Stefan Engeser *Editor*

Advances in Flow Research

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Foreword

This summer, the 24th translation of *Flow* appeared in the Russian language. The other 23 include practically all of the European languages, plus Chinese (traditional and modernized), Japanese, Korean, and some Indonesian languages I did not know existed. At least three prime ministers have been asking how flow could help their countries to avoid alienation from work or emigration to countries that offered more interesting challenges. The mayor of Seoul has shared his concern that the 40,000 employees of his metropolitan government might become too bureaucratic, as civil servants have a tendency to do. CEOs of some of the major companies worldwide have implemented flow in various aspects of their operation and, in at least two cases, have reported startling jumps not only in revenues but also in profits.

All of this started 43 years ago, when I decided to teach a senior seminar at Lake Forest College. The dozen or so undergraduates were not particularly academically oriented, and they were not even majoring in psychology—most of them came from the department of sociology and anthropology. I decided to teach the seminar on the topic of play—but what I had in mind was not children's play, on which there was a huge literature, but on the kind of play adults engage in. Although I was in my 30s by then, I still "played" chess, climbed rocks, and did many other things that did not have to be done, just for the sheer enjoyment of it.

As I started to read the psychological literature on play, I felt a sense of mounting incredulity and dismay. First of all, almost all the articles (or books) were on the play of children. But what was much worse was that even children's play was described in strictly functional terms, without reference to the experience of play itself, which, as far as I was concerned, was the only reason that made play interesting in the first place. True, playing football could be good training for a healthy lifestyle and for working on a team (as an adult), and playing chess might be a good way to develop intellectual skills that a child could use (as an adult). But I was quite sure that children did not play football or chess to prepare themselves for a later job.

It occurred to me then that most of the literature (and even such eminent psychologists as Jean Piaget and Erik Erikson) had been trying to explain the *distal* outcomes of play, not the *proximal* ones. They wanted to know "what good is it?" not "how does it feel like?" Having been exposed to the phenomenology of Husserl,

Heidegger, and Merleau-Ponty, I realized that what was missing from the literature was a consideration of the *phenomenology* of play. The next major realization was that the phenomenology of play seemed indistinguishable when the person felt it in a play situation like a game or in settings that are not usually thought of as play, like music, painting, and even in work.

When I started publishing the results of our first interview-based studies, I called the peculiar state people reported when they were "playing" the *autotelic experience,* Greek for something you might be doing primarily for the sake of the experience itself. Later, to use more accessible language, I called it *flow*, borrowing from the language of the people we interviewed, which often used the image of flowing waters as an analogy to the feeling they were describing.

The initial reception to the first book, *Beyond Boredom and Anxiety*, and to the research articles that ensued, could be best described as benign neglect. In private, some colleagues congratulated me for having given a name to something very obvious that they had known forever. Others congratulated me for having had the courage to write about something so fascinating, but that unfortunately was not amenable to scientific investigation. Even though patronizing, such responses were more comforting than the deep silence that otherwise surrounded my work. The only formal recognition in the first dozen years or so came from a brief and not exactly encouraging review of the book by Edward Deci in *Psych Abstracts*.

Interestingly, the first sparks of academic interest came from anthropologists, followed by sociologists, and finally by psychologists of sports and leisure. Then, slowly, the field began to grudgingly accept flow as something that might have some relevance to the central issues of psychology. The first intellectual contribution from a psychologist came from Fausto Massimini, a physician who became professor of psychology at the University of Milan. He and his lively lab have contributed more to the development of research on flow than could be summarized in a few pages. His insight into the role that flow plays in cultural evolution was a brilliant extension of the theory, and the many cross-cultural studies done under his aegis are now part of history.

So now, more than a generation later, as I am paging through the various chapters of this volume, I am reminded of an anecdote I read—a long time ago—about the last days of Leonardo da Vinci. In 1519, the old master was ailing and despondent in his sickbed at the Clos Lucé, a noble manor house Francis I of France had placed at his disposal near the royal chateau at Amboise, and the staff let the king know that they were worried about his guest. Francis hastened to the old man's bedside, and seeing how depressed he appeared to be, he said something like: "Maestro, you who have achieved more in your life than all other artists and scientists put together, how can you be so sad?" to which Leonardo is supposed to have answered: "Thank you Sire, for your kindness—but no master can die happy until at least one of his disciples surpass him."

If Leonardo was right, then—*mutatis mutandis*—I ought to die happy (but hopefully not for a long time yet). The chapters in this book show that there are quite a few directions in which the work I was able to accomplish is being stretched, continued, and improved upon; they show that new directions, unexpected and unimagined before, are being opened up for investigation.

Of course, Leonardo could also have been wrong—as a student of human nature, he did not shine as well as in other fields—and being surpassed might not make you as happy as he thought. After all, do you really believe that if some connoisseur of art had written: "Andrea Salai, who learned to paint in Leonardo da Vinci's studio, just painted a young lady's portrait he calls Monna Vanna, and it leaves his master's Monna Lisa in the dust," Leonardo would have been happy? I don't think so, either.

