

## Chapter 14

# RECOVERY FROM ANOREXIA NERVOSA

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## Abstract

The aim of this chapter is to critically analyze the difficulties still inherent in studying recovery from anorexia nervosa (AN). A comprehensive literature review demonstrates that there are at least ten definitions of recovery from AN, differentiated according to several criteria: definition of normal weight; inclusion of only behavioral vs. both behavioral and psychological recovery; inclusion of comorbidity and overall psychosocial functioning in addition to eating-related recovery; and the minimal time required to define recovery. These discrepancies likely account for the wide variation in the range of patients defined as recovered from AN in different outcome studies (0-92%). A great variability also exists with respect to the factors predicting recovery. Another limitation to the research on factors that predict recovery in AN is that most outcome studies have used univariate analyses for this purpose, enabling the assessment of only separate independent predictors. By contrast, multivariate quantitative models allow for the measurement of the relative contribution of each variable for recovery, as well as for the assessment of the cumulative predictive power of all variables included.

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Unfortunately, only a few quantitative studies exist. Still, an overall worse prognosis has been found repeatedly to be associated with several factors: body image disturbances, compulsive exercising, comorbid anxiety disorders (particularly obsessive compulsive disorder), personality disorders and non-clinical personality traits, poor social skills, longer duration of illness prior to treatment, and shorter follow-up. In the second part of the chapter we aim to provide the reader with several potential options to standardize the definition of recovery and the design of outcome studies in AN.

**Keywords:** anorexia nervosa, recovery, eating disorders

## INTRODUCTION

Anorexia nervosa (AN) is a chronic disorder with an often unfavorable course, imposing a considerable burden on afflicted individuals, their families and society at large (1,2). Treatment providers need a good understanding of what is meant by remission and recovery from AN, so that sound decisions can be made with respect to the planning of appropriate intervention strategies for this eating disorder (ED), and the optimal time range for their provision. For example, for patients who are not fully remitted, treatment may be increased or changed, whereas treatment can be discontinued if recovery is reached (3). Regrettably, the study of the exact criteria required is hampered by problems such as the prolonged course of AN until recovery is reached and the high relapse rate of the disorder within a relatively brief time period (4,5), as well as because of difficulties in defining and agreeing on standard criteria for recovery (2,5,6). Currently, definitions vary widely with respect to the required criteria and the duration required for recovery, creating difficulties in comparing the course and outcome of AN across different studies.

The aim of the present chapter is to provide a critical description of the different definitions for recovery from AN, emphasizing theoretical, clinical, and research-related conclusions associated with each definition. We further aim to provide a better understanding of the meaning of the distinction between remission and recovery. This distinction is of greater relevance in AN in comparison to other psychiatric disorders because of the high mortality, morbidity, and relapse rate associated with this disorder (5,7,8). Lastly, we relate to the critical issue of the relevant biopsychosocial dimensions influencing the course and outcome of AN and the complex interactions occurring among these dimensions in the all-important process of recovery. Recommendations for future research are also provided.

## DEFINITIONS OF OUTCOME IN ANOREXIA NERVOSA

Definitions of response to treatment, remission, and recovery in AN vary widely in the research literature, and reflect considerable confusion between these terms. Definitions differ both with respect to the criteria required and the duration of time needed to define them. According to Couturier & Lock (6):

**Response to treatment** – A significant clinical change or a significant change in a specific index (e.g. a score on an assessment scale) following a period of treatment, as compared to the baseline period. Time duration is not part of this definition.

**Remission** – The patient has been symptom-free at least for a brief period of time.

**Recovery** – A symptom-free condition maintained for a prolonged period of time.

Both remission and recovery are not related to the effect of treatment and may occur spontaneously, in line with the natural course of the illness. Still, the duration required to define both varies significantly, ranging from eight weeks to one year or more (5,6,9).

We now present the different definitions of remission and recovery reported in the AN literature. Probably the oldest and most commonly used scale for assessing the outcome of AN is the Morgan-Russell Scale (10). This scale defines three possible outcomes: good, intermediate, and poor, based on criteria of weight and menstruation. A “good” outcome is defined as weight not less than 85% of normal weight range according to age, gender, and height, combined with the presence of normal and regular menstruation. An “intermediate” outcome is defined as weight not less than 85% of the normal range, but menstruation is unstable, and/or irregular. A “poor” outcome is defined as weight lower than 85% of the normal weight range and the absence or near absence of menstruation. This instrument is limited in that an individual may be defined as fully recovered based on normal weight and menstruation, while still displaying pathological attitudes and behaviors regarding eating and body weight. The minimal duration required to define any outcome with the Morgan-Russell Scale is 8 weeks.

As an alternative, Strober and associates (5) have defined “good recovery” as a good outcome according to the Morgan-Russell Scale, whereas “full recovery” is defined as absence of all symptoms, both behavioral and preoccupational/attitudinal required for the diagnosis of AN. Accordingly, “full recovery” requires normal body weight, menstruation and eating related behaviors, and the absence of preoccupations and maladaptive attitudes concerning weight and shape. The other possible outcomes (partial recovery and poor recovery) are defined according to the Morgan-Russell criteria. The minimal duration required to define a respective outcome according to Strober et al (5) is similar to that of the Morgan-Russell Scale, namely 8 weeks.

