lacking.

72.4.4 Practical Aspects

The heterogeneity in the eating behavior of patients with obesity requires a problem-oriented, patient-centered nutritional counseling and—depending on the individual case—additional support from behavioral therapists. This is especially true for patients with indications of a binge-eating syndrome (Chap. 5). Restrictive guidelines, as practiced in conventional nutritional counseling for a long time, are no longer justifiable in view of the broad corridor of secured nutritional medical treatment options. This gives the therapist and patient greater scope for action and thus better chances for long-term therapy success, not least because the eating habits and preferences of the patients can be taken into account more strongly.

In view of the rapidly changing eating habits in the population with a growing proportion of always available “convenience” foods and a strong trend towards “eating out”, take-away or meal delivery, every counseling session should also aim to show the patient attractive alternatives that meet their taste preferences and ultimately their lifestyle and are useful for weight management. Suitable nutrient tables or apps for smartphones can provide valuable support.

Simple rules, such as appropriate portion sizes, no snacks between main meals, general avoidance of sugar-sweetened beverages, and lower-energy preparation of meals, can make significant contributions to maintaining or reducing body weight. By skillfully selecting primarily lower-fat foods and increasing fiber intake, an energy saving of 500–600 kcal/day can be achieved without restricting food quantities and thus ensuring good satiety (Sect. 72.3.4).

72.5 Long-Term Weight Stabilization and Relapse Prevention

The long-term results of any form of dietary obesity therapy depend crucially on the long-term care concept (Chap. 69). Since energy expenditure decreases during weight reduction (Leibel et al. 1995), energy intake must be permanently reduced, otherwise a weight regain is inevitable. The long-term results of obesity therapy to date are unsatisfactory: up to 80% of participants in weight loss programs experience a weight regain, usually to their initial weight. Evaluations of the National Weight Control Registry and other similar registries show that a low-fat diet avoiding fast food, as well as high physical activity, are suitable for preventing or limiting weight regain (Paixao et al. 2020). Successful long-term weight loss is generally possible with a low-carbohydrate diet, but is practiced by only a minority of successful long-term weight losers (Phelan et al. 2007). Regular self-monitoring of body weight is also an effective strategy for preventing weight regain (Vanwermel et al. 2008).

72.6 Nutritional Therapy in the German Healthcare System

The possibilities for guideline-based care of individuals with obesity are severely limited in the German healthcare system. Nutritional counseling is not part of the mandatory services provided by health insurance companies and therefore takes place only to a completely insufficient extent. Furthermore, there is only a very limited range of outpatient weight loss programs, for which health insurance companies cover the costs upon request (Chap. 69). This means that there is a fundamental lack of suitable structures and adequate funding in Germany to offer modern nutritional therapy to the necessary extent. This is an important reason why many people with obesity and a desire for

weight loss resort to questionable and untrustworthy offers outside the healthcare system.

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Treatment of Obesity—Sports and Physical Activity

73

Petra Platen

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Human evolution has always been accompanied by a physically active lifestyle and a diet consisting mainly of vegetables and wild fruits, with occasional meat consumption. Since our genes have not changed significantly in the last 50,000 years, many of today's chronic diseases, including obesity, can be explained by the maladaptation of our genetic makeup, adapted to hunting and gathering, to our current lifestyle characterized by inactivity and overnutrition.

The lifestyle in modern industrialized nations is characterized on the one hand by low calorie expenditure due to low physical activity, and on the other hand by the intake of an inexpensive, highly calorie-dense diet, which often results in

a positive energy balance, inevitably leading to obesity if persistently maintained. The extent to which a reduction in daily physical activities or an increase in daily calorie intake each contribute to the currently rapidly increasing obesity prevalence is not clearly distinguishable. However, recent studies clearly show that both aspects play a significant role.

► **Important** A main reason for obesity is the contradiction between human genetic makeup on the one hand and today's lifestyle (inactivity and over-nutrition) on the other hand.

In these contexts, the consideration is that the primary therapeutic approach to reducing obesity must be to achieve a negative energy balance. This can be achieved in principle either by reducing calorie intake through diet or by increasing calorie expenditure through physical activities, or a combination of both measures.

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73.1 Effects of Sports and Physical Activity in Adults with Obesity

73.1.1 Effects on Body Weight, BMI, and Body Fat Percentage

There is strong evidence from epidemiological studies that physical activity—at least in the general population—either alone or in combination with calorie-reduced diets contribute to a reduction in body weight and BMI. However, these measurements are only indirect and not always sufficiently accurate indicators of body fat percentage. For example, trained athletes with a large muscle mass may have body weight and BMI values that are classified as obese, even though their body fat percentage is very low. Accurate measurements of body fat percentage are not practically feasible in large epidemiological studies, so assessments are limited to measuring or inquiring about body height and weight. Since the reduction in body weight under physical training can be achieved predominantly through a reduction in body fat percentage and less through an (undesirable) decrease in fat-free (muscle) mass, as is the case with diet alone, effects of physical activity on fat mass are likely underestimated compared to pure diet effects.

73.1.1.1 Combination of Diet and Physical Activity

The greatest reduction in body weight can be achieved through a combination of calorie-reduced diet and increased physical activity, as a recent summary of various reviews has shown. A sports or activity program alone without further dietary measures leads on average to a reduction in body weight and/or BMI of “only” about 2–3% in non-closely monitored intervention programs. However, closely monitored intervention programs can achieve similar weight loss to diet interventions alone. In a well-controlled study, an average reduction in body weight of about 7.5 kg in three months

was achieved by increasing calorie expenditure by approximately 700 kcal/day while maintaining the same diet. This calorie expenditure was achieved with about one hour of intense, supervised physical activity per day.

The extent of achievable effects through physical training also depends on genetic factors. There are probably “responders” and “non-responders” here as well. In a large twin training study, the variance for training effects on body weight between twin pairs was 7 times higher than within the pairs.

In the long term, body weight will only stabilize at the lower level achieved after a training intervention program if such a training or activity program is continuously maintained.

- **Important** Physical activity must be integrated into daily life as a lifestyle change.

73.1.1.2 Reduction of Visceral Fat Mass

From a health perspective, visceral body fat is particularly detrimental. Therefore, it is especially important in the therapy of obesity to achieve a reduction of this metabolically active tissue through lifestyle changes and/or other measures. In fact, body weight and visceral fat content can be reduced, particularly through the combination of aerobic exercise with calorie reduction in the diet. Aerobic exercise alone can reduce visceral fat mass, even if no decrease in body weight can be demonstrated. No positive effects on visceral fat mass can be achieved through strength training alone or in combination with endurance training.

- **Important** A positive effect on visceral body fat mass in individuals with obesity is achieved primarily through the aerobic component of sports therapy programs. Strength training alone has no or only minor effects in this context, even when combined with endurance training.

73.1.2 Effects on Cardiovascular and Metabolic Performance

- **Important** Many studies have shown that regular physical activity and sports lead to an increase in overall physical performance. This also applies to obese individuals.

Performance improvements can also occur when the training program is not simultaneously associated with weight loss. In a differentiated view, training effects can also be achieved for individuals with obesity in various components of fitness, such as cardiovascular performance, muscle strength, and metabolism, with an improvement in so-called “aerobic performance” having the highest health relevance. Improved performance is also associated with an increase in quality of life through positive influences on general mood, self-confidence, and coping with activities of daily living.

In cross-sectional studies, aerobic performance is closely associated with the current level of physical activity, although other factors such as age, gender, health status, and genetic disposition play a role.

Aerobic performance can be assessed as an objectively measurable parameter, for example, in the context of bicycle ergometer stress tests. It is a more accurate parameter than the sole subjective assessment of fitness and activity levels when associations between a physically inactive lifestyle and negative health effects are to be demonstrated.

73.1.3 Effects on Cardiovascular and Metabolic Risk Factors and Overall Mortality

Both physical inactivity and obesity are widespread and each, both individually and independently of each other, are associated with an increased risk of chronic diseases, impaired functionality, and mortality. In a large longitudinal study of men, it was shown that physically inactive individuals with overweight have a

much higher overall risk of death than active individuals with overweight. In this study, the risk of death for active individuals with overweight was even lower than that of inactive non-overweight individuals. The lowest overall risk was found in active, non-overweight men. The “obesity paradox,” which describes a lower mortality rate for more obese individuals compared to less obese individuals in various diseases such as coronary heart disease, can only be detected in people with low physical fitness according to the latest findings. This phenomenon does not occur in individuals with higher fitness levels.

The more physically active a person is, the lower the risk of chronic diseases such as diabetes mellitus and hyperinsulinemia, arteriosclerotic cardiovascular diseases, cancer, lipid metabolism disorders, and hypertension. Sports and physical activity can positively influence almost all cardiovascular risk factors even without simultaneous reduction of body weight. It is particularly noteworthy that people with higher aerobic fitness have a lower abdominal fat content, which is considered particularly metabolically unfavorable, at the same BMI level.

- **Important** Regular and sufficiently extensive physical training changes the metabolism of people with obesity from a metabolically unhealthy state to a metabolically healthy state, regardless of changes in body weight or body fat mass.

The genetic makeup of modern humans, which developed due to the living conditions of hunter-gatherers in the Stone Age and long before, favors the intramuscular storage of triglycerides and transient insulin resistance with simultaneously increased plasma fat levels during times of food shortage. This metabolic situation ensured both the supply of vital glucose-dependent organs such as the brain with sufficient blood glucose and the energetic supply of the muscles with fatty acids as fuel for physically demanding hunting during periods of food shortage. This physiological and transient insulin resistance can be normalized by physical activity and the

resulting decrease in intramuscular triglycerides as well as food intake (with normal body weight or body fat percentage). In today's individuals with obesity, chronically elevated blood fat levels also lead to an increase in intramuscular triglycerides and insulin resistance, which persists if an adequate level of physical activity is not achieved. These relationships underline the importance of endurance exercises with a sufficient level of fatty acid oxidation to reduce intramuscular triglycerides in the therapy of obesity and the importance of sufficient body fat mass reduction to lower blood lipid levels and thus subsequently reduce intramuscular triglyceride storage. Both measures thus have a favorable effect on a diabetic or prediabetic metabolic situation and lead to a risk reduction of cardiovascular diseases. In the long term, a high level of physical fitness seems to be more important for health in the presence of obesity than a sole reduction in body weight.

- **Important** From a health perspective, both a physically active lifestyle and a body weight or body fat percentage within the normal range should be aimed for, according to current knowledge.

73.2 Gender-Specific Aspects of Sports and Physical Activity in Obesity

For at least a century, it has been known that sex hormones influence metabolism. Nevertheless, there is little detailed, reliable knowledge about the specific effects of the menstrual cycle, hormonal contraception, and menopause on many aspects of energy expenditure and substrate utilization in the context of the development and treatment of obesity. One study suggests that a diet/exercise intervention tailored to the phases of the menstrual cycle may lead to potentially higher weight loss compared to a non-cycle-phase-based intervention.

73.3 Effects of Sports and Physical Activity in Children with Obesity

Physical activity is a complex multidimensional behavior that is particularly difficult to quantify in children and adolescents. The methodological problems of recording are mainly in children under 10 years of age because their everyday life often consists of spontaneous, unstructured activities. Young children are not able to accurately record everyday activities or assign activities to specific time periods. The data from questionnaires on physical activity are therefore hardly usable. It is therefore not surprising that there are only a few studies for this age group that have investigated the relationship between measurements of physical activity and body fat percentage.

Studies that have objective measurement methods of activity levels are mostly designed as cross-sectional studies and compare the activity levels of children with normal weight and children with overweight. However, a causal relationship between physical activity and existing obesity cannot be reliably established. The few prospective studies conducted focus on pre-pubertal children and show inconsistent relationships between the extent of physical activity and the development of overweight.

It is certain that watching television, playing video and computer games, and the associated absolute physical inactivity are the dominant leisure activities for today's children and adolescents. In addition to television consumption and inactivity, however, other confounding factors, such as eating energy-rich snacks in front of the television and receiving advertising messages for energy-rich foods, must be added to promote the development of obesity in children and adolescents.

Meta-analyses of the success of diet and exercise intervention programs in the treatment of obesity in children and adolescents have shown that the highest effects were achieved through combination programs, consisting of

sports and diet interventions. However, a reduction in body fat percentage can also be achieved through exercise intervention alone.

- **Important** The available facts are sufficient to recommend movement, physical activity, and sports, especially in terms of long-term, long-lasting success, as a necessary part of therapy and prevention of obesity in childhood and adolescence.

73.4 General Recommendations for Physical Activity and Health

In their basic principles, the general recommendations for people with overweight regarding physical activity do not differ from the general recommendations for healthy, normal-weight people. Therefore, these recommendations are described below.

73.4.1 Recommendations for Adults between the Ages of 18 and 65

All healthy adult individuals between the ages of 18 and 65 should engage in at least 30 min of moderate-intensity aerobic exercise or 20 min of higher-intensity aerobic exercise on five days per week. A combination of moderate and higher-intensity aerobic exercises is also possible.

For example, this can be achieved by brisk walking (moderate) for 30 min twice a week, combined with 20 min of jogging (higher intensity) three times a week. Moderate exercise is characterized by a noticeable increase in heart rate. Such exercises can also be accumulated from various continuous 10-min phases. Higher-intensity aerobic exercises, in the sense intended here, lead to noticeably faster breathing and a very clear increase in pulse. These aerobic activities should be performed in addition to low-intensity or shorter than 10-min daily life activities.

In order to maintain or achieve good health and independence, adults should, in addition to aerobic exercises, perform activities twice

a week that lead to an increase or maintenance of muscle strength and endurance. Specifically, 8–10 exercises that include all major muscle groups should be performed on two non-consecutive days of the week. To achieve optimal effects, a resistance (weight) should be chosen that allows for just 8–12 repetitions of each exercise execution until fatigue. Such muscle-building activities include, for example, weight training programs, exercise programs with additional weight load, stair climbing, and similar activities with high resistance and the use of large muscle groups.

Those who regularly practice more activities than the described endurance and strength components in their daily lives benefit additionally from positive health effects and a further increase in performance.

73.4.2 Recommendations for Older Adults and Adults with Chronic Illness

For healthy older adults aged 65 and over and for adults aged between 50 and 65 years with chronic diseases and functional limitations affecting physical mobility, general performance, or resilience, the following recommendations apply regarding aerobic activities and strength training.

To maintain or optimize health, older adults should perform 30 min of moderate exercise 5 times a week or 20 min of more intense exercise 3 times a week. Combinations of these activities are also possible. The intensity is determined based on the individual's current performance level. Moderate intensity on a scale of 0 (absolute rest) to 10 (absolute exhaustion) is about 5–6 and leads to a measurable increase in breathing and heart rate. More intense exercise is in the range of 7–8 and leads to pronounced increases in heart rate and breathing. These exercises should be performed in addition to other moderate or somewhat more intense activities of daily life lasting less than 10 min.

In addition to these aerobic exercises, older adults should perform exercises that maintain

or even improve muscle strength and endurance at least two days a week. The same recommendations apply as for younger adults, except that the resistance should be somewhat lower, allowing for about 12–15 repetitions of each exercise until fatigue.

Older adults also benefit from additional physical activities through a further increase in performance and additional health effects. In the case of chronic diseases, the exercises should be adapted to the individual's resilience.

To maintain the necessary flexibility to perform the described minimal activities and daily life stresses, older adults should perform flexibility exercises for at least 10 min at least twice a week.

To prevent falls, older adults should also regularly perform exercises that train balance.

73.4.3 Recommendations for Children

Movement and play are the basis for the development of sensorimotor skills and for healthy intellectual, social, and personal development in childhood. Movement is necessary for an optimal cognitive development in children. The stimulation in the first years of life influences the development of neural connections and thus the maturation of the brain. A one-sided focus within the school on educational content at the expense of physical activity does not seem justified, as studies show that mental and physical performance are related. Thus, good and poor students differ not only in their school performance but also in their coordination abilities.

The deterioration of condition as well as weaknesses in the area of coordination are reported by sports teachers, but are also confirmed by the results of federal youth games. The motor performance of children has decreased by 10% in the last 25 years. Based on movement diaries, an average primary school child today shows the following activity:

- 9 h of lying,
- 9 h of sitting,
- 5 h of standing,
- only 1 h of movement.

Children need an environment that accommodates their natural urge to move and brings joy. Restriction and avoidance of movement opportunities inevitably lead to failures due to poorly developed motor skills, even more so in children with overweight. Resignation or aggressive defense sets in. The avoidance attitude causes a permanent change in the energy balance and further fat accumulation through increased lack of movement. The greater the body fat percentage, the more difficult every movement becomes: a vicious cycle.

- **Important** Current recommendations state that at least 60 min of moderate to strenuous activity per day, characterized by enjoyment of movement and varying activities, is necessary for children.

The importance of school sports is repeatedly emphasized, and there is no doubt that physical education can inspire children for sports activities. In addition, general motor skills can be taught in physical education. However, the benefit of school sports for daily activity is not clear. A study of 9-year-old children showed that despite large differences in the number of sports hours in different schools, the overall activity of the children was the same. Children who participated in few sports hours compensated for this with greater activity outside of school.

73.5 Concrete Recommendations for Physical Activity

73.5.1 Recommendations for adult Adults with Obesity

In principle, the recommendations given above for healthy people of different age groups also apply to individuals with obesity. These statements are supplemented below by concrete aspects for people with obesity.

Before starting a sports program, a sports medicine health examination should be carried out

to assess the cardiovascular risk profile and, if necessary, adapt the program to the individual's resilience.

To achieve stabilization or even a reduction in body weight, significantly more activities than the above-described minimum program are likely to be necessary in order to achieve a significant negative energy balance.

Some studies suggest that a **daily duration** of between 60 and 90 min of moderate activities is required to stabilize the achieved lower body weight in the long term after a period of weight loss. In a study in women with overweight, a weight loss of 13 kg over 18 months was stabilized with an exercise program of more than 280 min/week (40 min daily, 7 days/week). People with obesity who manage to implement a more extensive sports program are usually also more active in their everyday activities and thus achieve an additional calorie deficit.

- ▶ **Important** For individuals with obesity, a program that includes 200–300 min per week or more than 2000 kcal energy expenditure is recommended. Previously untrained individuals should be gradually introduced to these exercise volumes.

The **exercise intensity** for sports programs aimed at weight loss should be high enough to achieve a significant caloric expenditure. Intensities of 55–70% of maximum heart rate are recommended. Higher intensities may achieve better long-term effects. However, the overall calorie turnover achieved seems to be most significant. In a well-controlled intervention study, weight reductions after 24 weeks in women with overweight were identical if they had achieved the same caloric expenditure in different combinations of volumes and intensities.

- ▶ **Important** The less intensively an exercise is performed, the longer the duration must be.

Intermittent activities that are accumulated throughout the day are probably not as success-

ful in terms of weight loss effects as continuous exercise forms. Nevertheless, **intermittent exercises** spread throughout the day can be strategically helpful for sports beginners with obesity to get used to an increasing duration of training stimuli.