So it is a bittersweet experience to read these excellent scientific essays, each one of which adds something new and important to what has been written about flow so far. And, of course, I realize that whether I am happy or not is besides the point; what counts is that the ideas are carried forward into the future—it is their survival that matters and the consequences they will have for the lives of the next generation. In this respect, the present volume guarantees that the contribution of flow to an understanding of human behavior will grow and prosper in the years to come. At the end of day, I am grateful to all those who have contributed to it.

Claremont, CA, USA Mihaly Csikszentmihalyi

Foreword

"There's a guy in Chicago with an unpronounceable name who recently described exactly what you're reporting." This is what my teacher, Heinz Heckhausen, told me back in 1978, when, in a research colloquium of our motivational psychology workgroup, I reported on a "new" activity incentive that I was unable to categorize.

In the course of the *cognitive revolution*, our research group in Bochum had become accustomed to analyzing motivational phenomena according to the perspective that individuals constantly act with a view to the attainable outcomes and the value of their likely consequences. Of course, this purpose-centered analytical perspective was not erroneous, but it was constricted. We quickly notice this if we look at leisure activities, in which it is irrefutably apparent that besides the incentives linked to the consequences of the outcome, there are also incentives that lie directly in the performance of the activity itself (*activity-related incentives*). And here, one can find a colorful diversity of the most varied of perceptions, states, and feelings, which people like to have and for which reason they carry out certain activities time and time again and for as long as possible—even if these activities have *no* valuable outcome consequences and at times even bring with them foreseeable costs.

Back then, I wanted to find out about these things as comprehensively as possible and to describe and classify them precisely. A lot of things could be quickly understood or were already known: the experience of "thrill and adventure," joy in the interaction with nice people, feeling how one's own movements are functioning perfectly, experiencing how a piece of music is succeeding to an ever greater degree, the sense of well-being in nature, and much more. For one thing, however, no theoretically introduced category of experiences could yet be found at first glance: that good feeling of becoming so completely absorbed in a smoothly running activity that one loses track of time, forgets the original purpose of the activity, and indeed even forgets oneself. Even if one is working to one's full capacity, it is not experienced as a burden but rather as a pleasant state in which one is happy to become immersed.

Undoubtedly, this too was an incentive, which lies in the execution of the activity and not in the consequences of its outcome. But with which motivational systems might it be associated? Or had something entirely new been discovered here? No, it was nothing new. As is well known, the man with the difficult to pronounce name, Mihaly Csikszentmihalyi, had already termed this as the *Flow Experience* 3 years previously in his highly fruitful book *Beyond Boredom and Anxiety* (1975) and had described it in detail. His strongly phenomenological research, and the way in which he described it in his book, was in no way consistent with the mainstream of empirical-experimental psychology of the time. However, there was a clear sense that somebody had hit upon a phenomenon that had not yet been described in this structure. Certainly, there had been forerunners, but the configuration of flow components which he presented was new as a concept.

This flow concept had a very strong ally in academia, namely, that of self-experience. Academics in particular, who are practically obsessive in their search for opportunities to delve undisturbed and entirely into their thought systems and research findings and who then describe all of this in articles and books, are very well aware of this flow state. Even if, as an empirical psychologist, one might criticize details in research methodology or in theory formulation, one can hardly deny the existence of a state which is undoubtedly present in one's own experience. I believe that this indisputability of self-experienced flow was and is a first, and perhaps the most important, guarantor for flow to remain alive as an object of research.

The second guarantor is the fact that even after almost four decades of flow research and many exciting findings, there still remains so much to be clarified. And this is what this book deals with in an impressively clear and, where necessary, critical manner. On a theoretical level, attempts to elaborate more sharply on the functional particularities of the flow state are worthwhile. What exactly is happening differently in us when we are operating in flow rather than generating a result in a conscious and willful way? How, from this, can we explain the better performances which are sometimes reported for the flow state? From a motivational perspective, it needs to be clarified more precisely what leads us to repeatedly do things that bring about the flow state. Does the flow state itself act as an effective incentive or is it merely an attendant phenomenon of the accomplishment of well-mastered activities which we love anyway? Moreover, it remains to be clarified whether and what flow has to do with that which people describe as "happiness." Even though public attention for the flow concept might be on the increase, it would not be particularly helpful to rashly link together flow and happiness (or even equate them with one another). Independently of this, it remains to be clarified whether the flow state perhaps has an affinity with certain motivational systems. For instance, the balance between demand and skills is a condition that is conducive both to the flow experience and to competence-oriented achievement motivation. In accordance with this, flow elements can clearly be found in the description of the achievement motivational activity incentive. Should one therefore postulate a particular closeness between flow and achievement motivation? In that case, with a sufficient degree of freedom of lifestyle, highly achievement-motivated people should find themselves in a state of flow particularly frequently. Is this really the case? After all, flow can also arise in action

contexts that have nothing to do with the theme of achievement. These are but a few of the many questions that need to be empirically clarified and which are dealt with anew in this book.

When it comes to the empirical clarification of these types of questions or similar, then, with flow, we are faced with the particular problem that the measurement itself can change that which is being measured. Do classical survey methods thus become basically unsuitable because we interrupt the flow state through the survey? Or do surveys provide us with data that we can nevertheless use, albeit with certain limitations, as indicators of the state that has just been interrupted? And what, precisely, do we have to ask in order to be able to conclude with sufficient certainty from the survey data that flow has occurred? Is the ratio of skill to challenge, which is frequently used as an indicator of flow, really sufficient? Ideal, of course, would be possibilities to capture flow quasi "online" and without an interrupting survey, for instance through observable features of the activity performance or perhaps through psychophysiological indicators.