Steinhausen and Glanville (11) modified the semi-structured interview of Stuzenberger et al (12) to develop a scale that would define recovery from AN not only qualitatively (i.e., present or absent), but also from a quantitative (i.e., extent of recovery) perspective (11,13,14). Furthermore, this scale defines recovery with respect to both ED symptomatology and sexual and psychological functioning. Each of its 11 factors is scored on a scale of four points, reflecting severity and frequency (absent, minimal, moderate, or severe). These ratings lead to three scores: 1. An ED score, based on five factors – restricting behaviors, bingeing, vomiting, use of laxatives, and amenorrhea; 2. A psychosocial score based on six factors – lack of interest in sex, abstinence from sexual activity, unsatisfying interpersonal relationships, dependence on one’s family, unsatisfying social life, and a deficient professional career; 3. A general score based on all eleven factors, which encompasses both the ED and the psychosocial functioning score.

Herzog et al (15) have developed another scale assessing recovery from AN, the Psychiatric Status Rating Scale (PSR). Scores range from 1 to 6, with 1 representing full recovery [“usual self” with no evidence of AN and with normal body weight (defined as 100% of ideal body weight) and menstruation], and 6 representing active, severe AN (“definite criteria, severe” – a diagnosis of full-blown AN and severe overall dysfunction, such as a need for hospitalization). The PSR allows for several options in the definition of

each stage of recovery, and it also takes measures of AN-related attitudes and behaviors into consideration. For example, “full/good recovery” are defined as eight consecutive weeks with a PSR score of 1 or 2, respectively, whereas “partial recovery” can be defined as eight consecutive weeks with PSR score of 3 or 4, or less than eight consecutive weeks with PSR score of 1 or 2 (15).

Eckert et al (16) has developed another scale consisting of seventeen items, based on the criteria of the Morgan-Russell Scale and on Garfinkel et al's (17) Global Clinical Score. Scoring is based on a general rating of clinical outcomes as well as on sixteen items encompassing current weight and height, and pathology in seven areas: AN like behaviors and/or attitudes, menstruation, sexual attitudes and behaviors, social adjustment, educational and/or occupational adjustment, and psychological adjustment. Scores are based on the past six months. Each item is rated on a four-point scale, from “absent” to “extreme.” Data from this scale classify each case into one of four recovery categories: recovered, good outcome, intermediate outcome, and poor outcome.

Kaye and his group (18) defined recovery from AN as a condition requiring normal weight (defined as weight of 90% of average body weight) and menstruation (defined as 10-12 menstrual cycles in 12 months), as well as complete abstinence from bingeing, purging and restrictive eating behaviors for at least 12 months prior to assessment. This group was the first to define normal menstruation in term of number of cycles required, and among the first to require a prolonged 12-month duration criterion.

Casper (19) uses criteria similar to those of most other studies, but also adds a requirement for a substantial improvement in eating-related preoccupations and in attitudes related to food, physical appearance, and weight. Accordingly, Casper defines a “good recovery outcome” or “physiological recovery” as body weight within 85% or more of average body weight along with regular menstruation. “Psychological recovery” is established based on results of a rating scale, the Eating Attitudes Test-26 (EAT-26) (20), with “full recovery” defined as physiological recovery together with a score within no more than two standard deviations from the normal EAT-26 score. Like Kaye and his group, Casper also requires a period of no less than 12 months to define recovery.

Kordy et al's (21) criteria require weight of more than 88% of ideal body weight [body mass index (BMI)>19 kg/m<sup>2</sup>], and a score within the normal range on a standardized clinical interview assessing eating-related behaviors and attitudes [the Eating Disorder Examination (EDE) (22)] for a period of no less than 3 months, to define remission. A similar lack of symptoms for at least 12 months defines recovery.

Pike (23,24) sets stringent criteria for remission and recovery. For both, normal weight (BMI=20 kg/m<sup>2</sup>, or more than 90% of recommended weight), normal menstruation status and normal eating behaviors have to be achieved. In addition, recovery is attained only when the overall functioning and risk of recurrence of the symptoms is comparable to that of a control group of healthy women. To achieve this condition, Pike requires the presence of normal eating related behaviors and attitudes, defined as not more than 1 standard deviation of a normal comparison group on the EDE, and lack of AN-related acute health problems. Pike does not require a specific time duration to define recovery, but mentions that the requirement of Morgan & Russell (10) and Strober et al (5) for 8 weeks may be a reasonable starting point for defining the stage of recovery.

Lastly, Von Holle and associates (9) define recovery from AN as three consecutive years without ED symptoms (including low weight, no or disturbed menstruation, and the presence of restricting, bingeing, or compensatory behaviors). In explanation of their choice of the

three-year time frame, these authors emphasize their intention to maximize the probability that recovery would be diagnosed in those who are truly recovered rather than in cases of temporary remission, given that most relapses occur during the first year after the completion of treatment (4,5)

Table 1 summarizes many of the problems associated with the criteria required for remission and recovery from AN..