Also, **activities of daily living** play a role in the overall calorie balance and can contribute to an increase in performance and improvement of health-relevant factors. Therefore, individuals with obesity are advised to be as active as possible in their daily lives to achieve at least moderate intensities. However, an increase in everyday activities alone is probably not sufficient for weight loss and must at least be combined with a diet program.

Weight-bearing or strength training forms lead to an increase in muscle strength and muscle mass (fat-free body mass). Since muscles are metabolically active tissue, it has been assumed that weight training programs are particularly beneficial for individuals with obesity, as they are assumed to reduce or even completely prevent a diet-related decrease in muscle mass and thus basal metabolic rate. However, current studies do not provide evidence for these assumptions. In well-controlled weight reduction intervention studies with individuals with obesity, additional strength training did not result in an increase or maintenance of muscle mass, stabilization of resting metabolic rate, or an additional reduction in body weight.

- ▶ **Important** Strength training programs are not superior to conventional endurance programs. However, they can lead to an improvement in everyday performance (getting up from a chair, climbing stairs, etc.) in very weak individuals.

73.5.2 Recommendations for Children and Adolescents with Obesity

At the beginning of an exercise program, weight-supporting activities such as swimming and cycling should be included, as well as ac-

tivities that can be integrated into the lifestyle, such as climbing stairs. The intensity is unimportant in the initial phase.

The goal should be for children to stay active for at least 30–45 min. Endurance exercises are not very child-friendly; more appealing are alternating loads in a playful form. Musical-rhythmic accompaniment can be stimulating.

It must be achieved that movement is associated with fun and joy; it should be avoided that children shy away from physical demands due to their reduced performance and discontinue the program. It is important to consider the respective age and different preferences of boys and girls in the exercise program. Only when these goals are achieved and the motivation is sufficient can the requirements be adapted to increased performance, with a wide variety of sports and movement options available. A recommendation must take into account what is desirable and what is feasible and can be:

- physical activity of moderate intensity and lasting more than 30 min on 3–5 days a week;
- in the long run, if possible, be moderately active daily for 45–60 min;
- if motivation is strong, a longer program is more favorable.

The exercise program should not be one-sided but should be diverse and focus on endurance training, while also considering strength training. Exercises for general mobility and coordination should not be forgotten, especially for individuals with severe obesity. In the long run, a flexible program will prevail.

It is important to make the entire daily routine more active. Everyday routes, such as the way to school, should be covered on foot or by bicycle. Instead of using elevators or escalators, stairs could be used. Reducing television time and computer games is also essential. It is often observed that particularly strenuous exercises are chosen in an effort to “burn calories.” It is disadvantageous if these exercises cause hunger, which is then indulged. It should also be avoided that thirst is quenched with sweetened drinks. It is important to control the program in

such a way that motivation for physical activity is promoted. The selection of various sports and exercises should take into account different preferences of the respective age and developmental stages and gender and be flexible to change. Considering trendy sports can be motivating.

- **Important** Any regular physical activity is more important than a predetermined exercise program that may be discontinued.

In the long term, physical activity can more effectively prevent possible weight regain in children and adolescents with obesity than diet. Therefore, normalization or stabilization of body weight is best achieved through a combination of physical activity and diet. Physical activity is part of every therapy or prevention program, more in the sense of an everyday increase in activity than through sports courses or physical education in school.

Conclusion

Many chronic diseases, including obesity, can be explained by the maladaptation of our genetically predisposed movement-based traits to our current lifestyle, which is characterized by inactivity and overnutrition.

Regular physical activity and sports lead to an increase in physical performance. This also applies to individuals with obesity. Moreover, they are capable of positively influencing almost all cardiovascular risk factors and improving quality of life without simultaneous weight loss. Therefore, physical activities should be integrated into daily life as a lifestyle change.

For adults with obesity, a program that includes 200–300 min per week or more than 2000 kcal energy expenditure is recommended for weight loss or improvement of their metabolic situation. Previously untrained individuals should be gradually introduced to these exercise volumes.

Movement and play are necessary for healthy intellectual, social, and personal

development in childhood. Children need an environment that accommodates their natural urge to move and brings joy.

In children and adolescents with obesity, normalization or stabilization of body weight is best achieved through a combination of physical activity and diet. Therefore, physical activity is an essential part of any therapy or prevention program, especially in terms of increasing everyday activity. The goal should be for children to remain active for at least 30–45 min, with varying loads in a playful form being preferred.

- **Important** The large, pandemic problem of “obesity” can only be managed through consistent changes in movement and eating behavior. Efforts at all societal levels are required for this.

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Approaches to Eliminating Obesogenic Environments

74

Sven Schneider and Bärbel Holzwarth

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74.1 Background

Lack of physical activity and malnutrition are spreading endemically worldwide. The resulting “obesity epidemic” now represents a central health problem, especially in Western industrialized nations (Benecke and Vogel 2013; Devaux and Sassi 2013). In this handbook, various chapters point to the influence of genetic predisposition on the development of overweight. Nevertheless, the drastic increase in obesity prevalence in recent decades suggests an also relevant influence of other, specifically external factors, which are likely to interact with said

genetic factors (Robert Koch Institute 2019). Unlike genetic makeup, there has been a rapid development in our living environment regarding tertiarization, automation, mechanization, and food production during this period (Kirk et al. 2010; Huybrechts et al. 2011). Therefore, it makes sense to take a closer look at the importance of environmental factors in obesity-specific explanatory models and intervention planning.

Overweight results from an imbalance between energy intake and energy expenditure (Powell et al. 2010). For decades, biomedical therapies and educational intervention programs (such as diets and exercise programs) aimed at individually balancing these two influencing factors dominated (Lake and Townshend 2006; Müller and Kurth 2007). The simplified message “move more, eat less” (Parise 2020) has not been able to curb the obesity epidemic at the population level to date (Muckelbauer et al. 2011). Therefore, the biomedical paradigm, which focuses primarily on genetic and biological influences, has increasingly given way to the

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public health paradigm, which places the context of obesity development at the center (Müller and Kurth 2007; Igel et al. 2013).

74.2 Conceptual Definitions: Definition of Obesogenic Environments

The term “obesogenic environment” (German-language counterpart “adipogenic environment”) was coined in the late 1990s, particularly by Swinburn and colleagues: It refers to the sum of all influences from the environment, opportunity structures, and living conditions on the development of overweight (Swinburn et al. 1999). Obesogenic environments particularly promote unhealthy eating habits and physical inactivity (Hill et al. 2003). They thus encompass geographical, technological, economic, normative, and attitude-specific aspects (Gauthier and Krajicek 2013). Obesogenic environments are significant for children and adolescents as well as adults. However, the relevant characteristics can have very different effects for each age group: Due to their dependence on third parties, limited mobility, and restricted decision-making freedom, children and adolescents can only select, influence, or leave their environments to a limited extent (Gauthier and Krajicek 2013). In comparison, adults can move better within and between different environments (e.g., the workplace, the apartment, etc.) and thus avoid negative, health-relevant influences more easily.

74.3 Systematization of Obesogenic Environments

Obesogenic environments are commonly systematized according to size, dimensions, and impact (Kirk et al. 2010). In terms of size, the literature predominantly refers to the micro level when local environments are the focus of consideration. Local environments are also referred to as settings. For children and adolescents, the

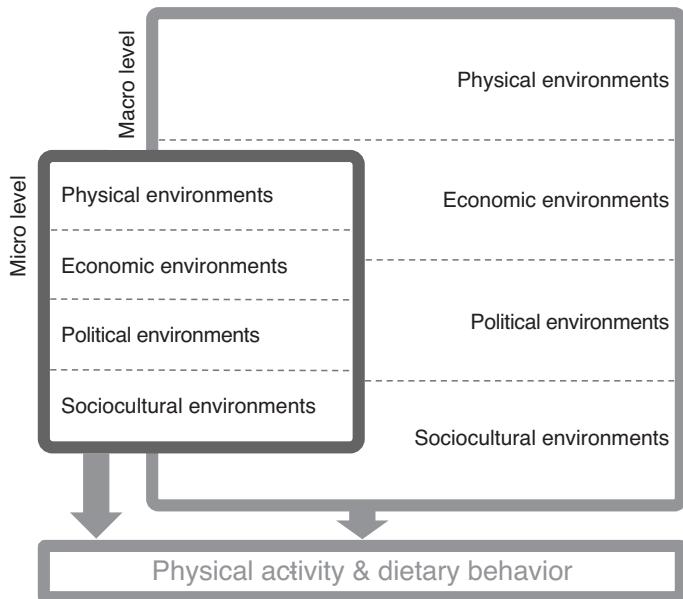
classic primary (family home), secondary (kindergartens and schools), and tertiary (sports clubs, etc.) socialization instances form these typical settings. For adults, typical settings can be the apartment, workplace, or local infrastructure with its shops, transportation, and recreational facilities (Swinburn et al. 1999; Gauthier and Krajicek 2013). Settings are largely geographically limited, comparatively small-scale, and influenced by the people present there (Kirk et al. 2010).

The environments operating at the macro level are called sectors. These include, for example, the economic, educational, and health systems, political framework conditions, mobility and transport sector, food, media, and sports industries, as well as societal norms, values, and cultures (Swinburn et al. 1999; Gauthier and Krajicek 2013). The conceptual model presented here for the first time in Fig. 74.1 is intended to illustrate that the supra-regional macro level influences the local micro level and both, in turn, affect the living conditions of individuals (Fig. 74.1). This model is thus compatible with the social-ecological approach of public health (Sallis et al. 2006).

Settings and sectors have physical, economic, political, and sociocultural dimensions (Kirk et al. 2010). Guiding questions for capturing and systematizing are: What is available? What does it cost? What (formal) rules apply? What (informal) cultures prevail? We have adopted this systematization by Swinburn and colleagues (Swinburn et al. 1999) in Fig. 74.1 and differentiated it according to specific obesogenic environments for dietary behavior (food environment) and physical activity (physical activity environment).

At the local level of settings, obesity can thus be influenced by the physical environment on the one hand. The physical environment, in turn, comprises natural and artificially created aspects. Physical activity depends, among other things, on traffic density in the residential area, the presence of movement opportunities (playgrounds, soccer fields, green spaces, and jogging

Fig. 74.1 Obesogenic environment—Exemplary systematization of potential influencing factors on overweight at micro and macro levels



trails), and the walking and cycling path network. Regarding one's own nutrition, the supply in regional, stationary retail and gastronomy is relevant. For children and adolescents, catering in daycare centers and schools (presence of a kitchen or cooking facility, a caterer, or a cafeteria) and for adults, the offer at study, training, and workplaces (e.g., canteens and gastronomy near the workplace) is significant.

At the same time, the economic environment also influences movement and nutrition-specific decision-making processes (e.g., entrance fees to parks and swimming pools, prices of local public transport, parking fees, membership fees for sports clubs, and the price structure in cafeterias and canteens).

Furthermore, the political environment also plays a role in one's own health behavior. For adults, examples include official usage restrictions for green spaces, access to green spaces and sports facilities for the possibilities of engaging in sports, and local traffic regulations (access restrictions, pedestrian zones, parking bans) for the choice of means of transportation. For children and adolescents, access to playgrounds and sports fields, such as opening

hours, and institutional or family regulations (e.g., the school's house rules or family rules on TV consumption, media use, and shared meals) are mentioned analogously.

Within the mentioned settings, the sociocultural environment, i.e., among other things, the implicitly shared values and norms, also plays a relevant role. These influencing factors manifest themselves, among other things, as the neighborhood, company, or school climate and as the subjective safety in the residential environment.

The physical, economic, political, and sociocultural environments at the micro level are determined, shaped, or at least influenced by the influences at the macro level (Table 74.1). In addition to natural influences, governments and other state institutions, markets (e.g., the food and sports industry), and the so-called "third sector" (non-profit organizations, non-governmental organizations (Schneider and Holzwarth 2020) are distinguished. These sectoral structures exist by definition at the supra-regional level and can gain different relevance depending on the setting.

In the area of the physical, in this case the natural environment, climate has an influence on

Table 74.1 Obesogenic environments—Systematization of potential influencing factors of movement and nutrition at micro and macro levels

		Physical environments	Economic environments	Political environments	Socio-cultural environments
Micro level (settings)	Movement	Walkability Crossing aids Sidewalk and bike lane network Traffic density Elevators and stairs parks and playgrounds	Pricing models in public transport membership and social contributions for sports clubs transport Admission fees for swimming pools, indoor playgrounds and parks	Local driving bans Regulations on pedestrian zones Restrictions on use of playgrounds and sport fields (e.g., in common property) Sports facility planning	Crime Perception of safety Trust Social networks
	Exercise & Nutrition	Connectivity Infrastructure Microclimate, topography and vegetation	Economic status of parents Pocket money availability	Institutional rules Family rules (e.g., on TV consumption, media use, eating together)	School climate Guiding principles Role model function of teachers, parents and peers
	Nutrition	Quantity, quality, accessibility and opening hours of the offers of e.g.: o Gastronomy o Retail o Canteens o Kiosks o Snack vending machines	Pricing models in canteens and cafeterias Price structure of e.g. kiosks and supermarkets	Water dispensers in schools Quality standards for catering in schools and daycare centers Informal rules (e.g., on break times, content of breakfast boxes)	Regional and family food culture Preferences and cooking skills within the family and among peers
Macro level (sectors)	Movement	Traffic route structure Sunshine hours Summer and Winter time regulations	State or institutional funding for physical activity programs Supraregional, sport sponsoring Fuel prices	Supraregional traffic planning Urban planning law and building regulations Road traffic regulations	Movement culture Trend sports (e.g. inline skating, e-biking, snowboarding and skateboarding)
	Exercise & Nutrition	Climate vegetation spectrum	Supraregional prevention programs and interventions Social inequality	Country-specific curricula (e.g. on physical education and home economics)	Child-friendliness Mass media role models Beauty ideals and body images
	Nutrition	Area-wide offers (e.g. children's meals in system gastronomy)	Lobbying of the food industry Food production conditions	Taxes (e.g. fat and sugar tax) Food labels (e.g. nutritional labelling system) Subsidy policy	Food traditions Drinking and table culture

our movement and eating behavior. For example, an increase in extreme heat periods due to climate change generally limits outdoor sports activities. At the macro level, economic structures also form the framework for our local actions. A high gasoline price, for example, favors the switch to alternative mobility options such as cycling or walking. The price level of sustainably and ecologically produced food promotes health-conscious shopping behavior. At the political level, structural preventive measures such as the introduction of a sugar tax, a nutritional labelling system, or effective standards for species-appropriate husbandry form the framework for the quality of locally available food offerings. And finally, cultural changes take place at the macro level. This refers, for example, to the emergence of new and trendy sports (such as popular running events, inline skating, or e-bikes) as well as developments in drinking and eating culture (functional food, organic products, vegetarianism, and veganism).

74.4 Empirical Findings on Obesogenic Environments

Within this young research direction, initial unsystematic and systematic review articles on the state of research, intervention possibilities, and operationalization instruments have now been published (Larson et al. 2009; Kirk et al. 2010; Mackenbach et al. 2014; Fisberg et al. 2016; Martínez-García et al. 2019). These show a broad heterogeneity regarding the research question, methodology, and findings (Larson et al. 2009; Mackenbach et al. 2014). Mackenbach et al. conclude that although it seems intuitively plausible that environmental conditions contribute to the obesity epidemic, the existing scientific evidence is neither consistent nor convincing (2014). The mentioned reviews also show that the vast majority of

previous studies come from the USA (Lake and Townshend 2006; Lakes and Burkart 2016; Martínez-García et al. 2019). This raises the question of the generalizability of the findings to European countries, as US-American conditions may only be partially transferable to the local context. For example, historical urban structures are typical in Europe and difficult to compare with urban planning in the USA.

It appears that this research gap in Germany is only slowly being filled with interdisciplinary empirical studies. The current evidence-based S3 guideline of numerous professional societies for the therapy and prevention of obesity in childhood and adolescence exemplifies that the complex influence and the manifold intervention opportunities of obesogenic environments have not yet been sufficiently recognized: In this extensive and interdisciplinary guideline, the term “adipogenic environment” does not appear even once. Only in a subordinate clause is there a mention of the “adipogenic living environment” (Arbeitsgemeinschaft Adipositas 2019).

74.5 Methodological Challenges in the Study of Obesogenic Environments

Worldwide, and particularly in Germany, the study of obesogenic environments is still in its infancy. Given the multifactorial etiology of overweight and the complexity of the explanatory approach presented here, at least the following methodological challenges arise for analytical studies of contextual determinants and for the evaluation of contextual interventions:

74.5.1 Distinction between Objective and Subjective Aspects

Objective aspects of a living environment can be perceived subjectively differently by the individuals living there. Empirical findings show that residents who subjectively classified their environment as less walkable, even though this was not objectively the case, had lower

physical activity and higher BMI values than residents whose perception was more in line with the objective indicators (Gebel et al. 2011). Methodologically, such evaluation processes must be considered as mediator effects (Kremers et al. 2006). In addition, moderator effects must be taken into account, as not every environmental influence is likely to have the same effect on every individual. We have illustrated these methodological considerations in detail elsewhere (Bucksch and Schneider 2014).

74.5.2 Distinction between Compositional and Contextual Effects

Most of the previous findings on contextual influences on overweight and obesity result from correlational studies and are not to be interpreted causally (Parise 2020). After all, regional or local differences in the prevalence of overweight and obesity do not always have to result from influences of obesogenic environments. Individual characteristics can also simply cluster in certain living environments. In this case, regional or local prevalence differences are not caused by environmental factors (i.e., contextually determined), but are merely a consequence of the population composition (i.e., compositionally determined). For example, if segregation effects cause some spatial units of a city to have a higher proportion of senior citizens than others, lower sports and movement prevalences there may be based on a compositional effect that merely reflects the generally lower physical activity of older people.

Conclusion

The rapid change in our living environments has created an ever-increasing imbalance in the metabolism of large segments of the population (Huybrechts et al. 2011), although a genetic determination of overweight is undisputed (Wardle et al. 2008). In our everyday life, on the one hand, hardly any physical

activity is required, and on the other hand, food is cheap, energy-rich, and ubiquitously available (Huybrechts et al. 2011). Therefore, the identification of obesogenic environments, i.e., contextual causes at the micro and macro levels, appears to be an innovative approach to explanation and intervention planning.

Although the relationships identified so far between context factors and weight-specific risk factors may appear weak and their empirical explanatory contribution may seem small at first glance, their preventive relevance may still be considerable: After all, the environments surrounding us constantly, and in the long term, affect not only individuals but also large population groups (e.g., cycle paths, sports fields, quality standards; Baar et al. 2013; Bucksch and Schneider 2014; Mackenbach et al. 2014). We conclude that curbing the obesity epidemic will continue to be unsuccessful without interdisciplinary consideration and concerted interventions at the micro and macro levels.