Once we are on methodologically secure ground, broad fields of questions open up, which will make the flow experience a fascinating object of investigation for basic and applied research for a long time to come. Under which situational conditions and with which activities do flow states occur especially frequently? Particularly for applied research, the question becomes important of where, with a view to its consequences, the flow state is desired and where it should be avoided if possible. According to the action context, both possibilities appear to be given. But how do we go about fostering or avoiding flow?

The current volume addresses such questions in contributions from colleagues who possess a high level of expertise in the area of empirical flow research. We find here a remarkable work which is not content to merely reproduce the current state of research. Of course, it does also do this, but it reaches further and sets itself the goal of making the flow experience a conceptually clear-cut study variable that is as methodologically "tough" as possible. This clear and strict strategy is particularly necessary when a construct such as the flow experience invites us to make far-reaching statements about happiness and positive lifestyle. Of course, academics too do not have to avoid far-reaching statements in principle—insofar as findings permit. However, we are not so far down the road in flow research. Here, we still have to research our object of investigation in more detail, i.e., grasp it more strongly in conceptual terms and make it more easily measurable in order to then be able to determine it precisely regarding its conditions and consequences. The current volume provides a solid foundation for this purpose for all those who are interested in a fascinating phenomenon, namely, a state in which we are entirely, and without self-reflection, absorbed in a smoothly running activity which, despite a high level of demand, we still have well under control. I am certain that, with *Advances in Flow Research*, the editor and authors have created a standard work on flow research.

Potsdam, Germany Falko Rheinberg

Preface

The book is addressed to researchers in the field of psychology as well as interested readers of social sciences like sociology, education, sport, and economics. It provides an overview of flow research in an intentionally balanced and scientific manner as well as details on central topics of research into flow. The book can also be used as a textbook for advanced courses on motivation, attention, flow experience, intrinsic motivation, optimal motivation and excellence, daily experience, well-being, and similar topics. Students will appreciate that the book will take different theoretical perspectives rather than advertising a single point of view. A preceding abstract to each chapter offers an overview of the topic. Text boxes provide more details and figures are used to illustrate the topic. Study questions at the end of each chapter can help students to test their knowledge.

In the introduction, we will talk about the definition of flow, draw the historical lines, and present a short review of current flow research, which is becoming more complex and is following different lines. Flow research could be regarded as a mission to understand enjoyment in human life, and many researchers have joined in the study of flow experience in an effort to understand the conditions and consequences in more detail. The mission drives researchers forward but sometimes leads to a less rigorous analysis on methodological grounds. Therefore, the book takes the time to present methodological aspects in flow research in order to qualify empirical work (Chap. 2). Following this, the focus will be on the conditions of flow experience (Chap. 3) and on the correlations and consequences that have been found in the research on flow (Chap. 4).

Flow can be experienced not only in typical "flow activities" but in nearly any kind of activities. As flow in nonachievement situations has some special aspects and conceptual difficulties, an entire chapter will be devoted to this (Chap. 5). It will be proposed that personal preferences will structure the situation and subsequently support the experience of flow.

At the heart of flow research is the motivational aspect of this experience. Flow motivates people to carry out the activity again and to seek challenge and thereby improve their skills and abilities. Chapter 6 focuses on the comparison of another

prominent theory of intrinsic motivation—the Self-Determination Theory—and flow theory. It will be argued that the two theories hold explanatory power in contrasting, largely nonoverlapping contexts. This contrasts with the prevailing understanding that each theory represents different levels of analysis of the same contexts.

The fact that flow experiences might have negative consequences has been almost neglected, but some researchers have begun to discuss and study this finding (Chap. 7). One vein of research is investigating whether flow might be experienced in antisocial activities as well. Second, it is examined whether flow experience is so rewarding that activities are still executed regardless of the negative consequences, as it is the case for addiction or in high-risk activities.

Along with the intensely emerging psychological view, neuropsychological considerations and empirical correlates of flow experiences will be presented (Chap. 8). It seems evident that the neurological aspect will be very important in understanding flow, and new insights and questions will arise. The next chapter reflects on the search for "flow personality" or "autotelic personality" (Chap. 9). This is a lingering question in flow research, which is awaiting a theoretical framework and more empirical research. The chapter tries to resolve this lingering question in a discussion on personality aspects and by providing a measurement of the "autotelic personality" as well as offering a dynamic perspective on personality and flow.

The book will end with a theoretical integration of the different paths being taken within the increasingly more complex field of flow research. It will also examine what has been learned since the beginning of flow research, what is still open, and how the mission to understand and foster flow experience should continue.