**Table 1. Summary of criteria for recovery from anorexia nervosa**

	<b>Weight (% of normal weight)</b>	<b>Behavioral recovery only</b>	<b>Behavioral &amp; psychological recovery</b>	<b>Overall (non-ED) Functioning</b>	<b>Duration</b>
<b>Morgan Russell (10)</b>	85%	+	-	-	8 weeks
<b>Strober (5)</b>	85%	+	-	-	8 weeks
<b>Steinhausen (11,14)</b>	BMI $\geq$ 17.5	+	-	+	No defined time period
<b>Herzog (15)</b>	100%	-	+	-	8 weeks
<b>Eckert (16)</b>	85%	+	+	+	6 months
<b>Kaye (18)</b>	90%	+	-	-	12 months
<b>Casper (19)</b>	85%	-	+	-	12 months
<b>Kordy (21)</b>	88%	-	+	-	12 months
<b>Pike (23,24)</b>	90%	-	+	-	No defined time period
<b>Von Holle (9)</b>	No defined weight range	+	-	-	36 months

Firstly, is the lack of ED-related symptoms and behaviors (i.e., normal weight, and/or normal menstruation and/or cessation of restricting/bingeing/purging behaviors) sufficient for the definition of recovery, as suggested by some researchers (e.g., 9,10,18), or should full remission be described only in the absence of eating/weight-related preoccupations and body image disturbances, as suggested by others (e.g., 5,15,16,19,21,23)? The inclusion of eating-related behaviors only suggests a “narrow” definition of recovery, whereas the addition of eating-related preoccupations and attitudes suggests a “broad” definition (6). This differentiation not only influences the proportion of individuals who recover from a studied sample, but also the time required to reach recovery. Not surprisingly, behavioral recovery appears to occur more often and at a shorter duration than psychological recovery (2,5,6,21). Secondly, should recovery be limited only to the ED per se (see 5,9,10,19), or should a reduction in psychiatric comorbidity (e.g., depression, anxiety or non-ED obsessionality) and/or an improvement in overall psychosocial functioning and general health be also included in the definition of recovery (see 11,14,16,23)? A third difficulty is related to discrepancies in the definition of normal weight [e.g., either 85% (5,10,16,19), 88% (21), 90% (18,23) or 100% (15) of required weight, presented in terms of ideal (21) or average (18)

body weight range, and BMI (14)]. Similar problems exist in the definition of normal menstruation, often leading to poor inter-rater reliability (25). Varying definitions of “normal weight” and “normal menstruation” may also affect the time frame (ranging from 8 weeks to 3 years) required for recovery.

From a different perspective, recovery rates in AN may also reflect in part the assessment tool used, i.e., higher rates in the case of rating scales, and lower rates if clinical interviews are used (26). Moreover, with the exception of Kordy et al (21) and Pike (23), none of the criteria proposed differentiate remission from recovery, except for the criterion of time, despite the likelihood of earlier remission representing a good predictor of later recovery (3). Lastly, most of the studies so far relate to adult female populations. Studying males likely requires a whole different set of criteria, which have still not been studied in depth. Similarly, the definition of recovery in adolescents is likely even more ambiguous than in adults, because recovered adolescents may have still not reached their final adult height (and in turn, their ideal weight), or not have had their first menstrual period. In this respect, the issue of menstruation represents a major problem in the study of recovery in AN, because periods are often irregular even in recovered patients, and many adolescent and young adult females nowadays use contraceptives.

## **RECOVERY RATES IN ANOREXIA NERVOSA**

AN is a chronic disorder, with recovery occurring mostly after 4-10 years from the onset of the illness (2,9), although it may happen even after 15 years of illness (9). The large variability in the definition of recovery and in the duration required for recovery, alongside variations in patient parameters (e.g., age, age at the onset of illness, the country in which the study takes place, or inclusion of outpatients vs. inpatients), and in study characteristics [e.g., selective attrition, duration of the follow-up period, the time period at the start of the study (representing a cohort effect) or the type of treatment provided], likely account for the large variability in remission/recovery estimates in AN.

Indeed, two comprehensive reviews, those of Herzog et al (27) and Steinhausen (2), summarizing the results of 33 and 119 outcome studies, respectively, have found recovery rates ranging from 17-77%, (27) and 0% to 92% (2). More recent studies have also shown a similar variability of outcome (4,9,21). These considerable discrepancies preclude meaningful comparisons among different studies. Still, on average, full recovery occurs in less than 50% of the patients, with 30% showing some improvement, and 15-25% remaining chronically ill (2,23).

Recently, Couturier and Lock (3,6) assessed the rate of remission and recovery from AN according to different sets of relevant criteria. In their first study (3), remission was defined along the criteria sets proposed by Morgan-Russell, Pike, Kordy et al, and the definition of AN according to the DSM-IV-TR, 2000 (28), taking into consideration different thresholds for normal weight and the absence/presence of psychological disturbances (i.e., attitudinal eating-related preoccupations on the EDE). Remission was assessed 12 months after the start of treatment. A wide range of remission rate was found, the lowest being 3% (full criteria according to Pike) and the highest 96% (if weight within 85% of ideal body weight was the only criterion required for remission). The authors suggested that combining the definition of

normal weight (85% of ideal body weight) and normal eating-related behavioral and psychological condition (EDE scores within 1-2 standard deviations of normal) appeared to reduce the variability in remission rates to the greatest extent.