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Behavioral Therapy for Obesity

75

Andrea Benecke

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“Behavior modification” is one of the central components of overweight and obesity therapy. In all relevant guidelines, changing behavior, specifically in terms of nutrition and physical activity, is described as a fundamental intervention. Behavioral therapy strategies, such as stimulus control strategies, have also found their way into nutrition counseling and advice on increasing physical activity. To be distinguished from this is the behavior therapy of obesity as a psychotherapeutic intervention, which is responsibly carried out by a psychotherapist.

75.1 Historical Overview

Behavioral therapy strategies have been applied to obesity since the 1960s. The first approaches described at that time were derived directly from learning theory and had a significant weight loss as their central goal. Aversion techniques, token-economy programs, or covert sensitization for several weeks were used, with significant weight losses achieved in some cases, but these were not permanent. With the increase in the prevalence of overweight and obesity, weight loss programs were increasingly in demand and new developments from behavioral therapy research were adopted. Furthermore, the programs were extended in time; there are now offers that last for one year.

Another development boost resulted from the need to incorporate findings from neighboring disciplines. It was obvious that overweight had something to do with eating behavior, from which the conclusion was drawn to significantly restrict eating. However, it emerged that learning

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an eating behavior that is too restrictive has a rather negative long-term effect, so that today, a moderate calorie restriction is usually used, with no restrictions placed on food selection. In addition, it has become clear from various research activities in recent years that the development of healthy exercise behavior is essential for avoiding subsequent weight gain. Although recommendations on how much exercise per week and at what intensity are useful keep changing, there is no longer any doubt about the fundamental finding that exercise must be included in any long-term successful weight loss concept. In this respect, today's behavioral therapists must have more than just basic knowledge in the field of nutrition and exercise therapy in order to carry out meaningful and successful treatment programs, or they need to work together with specialists from these areas (Sect. 75.5). As part of the so-called third wave of behavioral therapy, elements of acceptance and commitment therapy as well as mindfulness-based therapy have also been integrated into the treatment of overweight and obesity. The efficacy of these interventions in combination with the proven cognitive-behavioral techniques has not yet been systematically evaluated. However, initial results demonstrate the efficacy of the new approaches.

- ▶ **Important** The goal of today's programs is to change behavior in the long term, as diets that are followed for a few weeks do lead to weight reduction, but usually result in rapid weight gain as soon as the diet is stopped.

The reason for weight gain after the end of a diet is that most people revert to old behaviors and resume their old eating habits again. Only a change "until the end of life" can lead to a weight loss that is also (more or less) maintained. However, this means that the desired behavioral changes must be integrated into everyday life and the basic needs of the patients must be taken into account. A life that is only

based on the calculated energy needs of the body will not be satisfactory, and a failure of this "sensible" path is preprogrammed. Since a cure for obesity (i.e., achieving normal weight) through behavioral therapy is rather unlikely (Sect. 75.4), goal clarification is of essential importance. Strategies for increasing social competence and self-esteem stabilization for an improved life with obesity/overweight also appear important for therapy.

75.2 Essential Components of Behavioral Therapy for Obesity

75.2.1 Psychoeducation

At the beginning of therapy, it is important to inquire about the patient's knowledge regarding the development and maintenance of obesity as well as their ideas and experiences related to the desired weight loss. Often, incorrect or unrealistic ideas are discovered that need to be addressed. Only when the patient has been provided with a solid basic knowledge of the essential relationships between genetics, metabolism, environmental influences, nutrition, exercise, psychological well-being, etc., can meaningful goals and strategies for therapy be derived. The focus is on a long-term lifestyle change, not on implementing a new diet with psychotherapeutic support. Patients typically find it difficult to let go of the diet mindset (i.e., "I'll restrict myself for a while and can then return to normal").

75.2.2 Agreement on Therapy Goals

The agreement on goals plays a crucial role in obesity therapy. Patients' goals (and sometimes therapists' goals) can range from a realistic improvement of mental and physical health to unrealistic expectations, such as finding the perfect life partner once the ideal weight is achieved. Unrealistic goals must be explored in

a supportive manner, but ultimately redefined so that they can be agreed upon as fundamentally achievable in therapy.

Patient and therapist should try to

- define common goals,
- agree on respective responsibilities,
- agree on realistic expectations regarding therapy success.

A weight loss of 5–10% of the original weight, maintained over a year, is considered successful by professional societies. However, many patients perceive this goal as disappointingly low. Nevertheless, the patient must realize that achieving this weight loss is by no means easy and requires a lot of effort and commitment. In addition to the number on the scales, it is essential to consider other expected improvements, such as

- improvement in metabolic values,
- improved sleep in the case of sleep apnea,
- improved endurance in activities of any kind, as well as
- increased self-confidence, etc.

This can prevent disappointment over a (not yet) achieved target weight from overshadowing all other positive changes. Goals should be specific, easily operationalized, and divided into short-, medium-, and long-term goals. Operationalizability is important so that the patient and therapist can clearly recognize when the goal has been achieved, as this must be rewarded (or “reinforced”). Initially, small goals should be formulated and targeted, which can be achieved quickly to strengthen motivation.

75.2.3 Self-Monitoring Behavioral Analysis

The focus of self-monitoring is on **nutritional** and **physical activity behavior**. Patients should document daily what they ate, when, and under what conditions. Likewise, they should

record when and under what circumstances physical activity took place. This is intended to sensitize patients to their behavioral patterns. The records are also used to identify modifiable environmental stimuli that contribute to overeating and reduced physical activity. In addition, the number of calories consumed can be determined more accurately. Some studies have shown that patients who regularly monitor themselves and document their behavior achieve better therapy outcomes than those who do not. Behavioral analysis refers to the preceding conditions, the consequences of behaviors, and their contingencies. This can identify conditions that facilitate a specific desired behavior or increase the likelihood of undesired behavior (this applies not only to nutritional and physical activity behavior but also to problem and goal behaviors such as social contacts, leisure behavior, etc.). **Dysfunctional thoughts** can also be recognized in this way (for changing these thoughts, see Sect. 75.2.5) as well as emotional states that lead to overeating. In addition, patients are sensitized to perceive positive and negative consequences, which should be divided into short-term and long-term consequences. Rapidly occurring consequences (e.g., feeling good immediately after eating chocolate) determine our behavior to a much greater extent than do later consequences (e.g., not reaching the weekly weight goal).

75.2.4 Stimulus Control

The self-monitoring sheets usually provide a clear picture of the triggers that determine eating and physical activity behavior. Actions are influenced, among other things, by the time of day, the sight of things, smells, places, situations, and thoughts. These influences can be used to increase the chances of changing behavior. The application of stimulus control strategies increases the likelihood of desired behavior and decreases the likelihood of undesired behavior.

Proven stimulus control strategies

- Eat at fixed times
- Always eat in the same place
- Only shop when not hungry
- Have as few food supplies at home as possible
- Keep sports shoes near the door
- Arrange to do sports with friends
- Do not eat while watching TV or using the computer

75.2.5 Cognitive Restructuring

Among the other antecedents of problematic eating and exercise behavior are also **dysfunctional thoughts** (e.g., “I had such a stressful day, I need a balance,” or “I haven’t lost a single gram, I’ll never make it, so I might as well eat like I used to”). The dysfunctional thoughts must be identified through self-monitoring sheets, their consequences analyzed, and then changed. Techniques such as Socratic dialogues, decatastrophizing techniques, the three-column technique, etc., are available for this purpose. The restructuring takes place with regard to the functional use of helpful thoughts and the development of strategies to help interrupt the behavioral chain that leads to unfavorable behavior early on.

The identification of distorted cognitions also relates to the following areas.

Areas of identification of distorted cognitions

Development of overweight

Deep-seated beliefs that could not be changed at the beginning through education must be changed through cognitive restructuring. One goal can be to establish a functional understanding of “blame” for being overweight. Both excessive self-blame and exaggerated trivialization of the reasons for the weight problem are not conducive to therapy.

Justification of eating behavior As already indicated, there are many reasons to eat. It seems essential to find alternatives to

emotionally induced eating. Since emotions are linked to cognitions, changing these cognitions can also change the emotions that lead to eating (see above).

Justification of exercise behavior Here, too, there may be dysfunctional higher-level plans that make it difficult to increase physical activity (e.g., “The day was exhausting enough”).

Self-image Self-efficacy beliefs regarding long-term successful weight loss are often weakly developed in many people with obesity due to repeated unsuccessful attempts to lose weight. These must be slowly rebuilt. Ideas of worthlessness and hopelessness are also often prevalent.

Body image Many people with obesity have a distorted body image, usually perceiving themselves as fatter and more shapeless than they actually are. Many avoid dealing with their body at all, do not look at themselves, do not touch themselves, and do not dare to impose themselves on other people. Therefore, problems in sexuality are not uncommon. In therapy, it is often important to deal with one’s own body (lovingly) and learn to accept it (e.g., through mirror exercises or elements from acceptance and commitment therapy).

Behavior of others Since many people with obesity have experienced demeaning behavior from others, they are usually very sensitive to the behavior of others. It can happen that they relate the laughter, whispering, etc., of others to themselves and feel helplessly exposed to it. It is important to check these interpretations and, in cases where they are actually the target of demeaning behavior, establish alternative behavioral options to withdrawal, e.g., through social competence training.

Therapy goals As mentioned, the agreement on realistic therapy goals is essential. If these cannot be achieved through psychoeducation, the fundamental dysfunctional attitudes often need to be reviewed and changed (e.g., “Only people who are slim can be happy”).

75.2.6 Stress Management

Since psychosocial stress is a predictor of relapses into old behavior patterns, methods for stress and tension reduction are taught in many behavioral therapy programs. These can be “classic” relaxation techniques such as progressive muscle relaxation or autogenic training, or improved time management, teaching problem-solving skills, or the application of mindfulness exercises.

75.2.7 Social Support

Shopping, cooking, eating, and drinking take place to a significant extent in a social context. Therefore, the social contexts of the patient should also be addressed in therapy. Family, coworkers, and friends can facilitate, hinder, or sabotage weight loss, the achievement of other goals, and the maintenance of therapy successes. If possible, partners or other important, close reference persons should be involved in the therapy. Involvement can become relevant if a partner has taken on a controlling function for the eating and exercise behavior of the other or even sabotages the changes. Conversely, it may be useful to involve social partners in supporting the desired changes, e.g., to establish joint sports activities. A general recommendation for the inclusion of life partners/social partners cannot be given, as the study findings in this regard are conflicting.

75.2.8 Social Competence Training

Perceiving, expressing, and adequately asserting one's needs is of great importance in obesity therapy, as many patients have great difficulties with this. As part of social competence training, it can be practiced how to refuse offered food in a socially competent manner, and how to deal with controlling people or with people who express themselves inappropriately negatively.

Improving self-confidence in this way in turn reduces times of stress, which facilitates the maintenance of the new behavior.

75.2.9 Problem-solving Training

Patients need to learn to effectively and reliably solve emerging problems for their ongoing self-management. The problem-solving training is intended to clarify the individual necessary steps and can be learned and practiced during therapy. It consists of five steps:

- Problem formulation
- Goal formulation
- Development of alternatives
- Decision for one of the alternatives
- Review

As part of the problem formulation, the problematic situation is first described as precisely and comprehensively as possible on the levels of situation, feelings, and thoughts (as in a behavioral analysis). This is the prerequisite for all considerations on how to solve the problem. In the next step, the goal to be achieved must be described as comprehensively and concretely as possible (“What exactly do I want to achieve?”). Then, considerations are made as to which possibilities exist for achieving the goal. At this point, as many and diverse alternatives as possible should be collected. The consequences of these individual alternatives for achieving the goal are considered (costs and benefits). Afterward, a decision is made as to which alternative is the best, considering all implications. Once this alternative has been tried, a further step is to check whether the chosen alternative was goal-oriented, effective, and efficient, and whether the associated costs were acceptable.

Selected, effective behavioral therapy techniques and comprehensive relapse prevention also appear to be effective in the long term (Greaves et al. 2011).

75.3 Relapse Prevention

In this context, it should first be examined what constitutes a relapse or setback. For example, this could be a weight gain of a certain extent, a reduction in physical activity, or a change towards less favorable eating behavior. All those involved in the therapy process should be aware that relapses are highly likely to occur. Strategies for coping with them should be developed (e.g., “If I weigh 110 kg again, I will keep a food diary and analyze it closely”). Through such an approach, patients should realize that a relapse is not a catastrophe, but a reason to observe more closely and change any “mistakes” that have crept in. This prevents the danger of negative evaluations of these normal developments being generalized and leading to negative thoughts about oneself (“I knew it wouldn’t work this time either, I’m a hopeless case”). On the other hand, patients should be made aware that they must always be on guard against relapses into old habits. This can also counteract the danger of trivialization (“Even if I’ve gained a few kilos, what does it matter …”).

75.4 Maintaining the Lost Weight

Since 1994, the National Weight Control Registry has been collecting data from people who have lost at least 13.6 kg and maintained this lower weight for over a year. Over 10,000 people have been included in the registry and prospectively studied so far. From the results of this study, strategies can be derived that are more likely to serve long-term maintenance of the lost weight. The **self-control** of various behavioral patterns plays a central role in this:

- constant control of eating behavior (control of calorie intake, regular breakfast, consistent eating behavior),
- sustained weight control (at least once a week), and
- control of physical activity (on average 1 hour/day with reduced television consumption).

To maintain these changes, the behavioral therapeutic strategies listed above are helpful.

In therapist-led weight loss programs, one of the most important factors of effectiveness is continued contact with the therapist (face-to-face, by phone, or web-based), albeit at much larger intervals than during the intervention.

Conservative treatment measures for obesity grade I and II show limited long-term effects in most individuals with obesity. The average weight gain is 30–35% of the initial weight one year after the intervention. After about 5.5 years, most people with obesity have regained their old weight. However, approximately 15–20% of all participants in weight loss measures are able to maintain their weight permanently.

75.5 Collaboration with Other Relevant Professional Groups

As stated above, a behavioral therapist treating a patient with obesity should have profound knowledge of nutritional and physical activity aspects of obesity treatment. It is advantageous to work in a team consisting of doctors, medical or psychological psychotherapists, and nutrition and exercise therapists, who work in accordance with evidence-based guidelines. The possibility of such teamwork is not only available in interdisciplinary outpatient clinics or medical care centers, but also the collaboration of individual practices in obesity networks can be effective.

75.6 Individual or Group Therapy

In principle, both treatment modalities are possible. However, group therapy offers some advantages.

Group Therapy for Obesity

- Especially when the therapy is offered by a treatment team, the economic argument for group therapy is potentiated.
- People with obesity often have a great reluctance to engage in physical activity

in public. This is much easier in groups. The likelihood that this therapy module will be carried out reliably increases in groups.

- Social competence can be practiced much more effectively in groups.
- Model learning can be used well.
- Small groups can form from the group, whose members continue to support each other even after the therapy has ended, e.g., by continuing to exercise together.

However, care should be taken to establish sufficient individual competencies of the group members so that the learned content can be maintained even without the continued existence of the group.

Conclusion

According to the current state of research, behavioral therapy techniques can be considered effective. The more behavioral therapy strategies are applied, the more frequent the therapeutic contact, and the longer the duration of the intervention, the greater the effectiveness of the measure. If the behavioral therapy techniques are combined with dietary changes and/or increased physical activity, the results can be significantly improved.

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Medication Therapy for Obesity

76

Marcus May and Jens Jordan

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In Europe, drug therapy for obesity exists in the shadows, as the costs are often not covered. Three medications are approved in Germany for the long-term treatment of obesity, orlistat, liraglutide, and the fixed combination of naltrexone and bupropion. For short-term therapy, amfepramone, cathin, and phenylpropanolamine are still available. However, due to the insufficiently proven efficacy and safety in clinical studies, the importance of these substances in obesity therapy is questionable. Only for the sympathomimetic cathin, or norpseudoephedrine, are there newer studies available, which is why it is mentioned here.

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This chapter mainly deals with the mechanisms of action and clinical data on orlistat, liraglutide, and the combination of naltrexone and bupropion, the only drugs approved in Germany for the long-term treatment of obesity. In the USA, two additional medications, the selective serotonin-2c receptor agonist (5-HT_{2c} receptor agonist) lorcaserin (Belviq®) and the low-dose fixed combination of phentermine and topiramate (Qsymia®) are approved by the Food and Drug Administration (FDA). Furthermore, several other drugs are currently in clinical development.

► **Important** Nutritional interventions and physical exercise are the basic therapy for obesity. As supportive pharmacotherapy for an extended period, orlistat, liraglutide, and a fixed combination of naltrexone and bupropion are approved in Germany.

76.1 General Therapy Principles

Pharmacological therapy methods are suitable for patients who do not respond sufficiently to non-pharmacological methods. The success of a pharmacological therapy depends on the accompanying therapy. For example, patients who combined therapy with the formerly approved weight loss drug sibutramine with an intensive lifestyle intervention lost more than 12 kg within a year. In contrast, body weight was reduced by only 5 kg when sibutramine was combined with simple counseling in a doctor's office within a year. Therefore, pharmacological therapy is described by professional societies (German Obesity Society [DAG] and European Association for the Study of Obesity [EASO]) only as an adjuvant therapy option and should be part of a multimodal treatment plan that includes dietary changes, an exercise program, and behavioral therapy.

Pharmacological therapy may be considered for a BMI over 30 kg/m^2 without comorbidities, a BMI over 27 kg/m^2 with risk factors/comorbidities, after a basic therapy for six months has achieved only a weight loss of less than 5% compared to the initial weight, or if there has been a subsequent weight gain. In addition, the success should be checked four weeks after the start of pharmacological therapy, and if the weight loss is less than 2 kg, the pharmacological treatment should be discontinued.

- ▶ **Important** Pharmacological therapy is only considered if non-pharmacological therapy fails. The success of pharmacotherapy depends crucially on the accompanying therapy and is therefore only indicated in combination with basic therapy.

Obesity therapy aims to reduce morbidity and mortality while simultaneously increasing psychological and social well-being. Whether pharmacological therapy for obesity can achieve all of these goals has not yet been pro-

ven. A moderate weight loss of 5–10% of body weight is associated with a significant improvement in the risk profile, but without supportive pharmacological therapy, weight gain usually occurs again after a short time. A reduction in hard clinical endpoints has not yet been demonstrated for any obesity medication. In particular, patients with high cardiovascular and metabolic risk often require concomitant therapy with lipid-lowering agents, antihypertensives, and antidiabetic drugs.

- ▶ **Important** The medical goal of obesity therapy is to reduce morbidity and mortality while simultaneously increasing psychological and social well-being. Whether pharmacological therapy for obesity can achieve all of these goals has not yet been proven.