Trier, Germany Stefan Engeser

Contents

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Chapter 1
Historical Lines and an Overview of Current Research on Flow

Stefan Engeser and Anja Schiepe-Tiska

Abstract This chapter introduces the flow concept by listing the components of flow as provided by Csikszentmihalyi. We will show that these components constitute the widely shared definitional ground of researchers in the field, with only minor variation between research groups and time periods. Next, we try to clarify some lingering ambiguities regarding the components of flow, and then talk about flow as an optimal experience as well as discussing flow and happiness. Subsequently, we trace the history of flow. We take time to describe the beginnings of flow research by Csikszentmihalyi and a similar research program by Rheinberg in Germany. Following the description of flow and qualitative analyses, the quantitative method of the experience sampling method (ESM), which has greatly influenced research on flow, will be presented. Creativity and well-being remain an important part of flow research and will be considered here, but flow research has entered many other areas, spanning from a strong emphasis on sport, learning, and flow at work to the emerging research on flow in teams and social interaction or psychophysiological correlates of flow. Finally, we complete this chapter by exploring methodological aspects of the research on flow.

The Concept of Flow

> Flow is a state in which an individual is completely immersed in an activity without reflective self-consciousness but with a deep sense of control.

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Flow has become a widely known concept since Csikszentmihalyi (1975) systematically described this "optimal experience" in his book "Beyond Boredom and Anxiety." He noted that artists are entirely caught up in their projects, working feverishly to finish them and then lose all interest in their work after completion. Obviously, the incentive for engaging in that activity lay in the performance of the activity itself.

Determining what makes an activity valuable and satisfying became the focus of Csikszentmihalyi's work. "Beyond Boredom and Anxiety" can be seen as the title for a mission to accomplish this. The title might be seen as a contrast to Skinner (1971), who some years earlier had controversially advocated systematic conditioning as a way of social development in "Beyond Freedom and Dignity." With this strong focus on enjoyment, flow research has also founded and strongly influenced a new direction in psychology called "positive psychology" (cf. Snyder and Lopez 2009).

Since Csikszentmihalyi (1975) first described the flow concept more than 35 years ago, it has become a widely studied and popular concept with broad implications. Bearing this in mind, it is notable that there is a high level of agreement on the definition of flow itself (there is more dispute regarding how flow could and should be measured; cf. Chap. 2). We assume that this is due to the widely respected figure of Csikszentmihalyi, who has made only minimal modifications in defining flow over the years. Furthermore, the definition of flow, with different components, provides the flexibility to pronounce a particular component or add new components without completely changing the definition. And possibly the most important aspect, it taps into a scientifically meaningful concept and is at the same time intuitively understood on the basis of one's own experience.

Components of Flow

In defining flow, Csikszentmihalyi (1975) described six components of flow experience. These components are listed in Box 1.1 with additional citations given by the participants who were interviewed by Csikszentmihalyi. They shall illustrate why individuals are highly engaged in activities without extrinsic rewards (see "Historical Lines" below).

The merging of action and awareness, centering of attention, and the loss of self-consciousness represent aspects of the total immersion into the activity. Besides this, a person experiencing flow has a strong feeling of control. The demands are clear and noncontradictory, and the next steps of the action feel natural and occur without consciously thinking about the action itself, the pursuit of the action, or the distant goals. The action runs smoothly without the feeling of effort or will, and it is experienced as enjoyable and rewarding in itself. Csikszentmihalyi also speaks of an *autotelic nature* because the experience of enacting is the reason for the action itself (from the Greek "auto," meaning self, and "telos," meaning goal or purpose).

Box 1.1 Components of Flow Based on Csikszentmihalyi (1975)

Merging of action and awareness: a person is aware of its actions but not of the awareness itself; "You do not see yourself as separate from what you are doing" (p. 39).

Centering of attention on a limited stimulus field: high degree of concentration; "When the game is exciting, I don't seem to hear anything – the world seems to be cut off from me and all there is to think about is my game" (p. 40).

Loss of self-consciousness: considerations about self become irrelevant; this could be described as "the loss of ego," "self-forgetfulness," "transcendence of individuality," or "fusion with the world" (p. 42); "You yourself are in an ecstatic state to such a point that you feel as though you almost don't exist…. I just sit there watching it in a state of awe and wonderment. And it just flows out by itself" (p. 44).

The feeling of control of one's action and the feeling of control over the demands of the environment: "I get a tyrannical sense of power. I feel immensely strong, as though I have the fate of another human in my grasp" (p. 44).

Coherent, noncontradictory demands for action and clear, unambiguous feedback: goals and means of achieving them are logically ordered; action and reaction are automatic; "I think it's one of the few sorts of activities in which you don't feel you have all sorts of different kinds of demands, often conflicting, upon you…" (p. 46).

Autotelic nature: no need for external goals or rewards; "The act of writing justifies poetry. Climbing is the same: recognizing that you are a flow. The purpose of the flow is to keep on flowing …" (p. 47).

Later, other researchers in the field and Csikszentmihalyi himself provided different components of flow, but with only small variations. For example, Nakamura and Csikszentmihalyi (2005; Csikszentmihalyi and Csikszentmihalyi 1988a, b) additionally listed the characteristic of "distortion of temporal experience of time," which typically means the feeling of time passing faster than normal.

In a sports context, Jackson and Marsh (1996) listed nine components of flow. They considered time transformation as an additional component, too. Furthermore, the authors divided the component of coherent, noncontradictory demands into the two components clear goals and unambiguous feedback. Additionally, they included the challenge–skill balance as a component. Based on these components, they developed a state and a trait scale to assess flow (see Chap. 2). Those scales have also been used in other contexts than sports (e.g., Fullagar and Kelloway 2009).