In the second study, Couturier and Lock (6) defined recovery using various thresholds for normal weight (85-95%) and for normal eating-related behaviors and attitudes (EDE scores within 1 or 2 standard deviations from normal). Recovery was assessed 2-6 years after the start of treatment. A wide range of recovery rates was found, the lowest being 57.1% (scores for all EDE scales within 1 standard deviation of normal), and the highest 94.4% (if weight within 85% of ideal body weight was the only criterion required for remission). Of interest, all definitions of recovery showed a similar temporal trend, with no substantive changes occurring after 12 months. Accordingly, if remission was present for no less than 12 months, it was also maintained at long term follow-up. In addition, weight recovery occurred around one year earlier than behavioral and psychological recovery (an average of 12 vs. 24 months, respectively). Likely, it was necessary to achieve normal weight to alter eating-related behaviors and attitudes (29). The variability in recovery rates was the least when combining normal weight (defined as 85% of ideal body weight) and normal eating-related behavioral and psychological condition (EDE scores within 1 standard deviation of normal). All former patients fulfilling these criteria were functioning well at follow-up both from an occupational and a social perspective. Attainment of normal weight and normal scores on the restraint subscale of the EDE (but not on other EDE subscales or the total EDE score) at 12 months was highly correlated with normal scores in these two parameters at long-term follow-up. These findings led Couturier and Lock (3,6) to conclude that weight restoration and low EDE restraint scores might be excellent predictors of long-term recovery.

## PREDICTORS OF ANOREXIA NERVOSA OUTCOME

Studies assessing predictors of recovery from AN have mostly used longitudinal follow-up designs, or, less often, retrospective chart reviews. The earliest predictive factors are related to the time of onset of the illness, usually assessed with retrospective descriptions of patient and family during the index follow-up assessment, or according to medical charts. Other predictors of recovery can be assessed prospectively from different relevant points during the course of the illness, e.g., the return of the menstrual cycle (physical point of reference), when leaving home for college (psychosocial point of reference) or upon discharge from inpatient treatment (treatment-related point of reference).

Although a wide range of predictive factors have been found in different studies, reflecting the wide variability in the definition of recovery, the design of the outcome study, and the length of the follow-up period, several parameters seem repeatedly to have a greater power to predict outcome than others. The following summary of data is based on the reviews of Herzog et al, (27) Pike (23), and Steinhausen (2), as well as on more recent data:

1. **ED-related variables**—An overall worse prognosis is associated in particular with the presence of elevated drive for thinness, disturbances in body image (23) and vegetarianism (30) at any point during the course of the illness, the emergence of bingeing/purging behaviors in patients originally diagnosed with restrictive type AN (2,23), the likelihood of eating less varied food and/or food with lower caloric density

(31), and the presence of more compulsive exercising following discharge from inpatient treatment (5). Conversely, the lack of these variables may predict an overall more favorable outcome. Of interest, severity of dieting behavior and extent of emaciation during the course of AN have been usually found not to exert a significant influence on outcome (2,23).

## 2. **Comorbidity –**

**Anxiety disorders** – The likelihood of elevated rates of anxiety disorders, primarily non-ED obsessive compulsive disorder (OCD) and social phobia, both before the onset of AN (32) and during the course of the illness (33-35), suggests that elevated anxiety may have a role both in the predisposition to AN and in increasing the risk for non-recovery (36). Accordingly, patients not recovering from AN have been found to have a significantly greater incidence of anxiety disorders preceding the emergence of the ED compared to recovered patients (37). Similarly, a history of non-ED OCD in AN patients has been significantly correlated with a longer duration of the illness (35).

**Personality disorders** – Long-term outcome studies in AN have found that the presence of concomitant personality disorders, primarily obsessive compulsive personality, during the course of the illness may be a marker for an overall worse prognosis of the ED (2,27,38,39). By contrast, hysterical personality has been linked to an overall more favorable outcome (2).

**Non-clinical personality traits** - Elevated levels of personality attributes such as harm avoidance, rigidity, inhibition, perfectionism and obsessiveness, have been associated with an overall worse prognosis of AN in several long-term outcome studies (2,33,40), as well as in studies comparing recovered AN to non-ED control patients (41).

## 3. **Other demographic, psychosocial, and treatment-related factors** – The association between age at onset of the AN and prognosis is inconclusive, with younger age being linked to a better outcome in most (2,9,23), although not all (27) studies. Similarly, there is no evidence that the time period in which the study has been carried out (i.e. older vs. recent studies) has an influence on the outcome of AN (2). By contrast, longer duration of follow-up has been associated almost invariably with a better prognosis (2,9), whereas longer duration of illness until receiving treatment (2,23,27) and longer duration of treatment (13,14,43) have been associated with a less unfavorable outcome. With respect to psychosocial effects, the presence of disturbed parent-child relationships (2,27) and poor social skills (5,42) has been linked to an unfavorable outcome, particularly in adolescent AN.

## 4. **Quantitative Models for the Prediction of Outcome in Anorexia Nervosa**

Another limitation in the investigation of predictors of recovery in AN is that most outcome studies use univariate analyses for this purpose, enabling the assessment of only separate independent predictors. By contrast, multivariate quantitative models allow for the measurement of the relative contribution of each variable for recovery, or, alternatively, to what extent each factor affects outcome independently. These analyses further enable the assessment of the cumulative predictive power of all variables included, and whether risk accumulates as the number of predictive variables increases (23). Unfortunately, only a few quantitative studies exist (5,13,43-47).

In the first of these studies, Strober et al (5) followed 95 women 10-15 years after being hospitalized during adolescence because of AN. The use of stepwise logistical regressions



detected two variables predicting a chronic course of AN: compulsive exercising at discharge from the index hospitalization and a history of problematic social relationships prior to the onset of AN. The use of a regression equation explained 13.2% of the variance for a chronic course of AN.

The group of Herzog et al (47) in Germany followed 66 patients for an average of 12 years from hospitalization because of AN. The results of a stepwise multiple regression indicated three laboratory measurements performed at admission to this hospitalization that predicted a chronic course of AN: high levels of creatinine, low levels of albumin, and low fasting glucose levels.