76.2 Challenges in Drug Development for Obesity

A significant obstacle to pharmacological obesity therapy is the fact that weight loss drugs are not reimbursed by health insurance companies (Social Security Code 5, § 34), even though the biological genesis and significance of obesity as a risk factor are clearly proven. At the same time, regulatory authorities have raised the bar for new weight-reducing drugs. For new drugs, a placebo-adjusted weight loss of at least 5% after one year of therapy is required, with a focus on reducing fat tissue rather than fat-free mass. New obesity drugs should improve cardiovascular risk factors but not have central nervous side effects. It is likely that in the future, the cardiovascular safety of all obesity drugs will have to be demonstrated before approval in the context of larger outcome studies.

- ▶ **Important** Drugs for obesity should achieve a placebo-adjusted weight loss of at least 5% after one year and have no serious side effects.

76.3 Orlistat

76.3.1 Mechanism of Action

Fat consumed with food can contribute to obesity due to its high energy density. During fat digestion, triglycerides are broken down by intestinal and pancreatic lipases. The resulting free fatty acids and monoacylglycerol are incorporated into micelles and absorbed through the brush border of the small intestine. Orlistat (tetrahydrolipstatin) almost irreversibly inhibits intestinal lipase through a covalent bond. Triglycerides and cholesterol esters are no longer broken down in the intestine, and absorption decreases.

76.3.2 Pharmacokinetics

Orlistat is poorly absorbed, exerts its effect in the intestinal lumen, and is largely excreted unchanged in the stool. A smaller portion is probably metabolized in the intestinal wall and then excreted.

76.3.3 Drug Interactions

Orlistat can significantly reduce the availability of cyclosporin. Therefore, patients receiving cyclosporin should not be treated with orlistat. Orlistat has no significant influence on the pharmacokinetics of warfarin. The effect of warfarin and probably other vitamin K antagonists, such as phenprocoumon, is enhanced when given with orlistat. This is due to the reduced absorption of fat-soluble vitamins, including vitamin K. Orlistat reduces the absorption of amiodarone with unclear clinical relevance.

76.3.4 Efficacy

Orlistat reduces fat excretion in a dose-dependent manner, with a maximum effect when administering 100–120 mg of orlistat with meals.

Weight loss with orlistat has been demonstrated in numerous double-blind and placebo-controlled trials, which have been summarized in meta-analyses. In all studies, participants received a hypocaloric diet. With a treatment duration of one year, the placebo-adjusted mean weight loss with orlistat was 2.89 kg. The number of patients with obesity achieving a 5–10% weight loss increased significantly under therapy with orlistat. A positive effect of orlistat on body weight was also demonstrated after two and four years.

Total cholesterol and triglyceride levels in the blood decrease under treatment with orlistat. The mean reduction of LDL cholesterol under orlistat is 0.26 mmol/l, while the HDL cholesterol value hardly changes. Reduced cholesterol absorption may contribute to the reduction of LDL cholesterol.

- **Important** In 22 studies, for which data on body weight with a treatment duration of one year were available, the placebo-adjusted mean weight loss with orlistat was 2.89 kg.

On average, blood pressure decreases by 1.5/1.4 mmHg under treatment with orlistat. The effect of orlistat on blood pressure was examined in a meta-analysis of placebo-controlled clinical trials. In patients with isolated systolic hypertension, systolic blood pressure decreased by 9.4 mmHg under orlistat and by 4.6 mmHg under placebo. A moderate reduction in blood pressure was also observed in patients with elevated diastolic blood pressure values. The reduction in blood pressure under orlistat can be explained by the additional weight loss. A substance-specific effect is unlikely.

The Xendos study investigated whether orlistat can prevent the onset of type 2 diabetes mellitus. A total of 3305 patients with a BMI ≥ 30 kg/m² were randomized to lifestyle intervention plus orlistat or a lifestyle intervention plus placebo. 52% of patients in the orlistat group and 34% of patients in the placebo group completed the study. After four years, the cumulative incidence of type 2 diabetes was 9.0% in the pla-

cebo group and 6.2% in the orlistat group, corresponding to a relative risk reduction of 37%; 37 patients had to be treated for four years to prevent the onset of one case of diabetes. Patients with impaired glucose tolerance benefited more from treatment. In diabetics, orlistat reduces fasting glucose by 1 mmol/l and HbA1c value by 0.4%.

The efficacy of orlistat in patients with nonalcoholic fatty liver disease (NAFLD) was investigated in a smaller randomized, double-blind, and placebo-controlled trial. All patients participated in a weight loss program. After six months of therapy, patients treated with orlistat showed a greater reduction in liver fat content estimated by ultrasound.

76.3.5 Adverse Effects

Due to the mechanism of action, gastrointestinal side effects frequently occur, which decrease with a reduction in the fat content of the diet. Oily stools are very common. Particularly unpleasant is flatulence with involuntary bowel movement. Steatorrhea is associated with increased oxalate absorption, which increases oxalate excretion in the urine. Rarely, an acute deterioration of kidney function has been observed in patients with kidney damage. Since orlistat reduces the absorption of fat-soluble vitamins, supplementation is advisable.

76.4 Liraglutide

76.4.1 Mechanism of Action

Liraglutide is an analogue of the endogenous glucagon-like peptide 1 (GLP-1) and has been used for weight loss and for the treatment of type 2 diabetes for several years. Endogenous GLP-1 is secreted postprandially by L-cells of the stomach, depending on the intestinal glucose concentration. Its short half-life of only two minutes is due to the rapid enzymatic degradation by dipeptidyl peptidase 4. GLP-1 analogues like

liraglutide have a considerably longer half-life. Liraglutide increases insulin secretion, slows gastric emptying, and reduces appetite. Blood sugar is reduced without increasing the risk of hypoglycemia, and weight loss occurs. Liraglutide was approved for weight loss in Europe in 2015 under the brand name Saxenda®. Liraglutide must be administered subcutaneously.

76.4.2 Efficacy and Safety

Liraglutide was compared in doses of 1.2, 1.8, 2.4, and 3 mg against orlistat 120 mg and placebo over 20 weeks. For 3 mg liraglutide per day, a weight loss of 7.2 kg was achieved, compared to 2.8 kg in the placebo group and 4.1 kg in the orlistat group. The occurrence of prediabetes was also reduced. In the SCALE Diabetes study, liraglutide at doses of 1.8 and 3 mg was compared in patients with overweight or obesity and type 2 diabetes mellitus against placebo. With the higher dosage, 54% of patients reduced their body weight by at least 5%, in the lower dose group 40%, and in the placebo group 21%. In the SCALE Obesity and Prediabetes study, the time to onset of diabetes was extended 2.7 times over 160 weeks with liraglutide 3 mg.

Since nausea and vomiting often occur, especially at the beginning of therapy, it is advisable to start with a low initial dose and then gradually increase the dose. A daily dose of 3.0 mg s. c. is recommended for weight loss. The starting dose of 0.6 mg daily can be increased weekly by 0.6 mg up to the target or tolerated maximum dose.

The suspicion of an increased risk of developing pancreatitis has not been confirmed in clinical studies so far. However, slight increases in lipase and amylase without signs of pancreatitis have been observed. Furthermore, weight loss can promote the formation of gallstones. Moderate reductions in most lipid parameters with a moderate increase in HDL have been observed. Heart rate increases by 4-8 beats per minute, systolic blood pressure decreases by 1.2 mmHg, and diastolic blood pressure increases on average by 0.6 mmHg. In the LEADER study, a reduction in cardiovascular mortality and overall

mortality was demonstrated in patients with type 2 diabetes treated with the lower dosage approved for this indication. Whether there is a risk of worsening diabetic retinopathy under liraglutide requires further clarification. The use for the treatment of obesity is limited due to significant costs that must be borne by the patient.

76.5 Naltrexone and Bupropion

76.5.1 Mechanism of Action

Bupropion and naltrexone have been approved as monotherapy for other indications for some time. Bupropion is a dopamine and norepinephrine reuptake inhibitor (SDNRI) used as an antidepressant and for smoking cessation. Its mode of action includes stimulation of anorexigenic proopiomelanocortin hormones (POMC neurons) in the hypothalamus, alpha-melanocyte-stimulating hormone release (α -MSH release), and resulting melanocortin-4 receptor stimulation (MC4R stimulation). The μ -opioid receptor antagonist naltrexone enhances the feeling of satiety through its additional effect on α -MSH release. The fixed-dose combination of 8 mg naltrexone + 90 mg bupropion in extended-release tablet form was approved in Europe in 2015 under the trade name Mysimba[®], and was launched in Germany in early 2018.

76.5.2 Efficacy and Safety

The combination drug naltrexone/bupropion (32 mg/360 mg) showed an average percentage weight loss of 6.1% compared to 1.3% in the placebo group in clinical trials, and even 8.1% compared to 4.9% with placebo in a study with more intensive baseline therapy (COR-BMOD). Weight loss is somewhat lower in diabetic patients, at 3.7% and 1.7% under placebo. Naltrexone/bupropion was well tolerated in the approval studies. Adverse effects such as nausea, vom-

iting, headache, insomnia, and dry mouth are described. Although no severe psychiatric disorders or seizures occurred in studies, potential risks must be assessed using a checklist (www.cheplapharm.com/ppc-mysimba.de). Improvement in glucose metabolism is mainly seen in patients who do not have type 2 diabetes mellitus. Despite the significant weight loss, no corresponding blood pressure reduction was observed, and heart rate may increase. A cardiac outcome study was compromised and discontinued due to the publication of interim results, so the cardiovascular safety cannot be conclusively assessed.

76.6 Norpseudoephedrine/Cathin

Various sympathomimetics, including norpseudoephedrine or cathin, have been approved in Germany for short-term use (maximum of three months) for many years. Type 2 diabetes mellitus is a contraindication for all sympathomimetics, which further limits their use. In addition, safety data from large randomized controlled trials with hard endpoints are lacking. For norpseudoephedrine/cathin, data from a smaller randomized controlled trial are available. In this phase 2b dose-finding study, a dose-dependent effect was observed with a placebo-adjusted weight loss of up to 6.7 kg in the highest dose group and a weight loss of > 5% of baseline weight in 78% of patients in this arm. However, the cardiovascular risk profile is concerning, as individual patients showed increases in blood pressure and heart rate. When considering only patients with hypertension, a highly variable blood pressure reduction of systolic 8 ± 12 and diastolic 4 ± 8 mmHg was observed alongside weight loss. Adverse events were mainly classified as cardiovascular and central nervous system reactions to therapy and increased dose-dependently. Blood pressure, heart rate, and psychological changes should be carefully monitored during therapy.

76.7 Potential Future Obesity Medications

76.7.1 Lorcaserin

Serotonin is involved in the hypothalamic regulation of food intake. Serotonergic medications for the treatment of obesity, e.g. fenfluramine and dexfenfluramine, were withdrawn from the market due to an increased incidence of heart valve defects and pulmonary hypertension. Stimulation of 5-HT_{2a} and 5-HT_{2b} receptors is considered to be the cause of the cardiac side effects. For this reason, lorcaserin was developed, a specific 5-HT_{2c} receptor agonist without effect on 5-HT_{2a} and 5-HT_{2b} receptors. Lorcaserin has been approved in the United States under the trade name Belviq® since June 2012. Due to the increased safety requirements of the EMA, the application for approval in Europe was withdrawn by the manufacturer in May 2013. The weight-reducing effect of lorcaserin was demonstrated in the BLOOM and BLOSSOM studies in more than 7000 people with overweight and obesity. In the BLOOM study, participants lost an average of 3.6 kg more weight than in the placebo arm, and in the BLOSSOM study, the weight loss was 5.8 kg with twice-daily administration and 4.7 kg with once-daily administration compared to 2.9 kg under placebo. More patients achieved a weight loss of $\geq 5\%$ under lorcaserin, and blood pressure decreased slightly. The incidence of heart valve changes in echocardiography was the same in both groups. Dizziness and gastrointestinal side effects were reported more frequently under lorcaserin than under placebo.

76.7.2 Low-Dose Fixed Combination Phentermine/Topiramate

Phentermine, which has long been used in the USA for obesity therapy, increases the release of noradrenaline in the brain. Topiramate is approved for the treatment of epilepsy and migraine. Among other things, topiramate activates central

nervous glutamate receptors, blocks voltage-dependent sodium channels, and inhibits some carbonic anhydrases. The weight-reducing mechanism is not clarified. By combining both active substances in relatively low doses, side effects should be reduced and additive effects on weight reduction should be achieved. In studies with a total of over 3500 patients, about 75% achieved a 5% and about 50% a 10% weight loss. Two dosages of phentermine and topiramate were tested against placebo (7.5 mg/46 mg and 15 mg/92 mg). In the EQUIP study, patients lost 12.6 kg with the higher dose, 6 kg with the medium dose, and 1.8 kg with placebo within one year. In the CONQUER study, the weight loss after one year was 10.2 kg with the higher dose, 8.1 kg with the medium dose, and 1.8 kg with placebo. The SEQUEL study, a one-year extension of the CONQUER study, showed a sustained weight loss and a lower side effect rate in the second treatment year. In addition to the weight-reducing effect, the combination preparation also dose-dependently lowers blood pressure and metabolic risk markers. Side effects observed more frequently and dose-dependently under phentermine and topiramate included paresthesias, headaches, constipation, dry mouth, upper respiratory tract infections, nasopharyngitis, and headaches.

Topiramate is teratogenic, therefore it must not be given to women of childbearing age who do not use an effective contraceptive method. In the USA, the low-dose fixed combination of phentermine and topiramate has been approved by the FDA under the trade name Qsymia® since 2012 for patients with obesity and at least one comorbidity as adjunctive therapy. The EMA initially rejected the application and requested additional safety studies.

- **Important** Lorcaserin and the combination preparation topiramate/phentermine are now approved in other countries for the therapy of obesity. For a possible approval in Europe, safety studies must be conducted.

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Weight Stabilization

77

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77.1 What Does Weight Stabilization Mean?

Obesity is seen as a chronic disease with a high tendency for relapse, which is why suitable measures for long-term weight stabilization (“extended care”) should be recommended beyond the phase of weight loss.

In the majority of patients, there is an increase in body weight after the end of a therapy program—often up to the initial weight (“yo-yo effect”) or even beyond. Within the first year after weight loss, the majority of patients regain between 30 and 50% of the lost weight, and more than half reach or exceed their initial weight again after about 3–5 years.

Successful weight maintenance is often referred to as a weight loss of 5–10% of the

initial weight that can be maintained for 1–2 years after conservative weight loss treatment, as even a small to moderate weight loss means an improvement in health risks and quality of life (Magkos et al. 2016). Some authors (Stevens et al. 2006) even consider a long-term weight loss of only 3% of the initial weight to be sufficient.

The difficulty in maintaining weight is usually attributed to the inability of affected individuals to implement the necessary behavioral changes permanently. However, weight loss and weight maintenance or stabilization are dependent on several factors, such as

- environmental factors (availability of food),
- physiology/neurobiology,
- behavior, and
- psychosocial factors.

Today, it is known that genetic factors and the changed living conditions of modern society with food abundance and reduced physical activity (“obesogenic environment”) are strong opponents of conscious control of food intake. The

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amount of food consumed increases with portion size, regardless of taste. The constant availability of food promotes consumption. Under the given conditions of abundance, it is difficult to maintain permanent conscious behavioral control.

Biological causes for weight regain after successful weight loss are not presented in this overview. However, there is increasing evidence that the body's adaptations to the weight-reduced state favor weight regain. Increasing feelings of hunger, changes in peripheral appetite-regulating hormones, and changes in neuronal responses to food-related stimuli after weight loss are held responsible for this (Melby et al. 2017).

- ▶ **Important** Especially after conservative weight loss approaches, only a small proportion of patients are able to maintain their weight loss over a longer period of time.

Factors related to weight regain

- Attribution of obesity to medical reasons
- Medical reasons as motivation for weight loss
- External motivation
- Frequent weight fluctuations ("weight cycling")
- Problematic eating behavior (binge eating, emotional eating)
- Disinhibition of eating behavior by internal stimuli
- Dissatisfaction with body image
- Psychosocial stress, critical life events
- Lack of social support
- Mental disorders (e.g., depression, ADHD)
- Impulsivity
- Dichotomous thinking style
- Passive coping strategies
- Lack of self-confidence

77.2 Psychological Factors and Behavioral Aspects

It is well known that regular and balanced food intake with plenty of fruits and vegetables, low-fat foods, and few additional snacks, self-monitoring of eating behavior and weight, and continuous physical activity are prerequisites for long-term weight stabilization. However, psychosocial factors can pose a barrier to the behavioral changes necessary for weight stabilization. Psychological factors also play a role in long-term weight outcomes after bariatric surgery (de Zwaan et al. 2007; Sarwer et al. 2011). Numerous psychological factors and behavioral aspects have been investigated as moderators and mediators of successful weight stabilization and will be presented in detail (Varkevisser et al. 2019; Ohsiek and Williams 2011; Elfhag and Rössner 2005; Teixeira et al. 2005, 2012). These variables overlap significantly and are associated with each other.

77.2.1 Weight Course

A renewed weight gain seems to occur more quickly the more severe the previous calorie restriction was. Frequent weight fluctuations ("weight cycling") in the medical history represent a negative predictor for weight maintenance. Individuals with frequent weight fluctuations also report more frequent binge eating.

A pronounced weight loss at the beginning of a program is a positive predictor of long-term weight maintenance. A longer successful weight stabilization phase appears to be a good predictor for further weight maintenance; weight stabilization seems to become easier over time.

77.2.2 Reasons for Weight Loss

Individuals who attribute their obesity to medical reasons and those who lose weight due to pressure from their environment (external

motivation) are less successful in the long term (Elfhag and Rössner 2005). Further studies deal with the self-determination theory of motivation (Teixeira et al. 2012) and recommend motivational interviewing to strengthen autonomous, intrinsic motivation for maintaining the behavioral changes necessary for weight stabilization.

77.2.3 Unrealistic Weight Loss Expectations

Both patients and practitioners often have unrealistic expectations regarding the extent of weight loss. Expectations of weight loss include not only achieving a “dream weight,” but also improving self-confidence and self-assurance, increasing attractiveness, and improving health. If the often too high expectations are not met, the resulting dissatisfaction and demoralization can lead to self-stigmatization and the abandonment of behaviors that support weight stabilization (Teixeira et al. 2005; Hall and Kahan 2018).

77.2.4 Dissatisfaction with Achievements

Patients need to be supported in directing the focus of treatment towards health improvement (“It’s not a diet, it’s a lifestyle”) (Kwasnicka et al. 2019). Satisfaction with the achieved weight, whether it corresponds to the target weight or not, promotes weight maintenance (Gorin et al. 2007). Satisfaction with possibly smaller, but essential weight loss for the physical sequelae, therefore, represents a significant starting point for weight maintenance programs.