Similarly, Rheinberg defined flow with the components listed in Box 1.1 (see Rheinberg 2008), and the flow short scale was designed to assess them (cf. Engeser and Rheinberg 2008). Rheinberg did not include the "autotelic nature" of flow as a definitional part, as was occasionally done by Csikszentmihalyi and others

(e.g., Csikszentmihalyi and Schiefele 1994). We discuss the topic of autotelic nature in more detail below. Furthermore, we discuss some lingering ambiguities regarding other components and aspects of the definition of flow.

Flow as a Multifaceted Experience

Conceptual and empirical evidence showed that the components of flow are highly correlated. Factor analyses of instruments assessing the components of flow warranted that the components represent a single dimension (Beard and Hoy 2010; Engeser and Rheinberg 2008; Jackson and Marsh 1996; cf. Chap. 2). As a conclusion, the components of flow could be represented by one dimension only.

However, this conclusion is premature. To illustrate this, imagine a pilot in an airplane, with speed and height displayed on his control panel. Although the two measures are highly correlated (e.g., because the airplane is flying faster at a higher altitude), we would never recommend the pilot to pay attention to only one measure. The same applies to the components of flow. They could be highly correlated but at times dissociated. For example, "centering of attention on a limited stimulus field" is not only characteristic for flow but also characteristic for a state of high anxiety (Eysenck 1992). However, both states are highly different emotional states for an individual. Therefore, taking only this component as a single indicator for flow would be misleading.

Nevertheless, more research is still needed to specify under which conditions components are associated or dissociated. This includes research attempting to find out whether single components are triggered exclusively by certain conditions and whether they have the same consequences. In this case, the components would never dissociate, and the components to describe flow could be reduced. Csikszentmihalyi (1975, p. 38) speculated that the merging of action and awareness is the clearest sign of the experience, and immersion might, in fact, represent a more central aspect than the other components. Perhaps this state is most closely associated with all other components, but ultimately, we indicate that flow is an experience with different components, which, in their interplay, represent the experience of flow. As a result, flow cannot be reduced to a single component, and all attempts to take one component of flow as the definitional aspect of flow will consequently disregard essential parts. As Csikszentmihalyi put it, flow is the "*holistic* sensation that people feel when they act with total engagement" (1975, p. 36), and this holistic sensation is comprised of the components just described. This does not exclude research that pays special attention to only one component (cf. Moneta and Csikszentmihalyi 1999). However, one should keep in mind that this component does not fully represent the flow experience.

Flow as a Subjective Experience

Some of the listed components are sometimes regarded as conditions rather than components of flow. Take, for example, the component "feeling of control," which has

become especially important in flow research (e.g., Nakamura and Csikszentmihalyi 2005; cf. Chaps. 2 and 3). The individual is assumed to have the feeling of control and of being totally centered on the activity when challenge and skills are in balance. Therefore, this balance is regarded as one of the conditions to foster the experience of flow rather than a component of flow.

However, it is important to note that the balance does not necessarily lead to the feeling of control. This becomes evident when we contrast a person with high anxiety and one with low anxiety. Presumably, the two persons will feel confidence at different levels of challenge (cf. Engeser and Rheinberg 2008). Thus, the condition itself does not determine the experience of control, as it does not determine any human experience. "In any case, a sense of control is definitely one of the most important components of the flow experience, whether or not an 'objective' assessment justifies such feelings" (Csikszentmihalyi 1975, p. 46), and "it is the subjectively perceived opportunities and capacities for action that determine experiences" (Nakamura and Csikszentmihalyi 2005, p. 91).

The same can be illustrated with the component of coherent, noncontradictory demands. The activity can provide a clear goal and immediate feedback. Flow activities such as climbing or playing chess have such clear rules and goals. They also provide immediate feedback, which makes the experience of flow more likely. But once again, the person has to adopt this goal and perceive the feedback provided, which depends on the individual's history and expertise (cf. Rheinberg 2008). We can also see things the other way round and think of a less well-structured situation providing no such clear feedback. The individual may nevertheless exploit this purely provided feedback and find a way to structure the situation (cf. Schiepe-Tiska and Engeser for an analogous perspective, Chap. 5). Therefore, it is important to see the coherence and noncontradictory nature of the demands as a subjective experience that is part of the flow experience rather than a condition. This does not exclude that conditions strongly influence the subjective experience, but to exclude it as a component of flow would be shortcoming.

Flow as an Autotelic Experience

As mentioned above, the "autotelic nature" of flow is sometimes regarded as a component of flow. Flow is experienced as being highly rewarding, and individuals strive to attain this state over and over again. The incentive lies in the engagement of an activity (Schüler and Engeser 2009), and in this respect, it is an autotelic or intrinsically rewarding experience. The flow construct helps us to understand human motivation, as it explains why we do things without any obvious external rewards. This rewarding nature of flow experience has many implications and consequences and suggests that flow has generally positive consequences for the individual or society (Csikszentmihalyi 1997).

On the other hand, in some respects, adding this component of the autotelic nature to flow is problematic. First, the construct of flow was originally used to explain autotelic or intrinsically motivated behavior (see "History" below). When the

autotelic or intrinsically motivated behavior is part of the definition of flow itself, it poses a risk of circular explanations.