Other long-term follow-up studies of this group (45,46) tracked 84 patients over the course of 21 years on average from the first hospitalization due to AN. The use of ordered logistical regression analyses identified five variables as significant predictors of non-recovery: longer duration of illness prior to the index hospitalization, lower BMI and lower weight gain during this hospitalization, diagnosis of bingeing/purging type AN, and greater severity of psychological and social problems.

The group of Herzog et al (44) in the USA examined the course and outcome of AN over an average follow-up period of 7.5 years in 136 patients. The use of a Cox statistical model for follow-up studies indicated two variables predicting longer duration to full recovery: longer duration of illness and lower body weight.

Steinhausen et al (13) followed 242 adolescents treated for AN at five inpatient centers in Europe for an average period of 6.4 years after the start of treatment. The use of multiple regression analyses identified three significant predictors of poor outcome: longer duration of outpatient treatment following the index hospitalization, postponement of, or early dropout from treatment, and the presence of a comorbid psychiatric disorder at follow-up. All three variables were directly correlated with an overall worse recovery outcome. The use of a regression equation explained 26% of the variance for a chronic course of AN.

Lastly, Fichter et al (43) followed 103 AN patients for a period of 12 years from their admission to inpatient treatment. The use of logistic regression analyses detected four variables predicting an overall worse prognosis: sexual problems, impulsivity, and longer duration of AN and of the index inpatient treatment. The use of a regression equation explained 45% of the variance for a chronic course of AN.

## THE FINDINGS OF ISRAELI OUTCOME STUDIES

The authors of this chapter have recently carried out the first two long-term outcome studies of Israeli AN patients. Yackobovitch-Gavan et al (48) assessed 36 remitted AN inpatients, 24 non-remitted AN inpatients and 31 non-ED controls. Remission was defined according to Strober's (5) criteria, but we extended the required duration of remission to 12 months. Mean duration from index hospitalization to the follow-up assessment was 8.9 years. Only variables differentiating among the groups in separate analyses were included in the forward stepwise logistic regressions used in this study to create quantitative models for remission. By comparing past and follow-up parameters in remitted and non-remitted AN patients, the authors sought to identify factors predicting and contributing to remission, respectively. A similar comparison between remitted and control participants aimed to define

factors potentially predisposing to the development of AN [see Srinivasagam et al (18) for the explanation of this paradigm].

Five past variables predicted non-remission from AN: more hospitalizations and greater duration of ambulatory treatment following the index hospitalization, a history of vegetarianism, greater inclination to display anxiety, and sexual abuse during childhood. The use of a regression equation correctly predicted non-remission in 87.0% of the cases (sensitivity) and remission in 94.4% of the cases (specificity). It further explained 91.5% of the variance for non remission, considerably higher than the respective values in previous studies (13.2-45%). The explained variance ( $R^2$ ) of this equation was high:  $R^2=0.724$ . The accuracy of the diagnostic test of this model, depending on its ability to correctly separate remitted from non-remitted AN patients, was excellent [the area under the receiver operating characteristic curve (ROC) (49) equaled 0.938].

Three follow-up variables contributed to non-remission from AN: vegetarianism, higher total follow-up Eating Disorders Inventory-2 (EDI-2) (50) score, and lower BMI. The use of a regression equation correctly identified non-remission in 65.2% of the cases (sensitivity), and remission in 88.9% of the cases (specificity), correctly explaining 79.7% of the variance for non-remission. The explained variance of this equation was high:  $R^2=0.621$ , and the accuracy of the diagnostic test of this model was excellent (the area under the ROC curve equaled 0.907).

The use of univariate analyses showed that that remitted patients had elevated anxiety and eating-related obsessionality compared to the controls, suggesting that these variables may predispose to AN. In this respect, the results of this study highlight the specific role of anxiety in increasing the risk for both the predisposition to AN and for non-remission.

Another Israeli study by Bachner-Melman and associates (51) explored the implications of adopting different definitions of recovery. Two hundred and twenty-five women with a lifetime diagnosis of AN were interviewed, diagnosed, and assessed for level of recovery. When broad criteria for recovery were adopted (BMI of at least 19, regular menstruation for at least three months, and no bingeing or purging behaviors for at least eight consecutive weeks), 74 women (33%) were defined as recovered. When a more stringent definition was used (adding lack of body image distortion and fear of fatness to the aforementioned criteria), only 32 women (14%) were classified as recovered. The 32 women fulfilling the more stringent criteria were referred to as “behaviorally and cognitively recovered”, whereas the 42 women who had recovered according to the broad but not the stringent criteria were referred to as “behaviorally recovered”.

A battery of self-rating scales measuring current ED symptomatology (disordered eating, body dissatisfaction, and drive for thinness) and core ED-related personality characteristics (endorsement of the thin ideal concern for appropriateness, drive for success, fear of failure, harm avoidance, obsessionality, perfectionism, and self-esteem) was completed by the two groups recovered from AN and by 253 non-ED control women. On all scales, the scores of the behaviorally recovered women were significantly more pathological and in the direction expected from ill AN patients, in comparison to women who were also cognitively recovered; the latter, in turn, were indistinguishable from the control women on all measures.