77.2.5 Dichotomous Thinking Style (“Black-and-White Thinking,” “All-or-Nothing Thinking”)

A dichotomous thinking style is related to the extent of satisfaction with achieved weight loss and has proven to be a strong negative predictor

for the abandonment of behaviors that would favor weight maintenance (Byrne et al. 2004). Modifying rigid thinking styles regarding eating and weight might increase satisfaction with achievements and represent a promising therapeutic approach for weight maintenance.

77.2.6 Eating for Emotion Regulation

Eating is an effective method for many people to improve their mood, at least in the short term. All previous studies consistently conclude that so-called “emotional eating,” when used frequently as a coping strategy, promotes weight regain. In this case, people eat to feel better (“comfort eating”) or to distract themselves (“avoidance eating”). Common triggers are loneliness, nervousness, marital or family problems, depression, and anxiety (Byrne et al. 2004). These triggers are experienced as less stressful by people who are able to maintain their weight than by those who regain weight. People who lack adequate active coping strategies tend to respond to stressful situations with increased eating. This is especially relevant to dealing with relapse situations, which are often inadequately managed by people with more passive coping strategies (Elfhag and Rössner 2005).

77.2.7 Disinhibition of Eating Behavior versus Restrained Eating

Disinhibition of eating behavior, i.e., loss of control of food intake, especially due to internal triggers such as thoughts, feelings, and emotions, is associated with weight regain, whereas restrained, controlled eating with regular weighing and monitoring of food intake is associated with better weight maintenance (Wing et al. 2008; Elfhag and Rössner 2005). In this context, a somewhat more flexible control may be a better predictor of weight maintenance than a very rigid control over eating behavior.

77.2.8 Binge Eating

Binge eating disorder (BED) is found in up to 30% of participants in weight loss programs. Although the frequency of binge eating usually decreases during weight loss and does not seem to have an influence on the extent of weight loss, the recurrence of binge eating in the weight maintenance phase is quite clearly associated with increased weight regain (de Zwaan et al. 2005).

Up to 50% of patients can be expected to meet criteria for BED before obesity surgery. A negative influence of preoperatively diagnosed pathological eating behaviors such as “binge eating,” “grazing,” “night eating,” or higher consumption of sweets (“sweet eating”) on postoperative weight loss could not be demonstrated. However, a proportion (up to 50%) of patients with BED before surgery develop binge eating or “loss of control (LOC) eating” and other eating behavior abnormalities after surgery. Postoperative “LOC eating” not only has a negative impact on the extent of weight reduction but is also associated with increased general and eating disorder-specific psychopathology (de Zwaan et al. 2010).

77.2.9 Impulsivity

Both in adulthood and childhood, it is becoming increasingly clear that obesity seems to be associated with increased impulsivity (Chap. 66). There is growing evidence that increased impulsivity is a significant negative predictor for successful weight maintenance. This is especially true for children, adolescents, and adults suffering from attention deficit/hyperactivity disorder (ADHD) (Cortese et al. 2016; Nigg et al. 2016). Impaired attention and strong impulsivity and restlessness seem to negatively affect the ability to maintain control over eating behavior over a longer period. Children and adolescents receiving appropriate medication are able to maintain their weight better. However, this requires accurate diagnosis and monitoring of potential side effects, especially in people with obesity.

77.2.10 Depression

The relationship between depression and obesity was examined in a meta-analysis of prospective studies. The results show a reciprocal relationship. Individuals with depression have an increased risk of becoming obese (odds ratio 1.58), and conversely, people with obesity seem to have an increased risk of becoming depressed (odds ratio 1.55) (Luppino et al. 2010). This is particularly true for people with atypical features of depression (Silva et al. 2020). This mutual influence might be explained by biological mechanisms. The inflammatory response, insulin resistance, or HPA axis dysfunction found in obesity might promote the development of depression. On the other hand, the intake of psychotropic drugs in patients with depression can promote weight gain. Psychosocial factors such as discrimination against people with obesity or lack of self-care in depression also represent possible factors that may explain this reciprocal relationship between depression and obesity.

77.2.11 Social Support and Critical Life Events

Social support has proven to be an important aid for weight maintenance. However, whether involving family members in treatment improves long-term outcomes is unclear, as the results are conflicting (Elfhag and Rössner 2005).

Critical life events, such as physical illnesses, grief, or family disputes, not unexpectedly, pose a risk factor for weight regain.

- ▶ **Important** After obesity surgery, there is usually an improvement in depressive symptoms and a significant and rapid increase in quality of life. However, postoperative persistent mental comorbidity (depression, “loss of control eating”) negatively affects weight progression, so postoperative monitoring of the mental situation is indicated.

Conclusion

Behavioral factors and psychological variables seem to play a significant role in the ability to successfully maintain or stabilize a reduced body weight.

77.3 Therapeutic Approaches for Weight Stabilization

Since obesity is considered a chronic disease with a high tendency for relapse, patients should be recommended and offered appropriate treatment for long-term weight stabilization beyond the weight loss phase (Hall and Kahan 2018).

Therapeutic Attitude and Approaches to Support Weight Stabilization

- Offer long-term follow-up care
- Convey realistic expectations
- Promote intrinsic motivation
- Develop cognitive flexibility
- Strengthen satisfaction with achievements
- Support beneficial behaviors (“habit formation”)
- Consider mental comorbidity
- Implement relapse prevention strategies
- If necessary, escalate therapy

The psychosocial aspects can provide clues for the development of interventions to optimally support patients in the weight stabilization phase. Skills taught in weight loss programs are not necessarily identical to those for weight stabilization. Motivation for such programs can be challenging, as a program that does not lead to weight loss is experienced as less rewarding. This requires a change in attitude not only of the patients themselves but also of healthcare professionals who should place a greater emphasis on the importance of weight stabilization.

In the literature, there is an increasing number of evaluated weight stabilization programs

that have been used in partially large patient groups. These include web-based programs (Sorgente et al. 2017). These programs usually last for several months, and regular participation is an important predictor of success; this also applies to the regular use of internet services (e.g., number of logins, participation in chat rooms). However, the optimal contact frequency has not yet been clearly determined (e.g., monthly or weekly). Meta-analyses conclude that longer-lasting treatment can improve weight maintenance (Middleton et al. 2012; Dombrowski et al. 2014; Peirson et al. 2015), with moderate effect sizes being reported. Components of successful weight stabilization strategies include:

- Personal contact with the treatment team
- Social support to stabilize behavioral changes in the areas of nutrition and exercise
- Regular self-monitoring (including regular weighing)
- Practicing problem-solving strategies
- Strategies for relapse prevention and dealing with high-risk situations

► **Important** The need for weight stabilization programs is unquestionable, but they must be further developed to increase efficacy.

Conclusion

In order to stabilize weight in the long term, ongoing cognitive control of food intake is required. Environment and biology are powerful adversaries. Expectations for long-term success should become more realistic, and satisfaction with even minor long-lasting weight loss should be increased if possible. Pronounced psychological problems such as ADHD, binge eating, and depression should be specifically treated, as they can impair weight maintenance independently of biological and environmental factors.

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Bariatric Surgery and Metabolic Surgery

78

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78.1 Indication

When determining the indication for the procedures described below, it must be decided whether it is primarily a bariatric surgery or a metabolic operation, even if the same procedures are performed in both cases. Bariatric surgery refers to a surgical intervention when weight loss is the primary focus for the patient or the treatment team. Weight loss should naturally lead to an improvement in comorbidities or their prevention and an improvement in quality of life. Metabolic surgery includes surgical interventions that primarily aim at the remission or improvement of pre-existing type 2 diabetes mellitus (DM2).

Bariatric surgery or metabolic interventions should preferably only be performed in (certified) centers with appropriate expertise that

meet the necessary requirements (AWMF guideline). The indication for an bariatric surgery or metabolic intervention should be interdisciplinary and include the following team members: surgeon, internist/endocrinologist, mental health professional, and nutrition specialist, all with experience in obesity surgery. For metabolic interventions, a diabetologist should be involved; for adolescents, a pediatrician.

78.1.1 Indication for Bariatric Surgery

Bariatric surgery should be considered when, even in the presence of coexisting DM2, weight loss is the primary focus for the patient and the treating medical team, or when there is no DM2.

According to the current guideline (AWMF guideline), the indication for bariatric surgery is given under the following conditions:

1. For patients with a BMI $\geq 40 \text{ kg/m}^2$ without comorbidities and without contraindications after exhaustion of conservative therapy and after comprehensive education.

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2. For patients with a BMI $\geq 35 \text{ kg/m}^2$ with one or more obesity-associated comorbidities when conservative therapy is exhausted.
3. Under certain circumstances, a primary indication for bariatric surgery can be made without prior conservative therapy. The primary indication can be made if one of the following conditions is met:
 - for patients with a BMI $\geq 50 \text{ kg/m}^2$,
 - for patients in whom a conservative therapy attempt has been deemed unsuccessful or futile by the multidisciplinary team,
 - for patients with a particularly severe comorbidity and sequelae that do not allow for a delay in surgical intervention.

Obesity-associated comorbidities

DM2, coronary heart disease, heart failure, hyperlipidemia, arterial hypertension, nephropathy, obstructive sleep apnea syndrome (OSAS), obesity hypoventilation syndrome, Pickwick syndrome, non-alcoholic fatty liver disease (NAFLD) or non-alcoholic steatohepatitis (NASH), pseudotumor cerebri, gastroesophageal reflux disease (GERD), bronchial asthma, chronic venous insufficiency, urinary incontinence, immobilizing joint disease, fertility limitations, polycystic ovary syndrome.

For indication according to points 1 and 2, an exhausted conservative therapy is defined as follows (AWMF guideline):

- if after at least six months of comprehensive lifestyle intervention in the last two years, a reduction of the initial weight of $>15\%$ for a BMI of 35-39.9 kg/m^2 and of $>20\%$ for a BMI over 40 kg/m^2 has not been achieved,
- if the above weight loss could be achieved through conservative measures and persistent obesity-associated diseases can be further improved by bariatric or metabolic surgery,
- if after successful weight loss, a weight gain of $>10\%$ follows.

The BMI limits for bariatric surgery were historically established without evidence for BMI $\geq 40 \text{ kg/m}^2$ or BMI $\geq 35 \text{ kg/m}^2$. However, it is certain that patients who undergo bariatric surgery within these criteria lose weight more extensively and sustainably than after conservative therapy. In terms of improving obesity-associated comorbidities and quality of life, the surgeries are significantly superior to conservative therapy (Boido et al. 2015; Colquitt et al. 2014).

Advanced age (≥ 65 years) is not a contraindication for bariatric or metabolic surgery. Older patients also benefit from the positive effects of these surgeries, with the improvement of quality of life being the main focus, especially in the context of impending immobility and need for care. Special regulations apply to children and adolescents; we refer to the relevant guidelines (AWMF guideline).

Type 1 diabetes, chronic inflammatory bowel diseases such as Crohn's disease and ulcerative colitis, or multiple sclerosis do not constitute contraindications for bariatric or metabolic surgery per se.

Obesity can be a cause of infertility in women of reproductive age, which can also determine the desire for surgery. A desire for children is not a contraindication for bariatric or metabolic surgery; however, pregnancy should be consistently avoided during the period of weight loss (approx. 2 years) to prevent the risk of inadequate supply to the fetus.

78.1.2 Indication for Metabolic Surgery

Regarding the indication, a metabolic intervention is to be considered when the improvement of the diabetic metabolic situation is the main focus for the patient and the treating medical team. The term "metabolic surgery" was introduced when it was observed that a high percentage of patients experienced remission of pre-existing type 2 diabetes (DM2) after obesity surgery. The improvement of the glycemic metabolic status usually occurs within a few days and is independent of weight loss.

Patients with a BMI $\geq 40 \text{ kg/m}^2$ and coexisting DM2 benefit from a metabolic intervention not only in terms of better glycemic control or reduced antidiabetic medication but also from sustainable weight loss. The outcome after surgery is superior to the results of conservative therapy.

The indication for a metabolic intervention should be made in collaboration with a diabetologist.

According to the current American Diabetes Guideline and the German AWMF Guideline, the indication for metabolic interventions can be made as follows:

1. From a BMI $\geq 40 \text{ kg/m}^2$ and DM2, a metabolic operation should be recommended as a possible therapy option, regardless of glycemic control or the complexity of antidiabetic medication. In addition to the antidiabetic effect, the patient also benefits from the positive effects achieved through sustainable weight loss.
2. Patients with a BMI $\geq 35 \text{ kg/m}^2$ and $< 40 \text{ kg/m}^2$ and coexisting DM2 should be recommended a metabolic operation as a possible therapy option if it is not possible to achieve the diabetes-specific individual target values according to the National Care Guideline for the treatment of DM2.
3. Metabolic surgery should be considered as a possible therapy option for adults with a BMI $\geq 30 \text{ kg/m}^2$ and $< 35 \text{ kg/m}^2$ and coexisting DM2 if it is not possible to achieve the diabetes-specific individual target values according to the National Care Guideline for the treatment of DM2.
4. Metabolic surgery for adults with a BMI $< 30 \text{ kg/m}^2$ and coexisting DM2 should only be performed within the framework of scientific studies.
5. For patients of Asian origin, the BMI limit is 2.5 points lower.

In particular, gastric bypasses lead to altered intestinal hormone release, changes in food preference, bile acid metabolism, and microbiome, etc., which ultimately result in a normalization

of the diabetic metabolic status, independent of weight loss.

78.1.3 Contraindications for Bariatric Surgery and Metabolic Surgery

Contraindications include:

- Unstable psychopathological conditions, untreated bulimia nervosa, active substance dependence
- Consumptive underlying diseases, malignant neoplasms, untreated endocrine causes, chronic diseases that worsen due to postoperative catabolic metabolism
- Existing or immediately planned pregnancy

If the diseases and conditions mentioned as contraindications can be successfully treated or if psychopathological conditions can be brought into a stable state, a re-evaluation should be carried out.

78.2 Surgical Procedures

78.2.1 General

Bariatric surgery and metabolic interventions are highly elective procedures. This means that prior to the intervention, surgical preparation is carried out to minimize the surgical risks as much as possible. This includes the best possible adjustment of comorbidities or the clarification thereof.

In most centers, a protein-rich hypocaloric diet is performed preoperatively. This serves to reduce liver volume and to get used to liquid food, which is required postoperatively. The adherence of the patients to be operated on can also be tested once again.

The need for follow-up care must be clear to the patients, and they must consent to it. To prevent a deficiency of vitamins or trace elements, the intake of appropriate supplements is recommended.

Hospitals performing such interventions must have interdisciplinary expertise and equipment for patients with severe obesity.

The standard is that all procedures, including revision and conversion operations, are performed laparoscopically. Compared to the era of open surgery, this has significantly reduced perioperative morbidity and mortality, ultimately helping obesity surgery gain international acceptance.

78.2.2 Gastric Band

Synonym: Laparoscopic adjustable gastric banding (LAGB)

In Germany, the number of gastric bands has decreased significantly in recent years. This is mainly due to the fact that the results are significantly worse compared to the following operations. The LAGB is a purely restrictive procedure that limits food intake.

Modern gastric bands are adjustable. The band can be tightened or loosened by filling it through a subcutaneously placed port (LAGB). The LAGB is placed as a ring just below the cardia around the stomach, resulting in the formation of a small gastric pouch. By placing a cuff around the band, slipping of the band is to be prevented (Fig. 78.1).

78.2.2.1 Results

The expected results after implantation of a gastric band compared to the other standard procedures are shown in Table 78.1. It is thus the procedure with the worst results. Patient selection is generally described as difficult, as a significant percentage of those operated on do not or hardly benefit from the band placement. In addition, after 10 years, about 30% of all patients require revision surgery due to band-specific complications such as slipping or penetration into the stomach. On the other hand, band placement is the procedure with the lowest intra- and postoperative morbidity and mortality (compared to the other procedures). As with any procedure, lifelong follow-up care is required after gastric bands. In addition to monitoring



Fig. 78.1 Schematic representation of gastric band

the diet, supplementation, etc., band adjustment is also necessary. Under fluoroscopy, the width of the band is shown and, if necessary, adjusted. This makes follow-up care particularly more complex, especially at the beginning.

78.2.2.2 Pros and Cons of the Gastric Band

Advantages

- Compared to the following surgical procedures, shortest operation duration and lowest perioperative morbidity and mortality
- No malabsorption

Disadvantages

- In terms of expected weight loss and remission rates of comorbidities, worse results than the other surgical procedures described here

Table 78.1 Expected results after bariatric surgery or metabolic interventions (AWMF LL)

Procedure	Weight loss [%EWL]			Diabetes remission* [%]		
	≤ 2 years	> 2 to < 5 years	≥ 5 years	≤ 2 years	> 2 to < 5 years	≥ 5 years
Gastric band	28.7–48^{1,a} 52.3 (95% CI; 38.5, 48.5) ³ 48.7, 55.9⁴ 43.9 (95% CI; 44.0, 54.0) ⁵ 40.3, 47.5⁵	43.5 (95% CI; 38.5, 48.5) ³ 49.0 (95% CI; 47.2, 67.2) ⁴ 82.3 (95% CI; 71.4, 93.1) ^{5,f}	34.7 (95% CI; 23.5, 49.9) ³ 57.2 (95% CI; 50, 83) ^{4,e} 82.3 (95% CI; 71.4, 93.1) ^{5,f}	62 (95% CI; 46, 79) ² 68 (95% CI; 50, 83) ^{4,e} 78.7 (95% CI; 53.8, 100.0) ^{5,f}	62.5 (95% CI; 42.2, 79.2) ³ 78.7 (95% CI; 53.8, 100.0) ^{5,f}	24.8 (95% CI; 10.9, 47.2) ³
Sleeve gastrectomy	49–81^{1,b} 46.7 (95% CI; 42.9, 50.6) ⁴	36.3 (95% CI; 33.1, 39.5) ³	49.5 (95% CI; 39.3, 59.7) ³	53.3^{1,c} 60 (95% CI; 51–70) ² 86 (95% CI; 73–94) ^{4,e}	64.7 (95% CI; 42.2, 82.1) ³	58.2 (95% CI; 30.8, 81.3) ³
Gastric bypass**	62.1–94.4^{1,b} 80.1 (95% CI; 65.7, 94.4) ⁴ 58.0 (95% CI; 54.3, 61.8) ⁵	49.4 (95% CI; 10.8, 88.0) ³ 63.3 (95% CI; 58.4, 68.1) ⁵	61.3 (95% CI; 55.2, 67.4) ³ 64.9 (95% CI; 44.3, 85.6) ⁴	83^{1,d} 77 (95% CI; 72–82) ² 93 (95% CI; 85–97) ^{4,e} 84.0 (95% CI; 72.9, 95.0) ^{5,f}	71.6 (95% CI; 59.9, 81.0) ³ 85.3 (95% CI; 70.9, 99.7) ^{5,f}	75.0 (95% CI; 63.1, 84.0) ³
Biliopancreatic diversion***	–	–	–	89 (95% CI; 83–94) ²	–	–
Biliopancreatic diversion with duodenal switch	56.0 (95% CI; 47.9, 64.2) ⁵	73.7 (95% CI; 69.0, 78.4) ⁵	49.3 (95% CI; 38.7, 59.9) ³	100.0 (95% CI; 93.2, 100.0) ^{5,f}	98.9 (95% CI; 96.6, 100.0) ^{5,f}	99.2 (95% CI; 97.0, 99.8) ³

Data from high-quality systematic reviews (rated +/++ according to SIGN) with adult patients with BMI 30–55 kg/m² and without exclusive study populations with comorbidities or revision procedures and before-after comparisons over follow-up period.