Csikszentmihalyi originally used the term "autotelic experience" instead of flow. "In calling an experience 'autotelic,' we implicitly assume that it has no external goals or external rewards; such an assumption is not necessary for flow" (Csikszent-mihalyi 1975, p. 36). This means that flow could at least be triggered by external goals (cf. Csikszentmihalyi 1975, p. 41ff). Moreover, flow could be experienced in any activity, and not only in activities with a distinct "intrinsic" nature. In a working context, for example, an individual could be assigned to a task and become completely immersed in this activity while carrying it out. This would mean that an initially extrinsically motivated behavior could become intrinsic during its performance.

Related to this, there are also "negative" aspects of flow experiences, such as flow in combat, antisocial behavior, and addiction (see Chap. 7 for the dark side of the flow). Alternatively, flow might be used for the manipulation of a capitalist and patriarchal system (cf. Harari 2008). This might lead to some confusion when calling flow an intrinsically motivated experience, as the term "intrinsic" has merely positive connotations. To avoid this, and to keep the construct clearer and not restrict it only to "positive" aspects, the autotelic nature of flow may not be included as a definitional component itself.

All in all, the arguments presented above provide reasons why "autotelic nature" or "intrinsic nature" is not a univocal definitional part of the flow experience. Leaving it out of the definition, flow would be a state in which a person is totally immersed in an activity, feels in control, etc., regardless of whether the person does the activity for intrinsic and/or extrinsic reasons. At the very least, it could be empirically examined whether flow is always experienced as an autotelic experience. If so, the component could be left out for reasons of parsimony. If it is not the case, then the relationship between "flow" and autotelic experience should be determined more precisely.

Flow as an Optimal Experience

Csikszentmihalyi and LeFevre (1989) called flow the "optimal experience" in the sense that "Flow is defined as a psychological state in which the person feels simultaneously cognitively efficient, motivated, and happy" (Moneta and Csikszentmihalyi 1996, p. 277). Thus, flow is a positively valenced experience and is associated with feelings of enjoyment. As a highly functional state, flow correlates with performance enhancement in creative activities, learning, and sports (Csikszentmihalyi et al. 2005; Engeser and Rheinberg 2008; cf. Chap. 4).

Flow also provides the incentives for developing skills and personal growth. Flow fosters the engagement in challenging activities, and in order to maintain flow, a person has to set higher standards as skills progress. In this respect, Csikszentmihalyi assumes flow to be the key to a rich, productive life (Csikszentmihalyi 1996) and to cultural evolution (Massimini et al. 1988).

However, based on some empirical results, one might question the general conclusion that flow is an optimal experience. Just as an illustrative example, Schüler and Brunner (2009) found that in a marathon race, flow was not associated with higher performance, while for other sports, flow has been generally reported to be associated with high performance (Jackson and Roberts 1992). Perhaps, in a marathon race, it is necessary for the self to be a vivid "dictator," forcing the body to run, and flow would hinder this (see Schüler and Langens 2007). In more complex and technical sports, flow may rather be an optimal experience. On the other hand, Schüler and Brunner (2009) also found that flow was associated with higher training motivation. In this respect, flow is an optimal experience for the motivation to run, but not for a higher performance in the marathon race.

Regardless of whether this interpretation of Schüler's results is accurate, it is worth thinking about when flow is optimal to foster performance. More specifically, how does flow channel or modify the informational and motivational processes, and for what kinds of task is this optimal? Landhäußer und Keller (Chap. 4) will provide conceptual work and first data to tackle this question.

Additionally, a fluctuation of different states of consciousness may be optimal. Like sleeping and waking, flow experience has to be accompanied by relaxation (cf. Chap. 8 for stress and flow). Therefore, the optimal balance between flow experiences and other states of consciousness might come under closer examination. This would be important when thinking about performance or about what makes a successful and happy life (cf. Nakamura and Csikszentmihalyi 2005, p. 97). We suggest that persons may need to alternate and trade off flow with other experiences in order to optimize their lives.

Flow and Happiness

Flow is a rewarding experience, and loosely speaking, rewarding experiences make us happy, as punishing experiences make us unhappy. However, flow is not the experience of happiness itself. "When we are in flow, we are not happy … if a rock climber takes time out to feel happy while negotiating a difficult move, he might fall to the bottom of the mountain" (Csikszentmihalyi 1997, p. 32). Hence, the experience of happiness would distract attention from the action and prevent flow. Csikszentmihalyi himself did not always strictly separate flow and happiness, as seen in the quotation from Csikszentmihalyi and LeFevre (1989) presented in "Flow as an Optimal Experience" above.

Empirical data confirm that flow and happiness are not experienced at the same time. Instead, flow experience while climbing is associated with the feeling of happiness afterwards (Aellig 2004; cf. Rheinberg 2008), as Csikszentmihalyi (1997, p. 32) also expected. Correlational data from an experience sampling method (ESM) study by Rheinberg et al. (2007; cf. Rheinberg 2008) also showed that flow and happiness were not highly correlated. Furthermore, Schallberger and Pfister (2001) showed that flow is more strongly associated with emotional states indicated by high "activation"

than with emotions of happiness (cf. Rogatko 2009). The work of Silvia (2008) points in a similar direction, stating that flow is not strongly associated with happiness. Instead, he sees close links of the curious emotion of interest to the concept of flow.