Similar to the findings of Couturier & Lock (3,6), these results highlight the need for a standardization of the definition of recovery. These findings also underscore that full return to normal functioning, both behavioral and cognitive, albeit infrequent, is possible even in a chronic debilitating illness such as AN. Thirdly, this study replicates earlier studies

(18,19,40,48,52), in showing an elevation of personality attributes characteristics of AN (in the present study elevated perfectionism, obsessionality, harm avoidance and fear of failure, and lower self-esteem and drive for success) in behaviorally recovered patients in comparison to non-ED controls. Whereas some of the traits differentiating between the two samples might reflect the consequences of prior illness, the assumed absence of confounding nutritional influences in recovered patients raises the possibility of assessing in this case potential vulnerability factors that predispose certain individuals to the development of AN (18). On the other hand, the lack of difference between cognitively recovered AN women and never-ill controls, raises the possibility that these personality traits may actually be associated with the condition of the illness (i.e., appearing in behaviorally but not cognitively recovered patients).

## DISCUSSION, CONCLUSIONS, AND DIRECTION FOR FUTURE RESEARCH

The present chapter presents the multitude of problems associated with the study of recovery from AN. Based on the findings described; we highlight several points for further discussion.

1. Criteria for recovery: in the ongoing disagreement between favoring “narrow” and “broad” criteria for recovery, Couturier and Lock (6) favor the second option, as their definition of recovery requires normal weight range (likely associated with an overall stable physical condition) and lack of pathological eating-related behaviors and attitudes. We agree with most of the researchers excluding the condition of comorbid disorders from the definition of recovery, as many studies have shown elevated comorbidity to be present even in a high percentage of recovered AN patients (2,48). Still, since comorbidity may affect the functioning of AN patients above and beyond the influence of the ED per se, we suggest adding an evaluation of psychosocial functioning to Couturier and Lock’s (6) criteria, so that recovery would reflect, at least to some extent, the patient’s overall condition.
2. Behavioral vs. psychological recovery: The study by Bachner-Melman et al (51) supports previous studies (5,19) in emphasizing the differences between behavioral and psychological recovery, and that in order to lead a normal productive life, it is not enough for the recovered AN patient to be in an overall stable physical condition and to eat well. The persistence of eating and weight-related obsessionality and of pathological attitudes toward the body may considerably interfere with occupational, social, and sexual functioning despite the presence of physical and behavioral recovery (14,23). Moreover, studies focusing on the patients’ own perspectives have shown that factors such as personality strength, self-confidence, identification and expression of emotions, and feeling understood (53), as well as feeling a connection within oneself and others and that life has a meaning (54), are important ingredients of recovery. It is our opinion, therefore, that outcome studies should relate to both definitions of recovery and to the similarities and differences in the factors predicting them.
3. Methodological considerations: In our opinion, outcome studies in AN should combine prospective longitudinal designs assessing the patient’s condition at different time points during the course of the illness, with follow-up comparisons of recovered, non-recovered, and non-ED participants, analyzing the results with quantitative statistical models. Such

combined designs would enable the assessment of factors potentially predisposing to AN, vs. factors determining the course and outcome of the disorder.

4. Recovery in male AN patients: Understandably, most outcome studies in AN have related only to female patients, with only a few studies including additional small samples of male patients. This precludes the formulation of adequate recovery criteria in this population at the present time. It is most likely that gender differences beyond the issue of menstruation would be found in the process of recovery from AN.
5. Recovery vs. remission: Only the two studies of Couturier and Lock (3,6) have attempted to differentiate directly between remission and recovery from AN. According to these authors, the only difference between the two constructs is shorter vs. longer duration, respectively. The rationale for this paradigm is plausible, allowing for the investigation of a putative association between short-term remission and long-term recovery, and for the comparison of factors predicting the two conditions. Nevertheless, in our opinion, duration is not the only factor that should differentiate between recovery and remission. Remission may differ from recovery not only on clinical but also on theoretical grounds. For example, we believe that psychological (or cognitive) recovery should be part of the definition of long-term recovery, but not of short-term, potentially temporary, remission. If that is the case, future research should determine the factors increasing or decreasing the likelihood of progressing from remission to recovery. In keeping with the more broad differentiation between remission and recovery, Pike (23) suggests that although similar clinical criteria are required for both conditions, recovery can, nevertheless, be attained only when the overall functioning and risk of recurrence of the ED symptoms is comparable to that of never-ill women
6. The interrelationships between recovery and relapse: The ambiguity in the definition of recovery likely leads also to considerable problems in the characterization of relapse. In particular, should relapse be established only if a full AN syndrome recurs, or is the mere reappearance of interfering symptoms sufficient? Secondly, what is the minimum duration of a symptom-free condition required to define symptomatic reappearance as a relapse, rather than a part of an index episode?

In conclusion, the study of recovery from AN and of the factors increasing or decreasing its likelihood of is of vital importance. Although many outcome studies do exist, the multitudes of problems in defining recovery, and the great variations among the studies, still preclude a uniform definition of the construct. In light of these findings, the standardization of the definition for recovery from AN and of the design of future outcome studies is of vital importance to improve our ability to compare the results of different studies, to draw sound conclusions, and to plan appropriate treatment interventions.

## REFERENCES

- [1] Hoek HW. Incidence, prevalence and mortality of anorexia nervosa and other eating disorders. *Curr Opin Psychiatry* 2006;19:389-94.
- [2] Steinhausen HC. The outcome of anorexia nervosa in the 20th century. *Am J Psychiatry* 2002;159:1284-93.