There are no high-quality data for the mini-bypass because corresponding studies of sufficient quality are lacking.

* High heterogeneity regarding definitions of diabetes remission between primary studies and systematic reviews.

** RYGB, mini-bypass, and not further specified.

*** High-quality evidence at the level of a systematic review/meta-analysis not available for empty fields.

^a Average follow-up 1.7 years

^b Average follow-up 1.5 years

^c Average follow-up 9 months

^d Average follow-up 1 year

^e 30 days after surgery

^f Data endpoint “resolved or improved” used.

¹ Trastulli et al. 2013

² Panunzi et al. 2014

³ Yu et al. 2014

⁴ Chang et al. 2013: Results of OBS reported, as results were available for each data point and tended to be a more conservative estimate. Follow-up time points 2 and 5 years used

⁵ Buchwald et al. 2009

- High reoperation rate, due to unachieved therapy goals or band-specific complications
- Intensive follow-up care due to band adjustment
- Difficult patient selection

78.2.3 Sleeve Gastrectomy (SG)

Sleeve gastrectomy is still a relatively new operation with a lack of long-term data from larger studies. The sleeve gastrectomy was established

as a “first step” in biliopancreatic diversion with duodenal switch (BPD-DS). Meanwhile, the procedure has established itself as a solitary intervention and accounts for about 50% of all primary bariatric surgeries.

As a result of the operation, a small curvature-sided gastric tube is formed, which leads to a restriction of food intake (Fig. 78.2). However, hormonal changes also occur (e.g., decrease in ghrelin due to the resection of the gastric fundus). It is common to measure the filling volume of the resectate at the end of the operation. If less than 500 ml of volume has been resected, a lower weight loss can be expected.

78.2.3.1 Results

The current data on sleeve gastrectomy can be considered good, even though long-term data

from high-quality studies are still lacking. In the first two postoperative years, similar results can be expected after SG and proximal Roux-en-Y gastric bypass, but there is a somewhat stronger weight regain after SG in the further course (details; Table 78.1).

Regarding remission rates of type 2 diabetes and other comorbidities such as arterial hypertension, publications show a significant improvement after SG. The remission rate of type 2 diabetes after five years was 58%. However, bypass procedures show better results regarding the remission of pre-existing type 2 diabetes.

SG is a safe operation. The data show that the mortality rate in large centers is well below 1%, and in current RCTs it is 0%. The morbidity after SG is reported to be 7–8% and is thus lower than with bypasses. The most common complications are (post-)bleeding and fistulas of the staple line or abscesses.

78.2.3.2 Pros and Cons of Sleeve Gastrectomy

Advantages

- Technically safe even in very high BMI range, unlike bypasses
- If therapy goals are not reached, there are many surgical options, from repeated sleeve gastrectomy to conversion to a bypass.
- Lower perioperative morbidity compared to bypasses (but same mortality)
- No malabsorption, omitting prophylactic supplementation (which is not recommended) is probably less problematic in the long term

Disadvantages

- After 2–3 years, stronger weight regain than with bypasses, often due to dilation of the gastric sleeve
- Relevant rate of de-novo reflux disease or worsening of pre-existing reflux disease
- Inferior to bypasses regarding remission rate of pre-existing type 2 diabetes



Fig. 78.2 Schematic representation of gastric sleeve

- Due to the long staple line and increased pressure in the gastric sleeve, relatively high rate of staple line fistulas (1–3%), which is associated with an extension of hospital stay

78.2.4 Proximal Roux-en-Y Gastric Bypass (pRYGB)

The proximal Roux-en-Y gastric bypass is the best-studied of all bariatric surgery or metabolic procedures, with follow-up data up to 20 years. It was long considered the “gold standard” and is the most frequently performed procedure to date. Currently, the SG or pRYGB is the most common procedure depending on the country. However, the Omega-Loop gastric bypass is increasingly being performed as an alternative to pRYGB, without high-quality scientific data to support it.

Numerous technical variants exist for the “gastric bypass.” The procedure widely accepted as the “gold standard” for obesity or metabolic surgery in the past is a laparoscopically performed proximal Roux-en-Y gastric bypass (Fig. 78.3).

78.2.4.1 Results

The pRYGB provides good long-term results regarding sustainable weight loss or remission or improvement of pre-existing obesity-associated comorbidities. The proximal Roux-en-Y gastric bypass leads to a sustainable weight loss of approximately 13–14 BMI points up to five years after surgery.

Compared to SG, the meta-analysis by Zhang et al. (2014) found a significant advantage for pRYGB regarding %EWL from the second postoperative year (mean difference in favor of RYGB (mean difference after two years = 5.77% [95% CI; 4.29; 7.25], mean difference after four years = 2.68% [95% CI; 0.18; 5.19])]. Regarding the remission rate of pre-existing DM2, a significant advantage for pRYGB was also found.

Regarding the remission rate or improvement of T2DM, a meta-analysis showed a remission

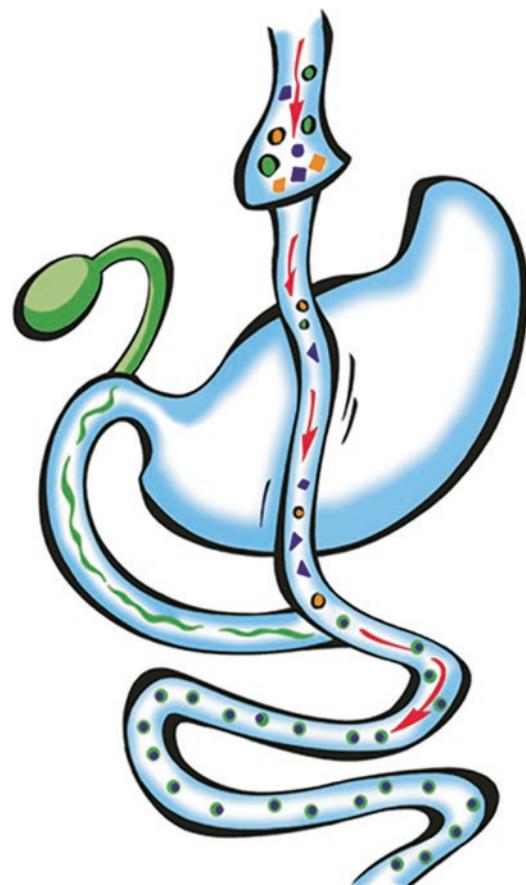


Fig. 78.3 Schematic representation of proximal Roux-en-Y gastric bypass

rate of pre-existing T2DM of 77% (compared: BPD 89%, SG 60%) (Panunzi et al. 2014).

Regarding the remission rates of other pre-existing comorbidities, pRYGB was superior or comparable to SG, as shown in a meta-analysis as follows: for DM2 (OR 3.29), arterial hypertension (OR 1.29), dyslipidemia (OR 1.15), sleep apnea (OR 1.46), however, accepting more adverse events OR 1.98 (Zhang et al. 2014).

For gastric bypass procedures, a mortality rate of 0.38% in RCTs and 0.72% in observational studies is reported, for SG it was 0.29 and 0.34%, respectively. Morbidity is reported at an average of 21% in RCTs (Chang et al. 2013).

The most common procedure-specific complications are (post-)bleeding, staple line fistulas, anastomotic insufficiencies, or abscesses. Due to the exclusion of the stomach, duodenum, and proximal jejunum, deficiencies after pRYGB are more common than after SG.

If the stomach is transected proximally with a small pouch as propagated, no (or only very small amounts of) acid can be produced in the pouch after reconstruction. Thus, pRYGB also represents an effective anti-reflux operation.

78.2.4.2 Pros and Cons of the Proximal Roux-en-Y Gastric Bypass Procedure

Advantages

- Long considered the “gold standard” of obesity surgery, with very good available data with long-term results
- Effective treatment of pre-existing reflux disease
- Bypassing the duodenum leads to hormonal changes, independent of weight loss/restriction, which favorably influence pre-existing type 2 diabetes
- Weight regain lower than with sleeve gastrectomy (SG)
- Higher remission rates of pre-existing type 2 diabetes than with SG

Disadvantages

- Risk of dumping syndrome, especially with improper nutrition
- Lifelong supplementation necessary for prevention of deficiency
- No endoscopic access to the remnant stomach or duodenum
- More complex surgical options for conversion if therapy goal is not achieved (compared to SG)
- Internal hernias
- Technically not possible in higher BMI range and with unfavorable fat distribution (so-called apple type)

78.2.5 Omega-Loop Gastric Bypass

Synonym: Mini Gastric Bypass (MGB)

The MGB (Fig. 78.4) was first described by Rutledge in 1997. The number of operations is increasing, and it is considered a safe procedure. The principle of this procedure is the formation of a small curvature-sided long gastric pouch up to the antrum (up to 18 cm long). In advanced age or vegetarians, shorter biliary limb lengths are preferred (180–200 cm), as well as recommended for less obese type 2 diabetics without massive obesity (150 cm).

78.2.5.1 Results

Although the MGB is already relatively widespread, there are almost no outcome data from high-quality studies.

It can be assumed that the results are similar to those of pRYGB, but if longer small intestine sections (longer biliopancreatic loop) are made, a stronger weight loss can be expected.

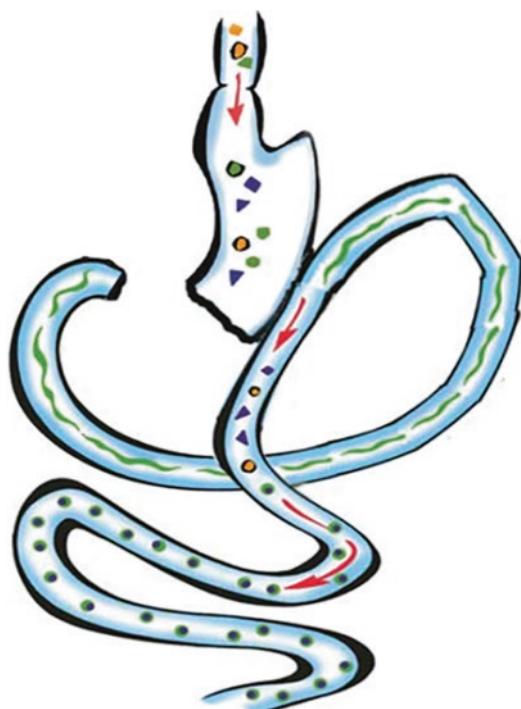


Fig. 78.4 Schematic representation of Omega-Loop Gastric Bypass

However, in the long term, the risks of increased malabsorption (deficiency of vitamins or trace elements, hypoproteinemia) or, for example, fatty stools are accepted.

The morbidity is lower than with pRYGB, as only one anastomosis is created. Internal hernias also seem to be less common. However, there are few or no high-quality data from RCTs on this.

Whether the MGB should be used in patients with reflux disease is controversial. Due to the surgical technique, bile acids from the biliopancreatic loop can enter the gastric pouch, which can lead to bile reflux in predisposed individuals. It is also historically known from ulcer surgery (similar reconstruction in Billroth II gastric resection) that bile in the stomach can lead to ulcerations and even carcinomas. As a result of these concerns, the MGB is sometimes controversially discussed and is not offered or only offered for older patients in some clinics.

After MGB, a weight loss of 11.3 BMI points ($4.1\text{--}18.6 \text{ kg/m}^2$) or an EWL of 61–69% after twelve months can be expected. In the medium term, an expected EWL of 64–85% after two years or 73–77% after five years is reported (Georgiadou et al. 2014; Quan et al. 2015).

78.2.5.2 Pros and Cons of the Omega-Loop Gastric Bypass

Advantages

- Compared to pRYGB, shorter operation time and lower morbidity, as only one anastomosis
- Compared to pRYGB, also possible in higher BMI range, as the pouch is very long and the small intestine loop does not have to be led so far to the anastomosis

Disadvantages

- With a long biliopancreatic loop, increased risk of suffering a deficiency despite supplementation
- Especially with improper nutrition, there is a risk of dumping syndrome

- No endoscopic access to the remnant stomach or duodenum
- Uncertain data regarding negative effects of a potential bile reflux into the gastric pouch or the esophagus
- If therapy goals are not achieved, surgical options for conversion are comparatively more complex (compared to SG)

78.2.6 Biliopancreatic Diversion (BPD)

Synonym: Scopinaro operation

This is a highly malabsorptive procedure that has hardly gained any further distribution outside of Italy (Fig. 78.5). The procedure is also rarely performed in Germany. Similar to the Omega-Loop gastric bypass, there are few data from high-quality studies.

78.2.6.1 Results

Regarding weight loss and remission of pre-existing DM2, BPD seems to be superior to the bypasses described above. However, there are no high-quality data in this regard.

Due to the very short common channel, there is a pronounced malabsorption, which results in deficiencies of vitamins, trace elements, or protein occurring more frequently compared to the above procedures, despite the prophylactic intake of multivitamin preparations with trace elements. This is also a reason why the procedure is not performed by various centers. Fat stools and diarrhea can also lead to a reduction in quality of life. The perioperative complication rates are comparable to those of pRYGB.

78.2.6.2 Pros and Cons of Biliopancreatic Diversion (according to Scopinaro)

Advantages

- Superior due to the pronounced malabsorption of the procedure regarding weight loss and remission of pre-existing DM2
- Long-term stable surgical outcome



Fig. 78.5 Schematic representation of biliopancreatic diversion (according to Scopinaro)

Disadvantages

- Pronounced disadvantages of malabsorption such as fat stools, diarrhea, and deficiency states despite supplementation (which is why the procedure has not gained widespread acceptance and is not offered in many places)
- High reoperation rate due to excessive malabsorption
- Rare procedure, only a few centers have expertise
- Especially with improper nutrition, there is a risk of dumping syndrome
- No endoscopic access to the remnant stomach or duodenum

78.2.7 Biliopancreatic Diversion with Duodenal Switch

The biliopancreatic diversion with duodenal switch (BPD-DS) is a complex operation,

usually performed in two steps, which combines restriction (sleeve gastrectomy; 1st step) with malabsorption (postpyloric bypass with short common channel; 2nd step) (Fig. 78.6).

Although not as pronounced as with BPD, the side effects of malabsorption described above can occur. In addition, due to the surgical technique, there is a higher perioperative morbidity and mortality due to the dissection at the head of the pancreas and the risk of insufficiency of the duodenal stump. BPD-DS can be performed in one or two stages, with the two-stage approach being more common, especially in the higher BMI range.

78.2.7.1 Results

BPD-DS offers very good long-term results regarding weight loss and remission of

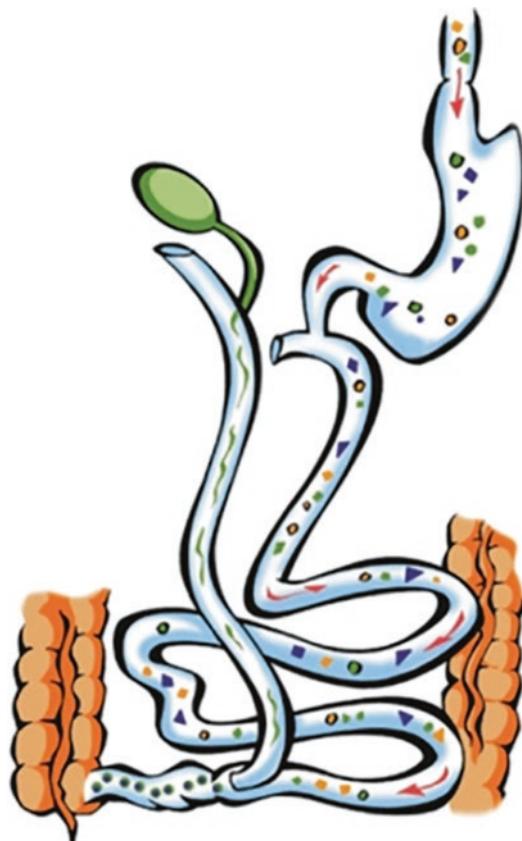


Fig. 78.6 Schematic representation of biliopancreatic diversion with duodenal switch

pre-existing DM2. After BPD-DS, complete remission of pre-existing T2DM can be expected in 88–99%.

Although the common channel is not as short as with BPD, stronger malabsorptive effects can also be expected with BPD-DS than with the pRYGB or MGB described above, and intensive follow-up of patients, including laboratory controls, is required. As already noted above, perioperative morbidity and mortality are higher than with the other procedures described here.

78.2.7.2 Pros and Cons of Biliopancreatic Diversion with Duodenal Switch

Advantages

- Due to the restriction (sleeve gastrectomy) in combination with pronounced malabsorption (postpyloric bypass with short common channel), superior to the other procedures mentioned above regarding weight loss and remission of pre-existing DM2
- Long-term stable surgical results
- Low risk of dumping syndrome, as the pylorus is preserved in the passage

Disadvantages

- Surgically very complex procedure with increased perioperative morbidity and mortality
- Disadvantages of malabsorption such as fatty stools, diarrhea, and deficiency states despite supplementation
- Rare procedure, only a few centers have expertise

78.2.8 Endoscopic Techniques

A gastric balloon can be offered to patients with obesity as part of a multimodal program. The effects are significantly lower than with surgery. After removal of the balloon, weight regain occurs in many cases. It can be offered to

patients with obesity after failure of conservative therapy and refusal of surgery or in cases of contraindications for surgery as part of an appropriate accompanying program. In patients with severe obesity, where surgery is not possible or borderline, treatment with a gastric balloon can be performed prior to surgery to establish (safe) operability. This is an individual decision. Scientific studies proving better outcomes do not exist.

For the Endobarrier™, aspiration therapy techniques, endoscopic suturing procedures, or mucosal manipulations, etc., there are currently no valid data regarding their sustainability and risk-benefit ratio, so the application of these endoscopic procedures (except gastric balloon) should only be carried out within scientific studies.

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Psychosomatic Aspects of Bariatric Surgery

79

Stephan Herpertz and Martina de Zwaan

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79.1 On the Question of Indication

About half of participants in a conservative weight loss program (“lifestyle” interventions) reduce their weight by 5–10%, which represents the minimum weight loss in terms of a clinically significant reduction in somatic risk parameters. In addition to the high rate of non-responders, weight regain is more the rule than

the exception. About a third to a half of the original therapy responders have regained their initial weight within one year after the end of treatment, and even with long-term treatments, on average, only 4–5% of the initial weight loss can be maintained (Look AHEAD Research Group 2014). In particular, with severe obesity (class 3; $\text{BMI} \geq 40 \text{ kg/m}^2$), the success of a consistent conservative measure is likely to be even lower. The figures here range between 2 and 6.9% weight loss (Mingrone et al. 2015).