It is also important to point out that flow itself is not defined through an affective state. The components of flow listed above (Box 1.1) do not include any description of an affective state. Of course, it does not rule out that flow is highly correlated with some affect. Further conceptual work and empirical research need to be conducted to relate flow experience and affect. As just mentioned, this line of flow research has already begun, and Landhäußer and Keller (Chap. 4) will present further data on this aspect.

Historical Lines and Current Flow Research

> If we continue to ignore what makes us happy, and what makes our life enjoyable, we shall actively help perpetrate the dehumanizing forces which are gaining momentum day by day (Csikszentmihalyi 1975, p. 197).

The Beginning

The term flow was created by Csikszentmihalyi in 1975 after several years of research into play activities, creativity, and artists' personality (Csikszentmihalyi and Bennett 1971; Csikszentmihalyi and Getzels 1973; Getzel and Csikszentmihalyi 1966). He was seeking to understand what makes activities inherently motivating. Investigating what makes an activity enjoyable has broad implications for our lives. It is also important on the level of society as a whole, as Csikszentmihalyi vividly expressed in the quotation presented at the top of this section.

The quotation also gives the impression that searching for the enjoyment of activities was not in the focus of psychology at that time, and Csikszentmihalyi articulated the danger that life could become worse in a technocratic world, with behaviorism being the main paradigm in psychology at the time. Subsequently, he tried to start a research program to counter this potential danger, and Csikszentmihalyi himself mentioned the following starting point of his research program:

> In a world supposedly ruled by the pursuit of money, power, prestige, and pleasure, it is surprising to find certain people who sacrifice all those goals for no apparent reason: people who risk their lives climbing rocks, who devote their lives to art, and who spend their energy playing chess. By finding out why they are willing to give up material rewards for the elusive experience of performing enjoyable acts, we hope to learn something that will allow us to make everyday life more meaningful. At present, most of the institutions that take up our time—schools, offices, factories—are organized around the assumption that serious work is grim and unpleasant. Because of this assumption, most of our time is spent doing unpleasant things. By studying enjoyment, we might learn how to redress this harmful situation. (Csikszentmihalyi 1975, p.1)

To study enjoyment, Csikszentmihalyi argues that the dominant paradigm of behaviorism and a psychoanalytic approach may not provide a full answer. Instead of explaining the activities as means to get a reward or to satisfy libidinal needs, he shifted his view to see it "as an autonomous reality that has to be understood in its own terms" (Csikszentmihalyi 1975, p. 10). He approached the understanding of enjoyment by investigating individuals' subjective experience and the subjective reasons why they perform such activities, which were assumed to be autotelic.

Initially, Csikszentmihalyi conducted pilot interviews with hockey and soccer players, spelunkers and explorers, a mountain climber, a handball player, and a long-distance swimmer, who provided the basis for questionnaires and more structured interview forms. A first quantitative analysis was conducted, with eight possible reasons for enjoying activity, based on rock climbers, composers, modern dancers, chess players, and basketball players. The results suggested that "enjoyment of the experience and use of skills" and "the activity itself: the pattern, the action, the world it provides" ranked first in the subjective reasons for action, followed by "development of personal skills." "Prestige, regard, glamor" was placed at the end of the list (Csikszentmihalyi 1975, p. 15).

An in-depth analysis of interviews (accompanied by quantitative data similar to that just listed) relating to chess, rock climbing, rock dancing, and enjoyment of work among surgeons showed the recurrent experiences which are listed in Box 1.1. In his analysis, Csikszentmihalyi recognized these recurrent experiences and realized their importance for understanding the motivational significance.

Flow Theory

The shift to analyze the experience of the activity in its own right and to recognize the recurrent patterns was essential for flow research. However, an additional major step was to formulate a model that explained why activities are enjoyable in themselves. Altogether, this allowed researchers to go beyond the description of single activities and provided the generalizations to simulate scientific progress. As described in Chapters 2 and 3, the flow model of 1975 assumes that flow is experienced when the challenges and skills match (see also Box 1.2). When there is a mismatch and challenges are too demanding for an individual's skills, worry and anxiety will result. If skills exceed opportunities, boredom is experienced.

Many aspects of the model were already outlined in the article "An exploratory model of play" (Csikszentmihalyi and Bennett 1971). The model of play is grounded in the assumption that play provides a perfect structure for action. The individual has to decide on a definite number of alternatives and does not have to think about potential indefinite possibilities. Games thus provide the right number of possibilities and opportunities for action (compare the "coherent, noncontradictory demands" as one component of flow in Box 1.1).

Box 1.2 Highlight One Aspect and One "Curiosity" of Csikszentmihalyi's 1975 Model of the Flow State

The relations between challenge and skills are the basis of the flow model. It is important to point out that *challenges are seen as opportunities for action and skills as action capabilities* (Csikszentmihalyi 1975, p. 49). This means a quite broad understanding of challenge and skills, which can be understood when keeping in mind the basic assumption of "an exploratory model of play" (see above). This broad understanding of challenge and skills extends flow theory to activities without a clear achievement character (i.e., in which challenge and skills are not inherent and natural aspects; see Chap. 5). On the other hand, such a broad understanding clearly poses conceptual and methodological problems, too.