- [3] Couturier J, Lock J. What is remission in adolescent anorexia nervosa? A review of various conceptualizations and quantitative analysis. *Int J Eat Disord* 2006;39:175-83.
- [4] Carter JC, Blackmore E, Sutandar-Pinnock K, Woodside DB. Relapse in anorexia nervosa: A survival analysis. *Psychol Med* 2004;34:671-9.
- [5] Strober M, Freeman R, Morrell W. The long term course of severe anorexia nervosa in adolescents: Survival analysis of recovery, relapse, and outcome predictors over 10-15 years in prospective study. *Int J Eat Disord* 1997;22:339-60.
- [6] Couturier J, Lock J. What is recovery in adolescent anorexia nervosa? *Int J Eat Disord* 2006;39:550-5.
- [7] Kaye W, Strober M, Jimerson D. The neurobiology of eating disorders. In: Charney DS, Nestler EJ, eds. *The neurobiology of mental illness*. New York: Oxford Press, 2004:pp. 1112-28.
- [8] Neumarker ICI. Mortality and sudden death in anorexia nervosa. *Int J Eat Disord* 1997;21:205-12.
- [9] Von Holle A, Poyastro Pinheiro A, Thornton LM, Klump KL, Berrettini WH, Brandt H, et al. Temporal patterns of recovery across eating disorder subtypes. *Aust N Z J Psychiatry* 2008;42:108-17.
- [10] Morgan HG, Russell GFM. Value of family background and clinical features as predictors of long term outcome in anorexia nervosa: Four- year follow- up study of 41 patients. *Psychol Med* 1975;5:355-71.
- [11] Steinhausen HC, Glanville K. Follow up studies of anorexia nervosa a review of research findings. *Psychol Med* 1983;3:239-49.
- [12] Sturzenberger S, Cantwell PD, Burroughs J, Salkin B, Green JK. A follow-up study of adolescent psychiatric inpatients with anorexia nervosa. *J Am Acad Child Psychiatry* 1977;16:703-15.
- [13] Steinhausen HC, Boyadjieva S, Griogoroiu- Serbanescu M, Neumarker KJ. The outcome of adolescent eating disorders: Findings from an international collaborative study. *Eur Child Adolesc Psychiatry* 2003;12(Suppl. 1):91-8.
- [14] Steinhausen HC, Seidel R, Winkler-Metzke C. Evaluation of treatment and intermediate and long term outcome of adolescent eating disorders. *Psychol Med* 2000;30:1089-98.
- [15] Herzog DB, Sacks NR, Keller MB, Lavori PW, Ranson KB, Gray HM. Patterns and predictors of recovery in anorexia nervosa and bulimia nervosa. *J Am Acad Child Adolesc Psychiatry* 1993;32:835-42.
- [16] Eckert ED, Halmi KA, Marchi P, Grove W, Crosby R. Ten-year follow-up of anorexia nervosa: clinical course and outcome. *Psychol Med* 1995;25:143-56.
- [17] Garfinkel PE, Moldofsky H, Garner DM. Prognosis in anorexia nervosa as influenced by clinical features, treatment and self-perception. *Can Med Assoc J* 1977;117,1041-5.
- [18] Srinivasagam NM, Kaye WH, Plotnicov KH, Greeno C, Weltzin TE, Rao R. Persistent perfectionism, symmetry, and exactness after long-term recovery from anorexia nervosa. *Am J Psychiatry* 1995;11:1630-4.
- [19] Casper RC. Personality features of women with good outcome from restricting anorexia nervosa. *Psychosom Med* 1990;52:156-70.
- [20] Garner DM, Olmsted MP, Bohr Y, Garfinkel PE. The Eating Attitudes Test: Psychometric features and clinical correlates. *Psychol Med* 1982;12:871-8.