According to the **German guideline “Surgery for Obesity and Metabolic Diseases”** (2018), the indication for surgical intervention after failure of conservative therapy exists for patients with obesity class 3 ($\text{BMI} > 40 \text{ kg}$) or for patients with obesity class 2 ($\text{BMI} > 35 \text{ kg/m}^2$) with significant comorbidities (e.g., type 2 diabetes mellitus).

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79.2 Surgical Approach

While purely restrictive procedures (gastric band, gastroplasty) have largely been abandoned, the gastric sleeve (gastric sleeve resection), in which 90% of the gastric fundus and corpus are removed, leaving a tubular remnant stomach, is now one of the most common surgical procedures within bariatric surgery, along with the Roux-en-Y bypass. While gastric band and gastroplasty are intended to limit food intake (referred to as restrictive techniques), the various gastric bypass procedures additionally have a malabsorptive effect, i.e., a restriction of the metabolism of the ingested food. The Roux-en-Y bypass is considered primarily restrictive with a malabsorptive component, while the biliopancreatic bypass (BPD) with or without duodenal switch (DS) derives its main effect from the malabsorptive effect.

All surgical interventions are performed almost exclusively minimally invasively, which is gentler and less complicated for patients (lower risk of wound healing disorders due to smaller scars, faster mobilization).

79.3 Preoperative Diagnostics

Up to 50% of patients with severe obesity who present for surgical intervention meet the criteria for a current, treatment-requiring, mental disorder (Dawes et al. 2016). Up to 30–40% are in mental health treatment and/or take psychotropic drugs, especially antidepressants. A preoperative psychological evaluation should ideally be carried out by a mental health professional experienced in obesity treatment. This refers to colleagues from the fields of psychosomatic medicine, psychiatry, and clinical psychology. Often, the question is about state or trait, i.e., whether mental health factors significantly influence the development of obesity or whether the mental health symptoms are a consequence of obesity and, for example, the associated societal stigmatization. The following provides an overview of the “diagnostic building blocks.”

Mental Status

- Mental disorders including eating disorders
- Psychopathological findings
- Inpatient psychiatric/psychosomatic treatments
- Outpatient treatments, psychotherapy, psychotropic drugs
- Currently in treatment?

Eating and Drinking Behavior

- Objective and/or subjective binge eating
- Loss of control while eating (binge eating, grazing, night eating)
- Drinking amounts, preferred beverages (high-calorie drinks, alcohol)
- Compensatory measures (vomiting, laxatives, diuretics)
- Restrained eating behavior (constant attempt to diet)
- Attitude towards and evaluations of weight and figure
- Portion sizes, food selection

Weight History

- Self-report on the development of obesity (“weight autobiography”)
- Overweight/obesity as a child
- Family burden (overweight/obesity in the maternal or paternal line)
- Life events related to weight gain
- Previous weight loss attempts and their successes

Stress, Problem-Solving Ability (Coping)

- Psychosocial stressors
- Expected life changes in the year after surgery

- Eating as the sole stress management (coping)
- Positive aspects of obesity (e.g., protection)
- Sexual or physical abuse experience
- Intelligence level, cognitive functions
- Neuropsychological testing if needed

Social Support

- Acceptance and help in partnership, family, and circle of friends
- Possible negative consequences (e.g., attractiveness as a problem for the spouse)?
- Practical help
- Moral support
- Openness towards others, hiding (e.g., for fear of discrimination or fear of failure)

Motivation, Compliance

- Extent of motivation (e.g., from 0 to 10)
- Primary reasons for the surgical intervention (health, mobility, appearance, etc.)
- Intrinsic (self-) or extrinsic motivation (e.g., by relatives)
- Previous handling of medical recommendations

Expectations

- Weight reduction as the sole “problem solver” (quick fix)
- Realistic expectations of the extent of weight loss (normal weight is rarely achieved)

79.4 Mental Well-Being After Bariatric Surgery

The vast majority of studies show a significant improvement in mental health and various psychosocial parameters such as interpersonal relationships, sick leave, and employability. Mental comorbidity, especially depressive and anxiety disorders, generally decrease postoperatively. Self-esteem and social behavior, including partnership and sexuality, also improve. The rate of return to work ranges between 16 and 36%. It is obvious that these findings also have a positive impact on quality of life. This applies almost without exception for the first years after the operation, with physical quality of life improving significantly compared to the preoperative status, rather than mental quality of life. In longer follow-ups, a declining trend in quality of life can be observed, although the study findings are not consistent (Herpertz et al. 2019).

Surgical complications such as band dislocation, pouch dilation, etc., are rarely the cause of an unsatisfactory postoperative course; rather, in many cases, an adherence problem can be assumed, which in turn may be due to mental health problems. An example is a “suboptimal” to disturbed affect regulation, which is associated with high-calorie eating behavior. Thus, the consumption of large amounts of sweets, fast food, etc., often serves as an attempt to at least temporarily neutralize dysphoric moods. Affect regulation disorders can also be an expression of a general disturbance of impulsivity in the sense of an impulse control disorder, as is primarily found in certain personality disorders such as emotionally unstable (borderline) personality disorder. Sexual abuse in the medical history can trigger fear of sexual retraumatization during weight loss; an unstable partnership can break up due to the partner’s change.

- **Important** Bariatric surgical measures and weight loss cannot solve psychosocial problems.

79.5 Bariatric Surgery and Eating Disorders

The prevalence of binge eating disorder (BED) in patients with obesity before surgery is about 15–30% (Dawes et al. 2016). However, other forms of non-normative, usually hypercaloric eating behavior, such as night-eating syndrome, “grazing” in the sense of consuming small amounts of food throughout the day without feeling hungry, loss of control eating (LOC), emotional eating, eating without hunger, or addictive eating are also often observed. Eating disorders decrease in the short term after bariatric surgery but seem to increase again over time. The amounts of food consumed during an eating binge are generally smaller after restrictive surgical procedures than before the operation. Patients with an eating disorder before surgery have a higher risk of problematic eating behavior after surgery (Opozda et al. 2016), which in turn is associated with less weight loss or greater weight gain.

Considering the relationship between pre- and postoperative eating behavior and their predictive function for postoperative weight development, postoperative eating behavior is clearly more informative (Opozda et al. 2016). The question of which patients will develop eating binges again and in which the eating binges will permanently cease is currently difficult to answer preoperatively (Herpertz et al. 2018). In a minority of patients, LOC eating occurs for the first time after surgery. So far, there are only individual case reports in the literature on the postoperative development of anorexia or bulimia nervosa. An adequate distinction between normal and pathological eating behavior after surgical obesity therapy is generally difficult. Some patients show frequent vomiting or regurgitations, but in most cases, this is more likely due to the initially difficult adjustment to

other foods, the intake of small amounts of food, and the necessity of intensive chewing than to a conscious attempt at weight loss.

Postoperative Outcomes in Binge Eating Disorder

1. Decrease in BED, partly due to the changed postoperative anatomical conditions
2. Decrease in problematic attitudes towards eating, weight, and body shape
3. Decline in eating binges
4. Reduced negative attitudes towards weight and body shape, however, possibly an increase in eating behavior disorders (e.g., grazing, LOC)

79.6 Increase in Eating Behavior Disorders (e.g., grazing, LOC eating)

After an initial weight loss, the majority of patients experience a weight gain 1–2 years after surgery, which usually leads to a weight plateau. The affected individuals often perceive this weight gain with great fears. The consequence is often a conscious restrictive eating behavior, which, in the case of a respective vulnerability, can promote the recurrence of binges.

79.7 Self-Harming Behavior, Suicide, and Suicidality

Numerous studies in recent years suggest an increase in mortality due to accidents, drug overdoses, and suicides in patients after bariatric surgery compared to the general population or individuals with obesity who have not undergone bariatric surgery (Müller et al. 2019), with the majority of suicides occurring within the first three years after surgery (Tindle et al. 2010). In a systematic review, Peterhänsel and co-authors (Peterhänsel et al. 2013) describe a

fourfold increased suicide risk in patients after bariatric surgery compared to the general population. This risk seems to apply particularly to younger patients. The risk of self-harm in bariatric surgery patients has also been the subject of several larger studies recently, with the majority of studies observing a postoperative increase in self-harm (Lagerros et al. 2017). The majority of these patients had a history of a mental health diagnosis. Whether and what etiological relationship exists with the bariatric surgery intervention remains unclear (Mitchell et al. 2013). However, it is clear that multidisciplinary bariatric surgery teams should always include experts in mental health disorders if possible.

Conclusion

Despite low absolute suicide numbers, the incidence of self-harming behavior and suicides increases postoperatively.

79.8 Bariatric Surgery and Addiction Behavior

Meta-analyses and large cohort studies (Spadola et al. 2015; Backman et al. 2016; King et al. 2017; Ibrahim et al. 2019) have shown that problematic alcohol consumption can increase after obesity surgery. While it was originally thought that an increase in problematic alcohol consumption occurs mainly after bypass procedures (alcohol is absorbed much faster, higher maximum alcohol concentrations are reached, and the elimination time is prolonged), the comparable result after sleeve gastrectomy suggests that other factors, such as a change in reward processing in the brain, could play a role in the postoperative increase in problematic alcohol consumption. This would support the model of “addiction transfers” or the occurrence of “cross addiction.”

Conclusion

Postoperatively, suicidality and problematic alcohol use should be actively inquired about. Patients must be informed about the potential risk.

79.9 Psychological Predictors for Weight Development

A psychiatric, psychosomatic, or psychological assessment is important, not least because mental comorbidity, as described above, is generally high in this patient group. With regard to the prognosis of both postoperative weight development and psychological well-being, the question of psychological predictor variables is repeatedly raised. Personality variables and Axis I mental disorders of the DSM-IV do not provide reliable predictors for postoperative weight development or psychological well-being after surgery. Rather, the severity of a preoperative mental illness seems to be of predictive value. In patients with severe mental disorders and multiple inpatient psychiatric treatments in their history, not only insufficient weight loss but also insufficient improvement in psychological well-being is often observed. It is important to identify these patients preoperatively and provide appropriate treatment.

Binge eating before surgery does not represent a stable predictor for weight loss, regardless of the surgical technique. However, patients who develop binge eating again after surgery seem to lose less weight and gain more weight after the “honeymoon phase” of 1–2 years than patients who never had binge eating or did not develop binge eating postoperatively. There is also evidence that these patients may have an increased rate of medical complications. The greater consumption of sweets is often considered a negative predictor for a purely restrictive surgical procedure. In contrast to the recurrence of binge eating, the preference for sweet foods postoperatively does not seem to be a reliable predictor for weight gain. Little is known about the postoperative course of patients with full-blown bulimia nervosa; however, appropriate therapy should be provided preoperatively in this case, which would be urgently indicated even without surgical intervention. There is evidence that the extent of weight loss may not be affected, but the eating disorder may persist unchanged and possibly increase the complication rate.

Predictors for Weight Development

No reliable predictors

- Personality variables, Axis I mental disorders of the DSM-IV
- Binge eating preoperatively
- Consumption of sweets

Reliable predictors

- Preoperative severe and unstable mental disorders
- Patients with multiple psychiatric or psychosomatic prior treatments

There is no evidence for a general exclusion of patients with mental illnesses from bariatric surgery. BED and other eating behavior abnormalities also do not represent a general contraindication for bariatric surgery. Nevertheless, the German guideline (AWMF 2018) lists unstable psychopathological conditions (e.g., suicidality, acute psychotic states), active substance dependence, and untreated bulimia nervosa as contraindications. After mental stabilization or successful treatment, a psychological re-evaluation is recommended.

79.10 Corrective Plastic Surgery

As a consequence of massive weight loss, large aprons of fat, particularly in the abdominal and chest area as well as on the thighs and upper arms, which can sometimes take on grotesque proportions and be experienced as very distressing by those affected. In addition to aesthetic problems, bacterial and fungal infections are not uncommon due to limited hygiene possibilities. Plastic surgery is the only option for removing these excess skin folds. Not every patient who has lost weight requires plastic surgery. However, many patients are indeed so limited after massive weight loss that body-tightening operations are necessary in certain areas. Some patients therefore require several operations in

different body regions. Only patients who have already lost weight and have been able to maintain their target weight for at least six months are eligible for body tightening operations. Possible dysmorphophobia or fundamentally unrealistic aesthetic expectations must also be ruled out preoperatively (AWMF 2018).

Conclusion

A key goal of the preoperative psychological evaluation is, in addition to a detailed psychological and biographical history, to clarify the patient's motivation, knowledge about the planned procedure, and expectations of the procedure ("problem solver", quick fix, achieving normal weight). The evaluation should address the expected social support, reduce anxiety about the surgery, and lay the foundation for postoperative adherence.

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New Media in Obesity Treatment

80

Christina Holzapfel

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80.1 Digitalization

Digitalization in the healthcare sector is characterized by various terms, e.g., “digital health,” mobile (m) health, electronic (e) health, telemedicine, which are not subject to a uniform definition. In general, it is about various care and treatment modes in the medical field that take place without direct eye contact with patients. The following elements are characteristic:

- Provision of a health service
- Application in prevention, diagnostics, therapy

- Overcoming spatial distance
- Use of information and communication technology

Digitalization can overcome spatial distances, making therapy access easier and more cost-effective due to reduced mobility effort. Furthermore, digital approaches promise to reduce inefficiency, increase quality, and personalize the offer for patients. On the part of patients and users, digital approaches facilitate and promote self-observation (“self-monitoring”) through data collection and tracking (e.g., smartphones, activity trackers). Moreover, a certain degree of anonymity reduces the inhibition threshold for affected individuals to participate.

Most weight management interventions (e.g., programs, training, counseling) are conducted through face-to-face conversations in individual or group sessions. Due to the high prevalence rates of overweight and obesity, as well as the wishes of those affected and professionals,

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alternative, easily accessible channels are needed to enable all treatment seekers to access individual obesity therapy. Adolescents and young adults with obesity, in particular, represent a target group that can be reached and motivated through the use of new information and communication technologies. To offer those affected an individual treatment strategy—as called for in the guidelines of the German Obesity Society (DAG) e. V.—not only various therapy contents (e.g., nutrition, exercise, behavior) but also different communication methods (e.g., telephone, video, internet, smartphone) are necessary.

The dropout rates in clinical trials and especially in weight loss studies are very high, at up to 90% (Moroshko et al. 2011). In the review by Moroshko and colleagues, the following eight categories of reasons for dropout were presented, which, however, are based on inconsistent data: demographic variables, weight history, eating behavior, mental health, physical health, health behavior, personal factors, logistics. The latter point includes, for example, the distance to the supervising institution (Moroshko et al. 2011). This sometimes very high time expenditure (e.g., travel) can be reduced by digital approaches.

► **Important** Digital approaches to obesity therapy are diverse and overcome spatial distance.

80.2 Telemedical Intervention

In a telemedical weight loss program, various transmission strategies (e.g., email, Bluetooth, SMS, telephone, mail) are usually combined for data transfer and information flow between patient and caregiver (Fig. 80.1). Typically, the patient collects and transmits data (e.g., weight data, nutritional parameters, exercise log) to a supervising institution, from which they receive prompt feedback. The feedback can be provided by a person or generated automatically.

In Germany, there are few evaluated telemedical programs for weight loss. For example, the “The Active Body Control” (ABC program) uses scales and pedometers for data collection and a home box for data transfer. The program is based on a lifestyle intervention and also includes four personal meetings in which the program is explained, the telemedical devices are handed out, initial anthropometric data are collected, and blood is drawn. Once a week, the health care center sends feedback to the

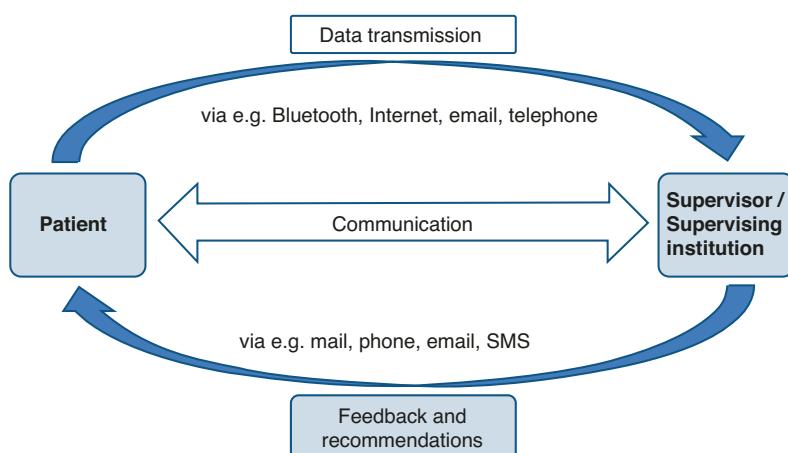


Fig. 80.1 Schematic representation of communication between patient and caregiver/supervising institution within a telemedical intervention

patients via email. A scientific evaluation of a small patient group ($N = 35$) with type 2 diabetes mellitus showed a mean weight loss of 11.8 ± 8.0 kg (94% “*completers*”) after six months (Luley et al. 2011). Another evaluation, in which individuals with ($N = 25$) and without ($N = 24$) the ABC program were compared during the follow-up period, showed that after 24 months, a weight loss of 8.5 and 9.0% of the initial weight was achieved, respectively (Stumm et al. 2016). The program has not been carried out in practice since mid-2021.

The telemedical lifestyle-based weight management program “SMART—Weight Management for Risk Patients” is offered at the Institute for Applied Telemedicine of the Heart and Diabetes Center (HDZ) North Rhine-Westphalia. An evaluation with 200 participants showed a weight loss of approximately 6 kg ($5.8 \text{ kg} \pm 6.1 \text{ kg}$) in the group with low carbohydrate intake and approximately 4 kg ($4.3 \text{ kg} \pm 5.1 \text{ kg}$) in the group with low fat intake (*intention-to-treat*) after twelve months. In both groups, weekly nutrition counseling was conducted by telephone during the first six months. Weight data of the participants was sent once a week to the study center via mobile phones using a Bluetooth-equipped scale. Visits for further data collection took place at the beginning and after six and twelve months (Frisch et al. 2009).

Comparing the weight loss data of these two telemedical programs with studies in which a face-to-face intervention for weight loss was conducted, the results regarding weight loss are similar.

Although telemedical weight loss programs seem to be a good alternative to face-to-face interventions at first glance, there are relatively few offers. Clinical studies with larger case numbers and longer intervention and follow-up periods are necessary to make reliable statements regarding the efficacy of telemedical weight management programs. Nevertheless, it is probably undisputed that telemedicine

represents a good opportunity to establish contact with patients, address individual needs, ensure data exchange, and facilitate regular weight control.

► **Important** Telemedical applications for obesity therapy are limited. They seem to be a good alternative to other methods in obesity therapy.

80.3 Telephone-based Intervention

Personal counseling plays a central role in obesity therapy and is preferred by many therapists and affected individuals. In recent years, more and more weight management interventions have been offered in the form of telephone interventions. This communication method is a good alternative to face-to-face approaches, as it is easy to implement, cost-effective, and still allows for personal contact.

► **Important** Telephone-based weight management is associated with less time expenditure for individuals with obesity and still allows for personal contact between patient and caregiver.

Comparing telephone-based interventions with personal counseling sessions (face-to-face) or a control group, it is shown that both interventions perform better in terms of weight loss than the control group. After twelve months ($N = 415$), a telephone-based intervention, which also included a website and email correspondence, resulted in a weight loss of 4.6 ± 0.7 kg. The group with personal counseling sessions on-site lost 5.1 ± 0.8 kg, and the control group lost 0.8 ± 0.6 kg (*intention-to-treat*) (Appel et al. 2011). In another study ($N = 407$), the telephone-based intervention group lost an average of 6.2 kg (4.9 to 7.6 kg) after 24 months. In

comparison, the weight loss in the face-to-face group was an average of 7.4 kg (6.1 to 8.7 kg), and in the control group, it was 2.0 kg (0.6 to 3.3 kg) (*intention-to-treat*) (Rock et al. 2010). As with personal counseling sessions, there is also a group effect in telephone-based interventions. In the “Support, Health Information, Nutrition and Exercise” (SHINE) study, the weight loss after 24 months in the group with telephone conferences was almost three times as high (6.2 ± 14.3 kg) compared to the group with individual phone calls (2.2 ± 14.2 kg) (Weinstock et al. 2013).

The German health insurance company Deutsche Krankenversicherung (DKV) offers its policyholders the weight management program “Leichter Leben” (Lighter Living). With this telephone-based program, participants achieved a weight loss of 4.4 kg after twelve months (N = 232, *completers*) (Holzapfel et al. 2016).

► **Important** Moderate weight loss can be achieved with telephone-based lifestyle interventions.

In general, as with almost all weight loss programs, there is a lack of reliable long-term data for telephone-based lifestyle interventions. Furthermore, due to the different program contents and heterogeneous statistical analyses, it is difficult to compare the effectiveness of the weight loss programs. The moderate weight loss achieved through telephone-based intervention is comparable to on-site personal interventions and is clinically relevant, especially when face-to-face interventions are not possible (e.g., due to mobility restrictions). Further health economic analyses are needed to determine the cost-effectiveness of telephone-based programs.

► **Important** Reliable health economic analyses on the cost-effectiveness of telephone-based weight loss programs are still lacking.

80.4 Internet-based Intervention

It is known that internet-based weight loss programs can reach a very large number of people at low cost and with high flexibility (Wadden et al. 2012).

In Germany, several weight loss programs have been offered online for several years. The growing market is quite confusing, making it difficult for those affected to choose a suitable program, especially since most programs are hardly scientifically evaluated and promise more than they ultimately deliver. The following describes selected programs in Germany.

The training program “Lean and Healthy” for a healthy lifestyle and successful weight management is offered through the Hamburg University of Applied Sciences. The program lasts 52 weeks and costs a one-time fee of 50 euros. An evaluation of 633 people who have completed all 52 training modules shows that women lost around 6 kg and men around 7 kg after one year (www.lean-and-healthy.de). An older evaluation of the program found that 13.3% (*intention-to-treat*) achieved a weight loss of 5% or more after one year (Westenhöfer 2005).

HausMed offers the twelve-week online course “Gesund Abnehmen (Healthy Weight Loss),” which, for example, conveys a healthy lifestyle through nutrition information (weekly topics), diaries, and food databases. Experts support participants via forums, email, or telephone. The program costs 69 euros. Health insurance companies reimburse 80–100% of the costs. Scientific evaluations and long-term data are still lacking (www.hausmed.de).

“Abnehmen mit Genuss (Losing Weight with Pleasure)” is a 52-week internet-based weight loss program aimed at lifestyle changes. Personal advice is provided in written form (e.g., via email) and through forums by an interdisciplinary advisory team. There is also a

recipe database, an online community, and the option to keep nutrition and exercise diaries. The program costs 79.90 euros. AOK-insured individuals usually receive a refund of the participation fee after completing the program (www.abnehmen-mit-genuss.de).

► **Important** The range of internet-based weight loss programs is growing in Germany. Since the market is confusing and many programs are not scientifically evaluated, it is difficult for those affected to choose a suitable program.

A recently published study demonstrated the benefits of an online program offered in America through 15 family doctor practices. In a cluster-randomized intervention study, three approaches to weight loss were examined: A) Online program with obesity manager (“Population Health Manager”), B) Online program alone, and C) Standard care. A total of 840 adults aged between 20 and 70 years with a body mass index (BMI) between 27 and 40 kg/m² and hypertension and/or type 2 diabetes mellitus participated in the study. All three groups significantly reduced their body weight after one year (Group A: 3.1 kg, Group B: 1.9 kg, Group C: 1.2 kg) (Baer et al. 2020). The fact that the online program was embedded in routine primary care makes the offer interesting. Whether the approach carried out in the study can be implemented in Germany is unclear.

The result of various review studies is that internet-based weight loss programs have a high potential for effective obesity treatment. In one review, weight loss in internet-based interventions ranged from no weight loss to 7.6 kg, with the intervention timeframe varying between studies. In general, a high dropout rate was observed in internet-based interventions (Arem and Irwin 2011). Comparing different methods

of lifestyle therapy for obesity, weight loss in internet-based programs is lower than in face-to-face counseling sessions, but still clinically relevant. Internet programs also perform well in terms of weight maintenance, as continuous contact between patient and supervisor (whether online or in person) plays an important role in maintaining weight (Wadden et al. 2007). In a Cochrane review, the authors concluded that after six months, computer-based interventions achieved greater weight loss than minimal intervention (standard treatment), but less than intensive personal on-site support (face-to-face). A similar picture emerges regarding weight maintenance. Participants in computer-based interventions regain less weight than those with standard treatment, but more than those who had personal support (Wieland et al. 2012). This shows that the comparison intervention is crucial for interpreting the results.

► **Important** Compared to face-to-face interventions, internet-based weight loss programs do not perform as well. However, with online weight loss programs—assuming longer participation—a moderate weight loss can be achieved, which is clinically relevant.

A large-scale evaluation of an internet-based weight loss program in Australia examined the prevalence of dropout and non-usage attrition. Of the nearly 10,000 people who signed up for either the 12- or 52-week program, the median age was 36 years. As expected, this group is somewhat younger than in other offerings. After twelve weeks, only 35% of the remaining 6,705 participants could still be considered users. For the 52-week group (N = 2,051), only 30% were still users after 52 weeks. This evaluation probably reflects everyday life and shows that a large proportion of participants discontinue active use of the online tool (Neve et al. 2010).

Table 80.1 Advantages and disadvantages of internet-based weight loss programs and the resulting research needs

Advantages	Clinically relevant weight loss, positive effects on weight stabilization, practical, location- and time-independent, self-monitoring possible, social support (e.g. supervision, chat rooms, forums), widespread
Disadvantages	High development costs, high dropout rates, self-reported data from participants not verifiable, lack of face-to-face effect
Research needs	Risk-benefit consideration, data protection, cost-benefit analysis, scientific evaluation, randomized studies, optimization of participant retention

► **Important** The dropout rate in internet-based weight loss programs needs to be improved.

It is undisputed that internet-based weight loss programs are increasingly being used and such programs are indispensable in obesity therapy. They undoubtedly expand the range of options for those affected and enable a flexible therapy choice tailored to individual preferences. Despite the advantages that using the internet for weight loss brings, there are still some questions that remain unanswered, indicating a significant need for research (Table 80.1).

80.5 Use of Smartphones

New information and communication technologies also include smartphones, which have revolutionized communication and information exchange between individuals and represent a high potential for effective use in obesity therapy. The advantage of smartphones is that standard websites and mobile-optimized websites can be accessed quickly and easily on the go. In addition, there are application software (apps, “applications”) for smartphones that promote a health-promoting lifestyle.

Health apps can facilitate a health-promoting lifestyle and support weight management (Holzmann and Holzapfel 2019). More and more commercial providers of weight loss programs are using this technology and offer online tools and apps in addition to traditional programs. A study has shown that such additional

tools positively influence weight loss. In a commercial weight loss program (Weight Watchers), interactive online tools and an app were used in addition to the established meetings. The tools were freely available to participants. It was found that using all three components led to the highest weight loss after six months (Fig. 80.2) (Johnston et al. 2013).

A pilot study ($N = 127$) investigated the acceptance of apps (smartphone), online tools (internet), and printed media (paper version) for weight loss. In the smartphone group, the dropout rate was the lowest and adherence was the highest. After six months, the average weight loss (*intention-to-treat*) in the smartphone group was 4.6 kg, in the paper version group 2.9 kg, and in the internet group 1.3 kg (Carter et al. 2013).

In a systematic review and meta-analysis with 41 studies, 6,348 participants, and 373 endpoints, it was shown that the use of apps positively affects eating behavior and nutrition-associated endpoints. In the studies included in the evaluation, the intervention lasted an average of 21 weeks. In total, 30 different apps were used across all studies. With regard to the short-term improvement of anthropometric data, significant positive effects were demonstrated (Villinger et al. 2019). Long-term studies show that app-supported interventions perform similarly well or worse than comparison interventions or the control group in terms of weight loss and thus do not provide additional benefits for weight management (Table 80.2).

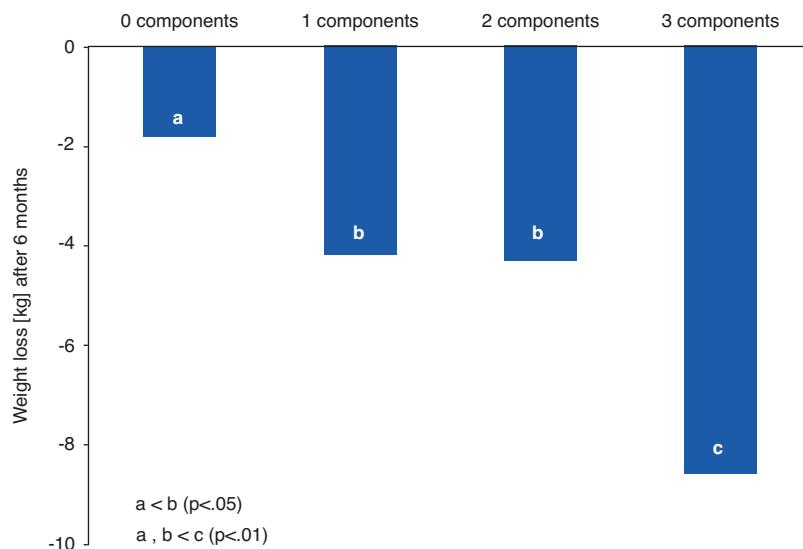


Fig. 80.2 Weight loss depending on the use of the offered components (meetings, online tools, apps). (From Johnston et al. 2013)

It should be noted that in the studies, apps are often used that are outdated and thus do not correspond to the current apps on the market. For this reason, study results with a new generation of apps are to be awaited in order to generate reliable evidence. It is evident from the studies and practical experience that apps represent a helpful additional tool for self-observation, but personal support from a professional cannot be replaced in weight loss. The use of activity trackers also shows no additional benefit (Table 80.2).

► **Important** In long-term studies, apps and activity trackers have so far shown no additional benefit for weight loss.

The ethical and legal framework conditions as well as the safety aspects regarding apps are largely unclear (Holzmann et al. 2017). Many apps collect personal data, and it is not clear to users to what extent data protection is guaranteed. The sources for the content of the apps are mostly not transparent, i.e., the user cannot understand on which expertise, for example, nutrition tips are based. Stiftung Warentest

(German consumer organization) examined health-related apps in 2013, of which around 100,000 are offered for download and about 1000 are added per month. The 24 tested apps ranged from calorie counting, weight control to medication management. The conclusion was that none of the applications performed very well. Above all, a lack of transparency and data security were criticized.

This conclusion was also reached by an American review article that examined weight management apps more closely. 204 apps could be identified via iTunes, which could be assigned to the categories nutrition, exercise, weight course (19%), nutrition recommendations and histories (34%), and weight control (46%). In terms of content, most apps were inadequate (Breton et al. 2011).

In order to improve or ensure the quality of health apps, examinations and certifications are necessary. However, usually only medical apps (e.g., apps for diagnosis) are checked by approval authorities, while most apps are not medical products and are therefore not subject to any examination or approval procedure. Health apps thus remain largely unregulated for

Table 80.2 Selected intervention studies for weight loss with apps and activity trackers

Study participants	Intervention	Weight loss	Effect	Reference
365 adults, BMI $\geq 25 \text{ kg/m}^2$, 70% women	a) mHealth intervention (interactive smartphone application) b) Personal coaching plus smartphone application c) Control group	After 2 years a) 0.99 kg b) 2.45 kg c) 1.44 kg	No significant difference	Svetkey et al. 2015
471 adults, BMI 25 to 40 kg/m^2 , 77% women	All: energy-reduced diet, group counseling All: after 6 months additionally phone calls, text messages, homepage → Randomization after 6 months: a) Intensive intervention: "wearable", "web interface" b) Control group: self-monitoring via homepage	After 2 years a) 3.5 kg b) 5.9 kg	Significant difference between groups	Jakicic et al. 2016
279 adults, BMI 27 to 40 kg/m^2 , 78% women	a) WW Online Program (WWO) b) WW Online Program with ActiveLinkVR (WWO1AL) c) Online newsletter (Control group)	After 1 year a) 2.1 kg b) 1.6 kg c) 1.2 kg	No significant difference	Thomas et al. 2017
276 adults, BMI 25 to 45 kg/m^2 , 83% women	a) GROUP (group-based therapy face-to-face, paper nutrition logs, written feedback) b) SMART: Smartphone-based therapy, online sessions, self-monitoring, feedback, monthly weighing appointments c) CONTROL: Self-monitoring, paper nutrition logs, written feedback, monthly weighing appointments	After 18 months a) 5.9 kg b) 5.5 kg c) 6.4 kg	No significant difference between SMART and GROUP Significant difference between SMART and CONTROL	Thomas et al. 2019

consumers. To evaluate the quality, various platforms are currently being set up. In addition, there are checklists for consumers to evaluate apps according to objective criteria (overview).

Selected criteria for evaluating apps

- Objective product tests
- Qualification of the provider (ISO, DIN)
- Interests of the provider (commercial)
- Data transparency
- Data protection
- Data storage and transfer
- Support/service offering
- Permanence of market presence

► **Important** The market for health apps is uncontrolled and intransparent. Many apps show weaknesses in terms of data protection, security, and evidence-based content. Caution is advised when selecting and using apps.

80.6 Digitale-Versorgung-Gesetz

In 2020, the Digital Care Act came into force in Germany. This law allows digital health applications (DiHAs), which are listed by the Federal Institute for Drugs and Medical Devices (BfArM), to be prescribed by doctors. The Digital Care Act created a framework for digital therapy concepts in Germany, the costs of which are covered by health insurance companies. It should be mentioned that prescribable DiHAs undergo a certain formal process through the BfArM, but this does not necessarily represent a quality feature.

Independently of the Digital Care Act, certified nutrition professionals and doctors in Germany offer personal consultations for weight loss via digital media (e.g., telephone, video, apps). These consultations are subsidized by most health insurance companies as part of obesity therapy.

80.7 Outlook

There is no doubt that new communication and information technologies significantly expand the range of methods for weight management. This helps to offer affected individuals programs that suit their preferences and can be easily integrated into everyday life. Although personal face-to-face consultations achieve the greatest weight loss success, other channels of information and knowledge transfer still seem to be a good alternative to personal consultation. Digital offers are particularly beneficial for people with limited time windows (e.g., working people) or with mobility restrictions (e.g., people with illnesses). In addition, the younger generation and tech-savvy individuals are particularly attracted by interactive electronic components. Comparing the various methods (Fig. 80.3) in terms of individual characteristics, it becomes apparent that weight loss is somewhat lower with new technologies, but significantly more people can be reached and the cost-benefit effectiveness is likely to be improved.

The guideline of the DAG recommends the most individual therapy possible, i.e., the choice of the respective option depends on the possibilities and personal preferences of the patient as well as the availability of the program. It has been shown that the various technical approaches to obesity treatment can be combined very well and complement each other. The new generation of weight loss programs will likely combine the various options and still let the patient decide which tools they prefer to use.

Further innovative technological approaches such as Artificial Intelligence and Virtual Reality will additionally expand the spectrum of digital approaches to obesity therapy. Artificial intelligence applications based on large multidimensional datasets will primarily promote personalized, target group-appropriate, and “just-in-time” recommendations. Virtual environments (e.g., virtual supermarket, virtual doctor’s office) will allow for realistic settings to be depicted in order to use them for digital interventions in obesity therapy. The creation of an avatar could, for example, improve body image perception in people with obesity and thus support obesity therapy.

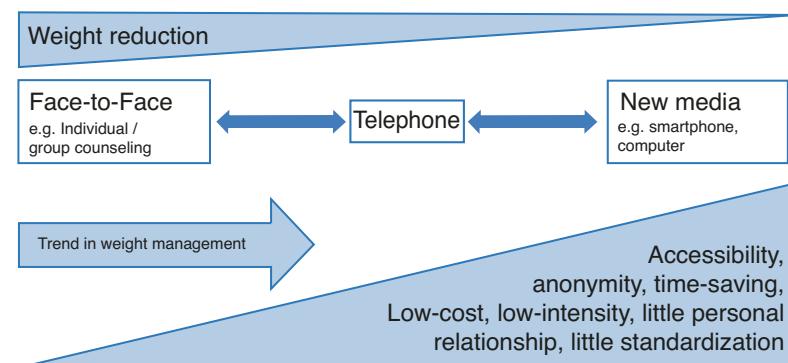


Fig. 80.3 Advantages and disadvantages of digital approaches to weight loss compared to face-to-face interventions

Conclusion

- Telemedical applications and new communication and information technologies are used in obesity therapy.
- The number of telemedical weight loss programs in Germany is limited. The achieved weight loss is comparable to face-to-face interventions.
- Telephone-based weight loss programs lead to moderate weight loss and represent a good alternative to face-to-face interventions.
- Internet-based weight loss programs have high dropout rates but lead to clinically relevant weight loss.
- Health apps show no additional benefit in terms of long-term weight loss but are a good option for self-monitoring and data collection.
- New media significantly expand the range of methods for successful weight management. This makes it possible to offer affected individuals programs that correspond to their preferences and can be easily integrated into everyday life.
- The Digital Care Act in Germany creates framework conditions for prescribing digital health applications.
- Innovative technologies such as Artificial Intelligence and Virtual Reality will expand the range of methods for weight loss in the future.

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