- [21]Kordy H, Kramer B, Palmer RL, Papezova H, Pellet J, Richard M, et al. Remission, recovery, relapse and recurrence in eating disorders: conceptualization and illustration of a validation strategy. *J Clin Psychol* 2002;58:833-46.
- [22]Cooper Z, Cooper PJ, Fairburn CG. The validity of the eating disorder examination and its subscales. *Br J Psychiatry* 1989;154:807-12.
- [23]Pike KM. Long term course of anorexia nervosa: response, relapse, remission and recovery. *Clin Psychol Rev* 1998;18:447-75.
- [24]Pike KM, Walsh BT, Vitousek K, Wilson GT, Bauer J. Cognitive behavioral therapy in the post-hospitalization treatment of anorexia nervosa. *Am J Psychiatry* 2003;60:2046-9.
- [25]Freeman RK, Walker MK, Ben-Tovim DI. Low levels of interrater reliability in a standard measure of outcome in eating disorders (the modified Morgan–Russell Assessment Schedule). *Int J Eat Disord* 1996;20:51-6.
- [26]Shisslak CM, Crayo M, Estes LS. The spectrum of eating disturbances. *Int J Eat Disord* 1995;18:209-19.
- [27]Herzog DB, Keller MB, Lavori PW. Outcome in anorexia nervosa and bulimia nervosa- a review of the literature. *J Nerv Ment Dis* 1988;176:131-43.
- [28]American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 4<sup>th</sup> ed text revised (DSM-IV-TR). Washington, DC:APA, 2000.
- [29]Clausen L. Time course of symptom remission in eating disorders. *Int J Eat Disord* 2004;36:296-306.
- [30]O'Connor MA, Touyz SW, Dunn SM, Beumont PJ. Vegetarianism in anorexia nervosa? A review of 116 consecutive cases. *Med J Aust* 1987;147:540-2.
- [31]Schebendach JE, Mayer LES, Delin MJ, Attia E, Contento IR, Wolf RL, et al. Dietary energy density and diet variety as predictors of outcome in anorexia nervosa. *Am J Clin Nutr* 2008;87:810-6.
- [32]Kaye WH, Bulik CM, Thornton L, Barbarich N, Masters K. Comorbidity of anxiety disorders with anorexia and bulimia nervosa. *Am J Psychiatry* 2004;161:2215-21.
- [33]Halmi KA, Sunday SR, Strober M, Kaplan A, Woodside DB, Fichter M, et al. Perfectionism in anorexia nervosa: Variation by clinical subtype, obsessionality, and pathological eating behavior. *Am J Psychiatry* 2000;157:1799-805.
- [34]Lilenfeld LR, Kaye WH, Greeno CG, Merikangas KR, Plotnicov K, Pollice C, et al A controlled family study of anorexia nervosa and bulimia nervosa: Psychiatric disorders in first-degree relatives and effects of proband comorbidity. *Arch Gen Psychiatry* 1998;55:603–10.
- [35]Milos G, Spindler A, Ruggiero G, Klaghofer R, Schnyder U. Comorbidity of obsessive-compulsive disorders and duration of eating disorders. *Int J Eat Disord* 2002;31:284-9.
- [36]Strober M. Pathologic fear conditioning and anorexia nervosa: On the search for novel paradigms. *Int J Eat Disord* 2004;35:504-8.
- [37]Toner BB, Garfinkel PE, Garner DM. Affective and anxiety disorders in the long term follow up of anorexia nervosa. *Int J Psychiatry Med* 1988;18:357-64.
- [38]Crane AM, Roberts ME, Treasure J. Are obsessive-compulsive personality traits associated with a poor outcome in anorexia nervosa? A systematic review of randomized controlled trials and naturalistic outcome studies. *Int J Eat Disord* 2007;40:581–8.
- [39]Saccomani L, Savoini M, Cirrincione M, Vercellino F, Ravera G. Long term outcome of children and adolescent with anorexia nervosa: study of comorbidity. *J Psychosom Res* 1998;44:565-71.

- [40]Sullivan P, Bulik CM, Fear J, Pickering A. Outcome of anorexia nervosa: A case-control study. *Am J Psychiatry* 1998;152:1630-4.
- [41]Bulik CM, Sullivan PF, Fear JL, Pickering A. Outcome of anorexia nervosa: Eating attitudes, personality, and parental bonding. *Int J Eat Disord* 2000;28:139-47.
- [42]Strober M, Freeman R, Lampert C, Diamond J. The association of anorexia nervosa with anxiety disorders and obsessive-compulsive personality disorder: Evidence from a family study with discussion of neurodevelopmental and nosological implications. *Int J Eat Disord* 2007;40:S46-51.
- [43]Fichter MM, Quadflieg N, Hedlund S. Twelve-year course and outcome predictors of anorexia nervosa. *Int J Eat Disord* 2006;39:87-100.
- [44]Herzog DB, Dorer DJ, Keel PK, Selwyn SE, Ekeblad ER, Flores AT, et al. Recovery and relapse in anorexia and bulimia nervosa: a 7.5- year follow up study. *Am Acad Child Adolesc Psychiatry* 1999;38:829-37.
- [45]Lowe B, Zipfel S, Buchholz C, Dupont Y, Reas DL, Herzog W. Long- term outcome of anorexia nervosa in prospective 21- year follow-up study. *Psychol Med* 2001;31:881-90.
- [46]Zipfel S, Lowe B, Reas DL, Deter HC, Herzog W. Long-term prognosis in anorexia nervosa: Lessons from a 21- year follow- up study. *Lancet* 2000;355:721-2.
- [47]Herzog W, Deter HC, Fiehn W, Petzold E. Medical findings and predictors of long- term physical outcome in anorexia nervosa: A prospective 12-year follow-up study. *Psychol Med* 1997; 27:269-79.
- [48]Yackobovitch-Gavan M, Golan M, Valevski A, Kreitler S, Bachar E, Lieblich, A, et al. An integrative quantitative model of factors influencing remission and non-remission in anorexia nervosa. . *Int J Eat Disord* 2009;42:306-17.
- [49]Metz CE. Basic principles of ROC analysis. *Sem Nuc Med* 1978; 8: 283-98.
- [50]Garner DM. *Eating Disorders Inventory-2 (EDI-2)*. Odessa, FL: Psychological Assessment Resources, 1991.
- [51]Bachner-Melman R, Zohar AH, Ebstein RP. An examination of cognitive versus behavioral components of recovery from anorexia nervosa. *J Nerv Ment Dis* 2006;194:697-703.
- [52]O'Dwyer AM, Lucey JV, Russell GF. Serotonin activity in anorexia nervosa after long-term weight restoration: Response to D-fenfluramine challenge. *Psychol Med* 1996;26:353-9.
- [53]Hsu LG, Crisp AH, Callender JS. Recovery in anorexia nervosa: The patient's perspective. *Int J Eat Disord* 1992;11:341-50.
- [54]Garrett C. *Beyond Anorexia: Narrative, Spirituality and Recovery*. Cambridge 1998: Cambridge University Press.