In the depiction of the flow model of 1975, we point to what, at first glance, appears to be a curiosity: "And finally, a person with great skills and few opportunities for applying them will pass from that of boredom again into that of anxiety" (p. 50). Csikszentmihalyi does not explain why this should be the case (later presentations of the model do not include anxiety when skill extensively exceeds challenges). We suppose that Csikszentmihalyi assumed that humans need structure, and when opportunities for action are not given, this will lead to the experience of chaos and anxiety. Experiments on sensory deprivation (cf. Solomon 1961) or prisoners who are kept in isolation may be prototypical for such a state. Both are highly aversive states after quite short durations of time.

Theoretical Precursors

Hebb (1955) and Berlyne (1960) proposed that the right amount of stimulus is essential to explain intrinsically motivated behavior. Animals including men strive for an optimal level of stimulation. Novel stimuli provide enjoyable sensation; however, too much novelty leads to anxiety and too little novelty leads to the exploration for stimulation. There are clear parallels to the flow model here, and Csikszentmihalyi explicitly refers to their work. Both are included as precursors of flow theory in Fig. 1.1.

White (1959) also outlined that novelty and variety are enjoyed for their own sake and proposed "effectance" motivation in dealing with the environment. Individuals like to have an effect on the environment which is perceived as enjoyable, and they consequently learn to deal with the environment and develop new competencies. This leads to a subjective experience of a feeling of efficacy or competence, which is enjoyable and rewarding in itself (compare the "feeling of control" as one component of flow in Box 1.1).

Csikszentmihalyi also referred to DeCharms (1968), who proposed that the feeling of being the origin of the action is an important aspect of enjoyment. Both, White an DeCharms, were incorporated into the self-determination theory (SDT; Deci and Ryan 1985), which is like flow theory, originated in the 1970s to

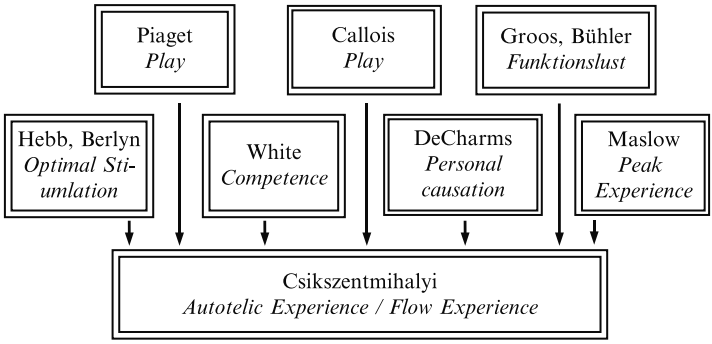

Fig. 1.1 Theoretical precursors of Csikszentmihalyi's flow theory

explain intrinsically motivated behavior (cf. Chap. 6 for a comparison of flow theory and SDT). White and DeCharms were also influential in terms of research on achievement motivation, which is the theoretical background for Heckhausen and Rheinberg's (1980) and subsequently Rheinberg's work (see below; cf. Engeser and Rheinberg 2008).

Other precursors were Piaget (1951) and Callois (1958), who both tried to understand the motivational aspects of play. Callois believed that individuals find pleasure in play by testing limits, extending skills, having new experiences, seeking danger, and altering their consciousness. Csikszentmihalyi used prototypical examples of Callois' postulated needs underlying the rewarding experience of activities in order to ascertain whether these needs are present in activities of interest (e.g., rock climbing, chess). Empirical results revealed that Callois' needs are important (but not exclusively so) for enacting these activities. At the same time, the empirical results showed "the underlying similarity that cuts across these autotelic activities, regardless of their formal differences … they all give participants a sense of discovery, exploration, problem solution—in other words, a feeling of novelty and challenge" (Csikszentmihalyi 1975, p. 30).

We also listed Groos (1899) and Bühler (1922) as precursors, who described the pleasurable sensation ("lust") when an individual functions ("function") effectively. The focus on the sensation or experience of the activity was the focus of Csikszentmihalyi's work, too: "… my first concern was about the quality of subjective experience that made a behavior intrinsically rewarding. How did the intrinsic rewards feel?" (Csikszentmihalyi and Csikszentmihalyi, p. 7). According to Bühler, the enjoyment lies in the sensation of effectance and control of action, and this is an important motivational aspect for understanding human behavior. It is a kind of innate reward mechanism provided by evolutionary means to ensure the development of skills (Bühler 1922, p. 456).

Csikszentmihalyi sees flow as having parallels to peak experiences as described by Maslow (1968) and in many respects to the experience in rituals, mediations, and any other religious experience (Csikszentmihalyi 1975). The component of flow in Box 1.1 "Loss of self-consciousness" has the strongest parallel with such peak

experience in religious contexts (cf. Chap. 8). Possibly, such religious activities, rituals, and meditation might be seen as "flow activities," with clear rules and goals, allowing the individual to become totally immersed.

Similar Research in Germany

In the 1970s, Rheinberg tried to predict exam preparation of students with a model adopted from Heckhausen (1977; cf. Rheinberg 2008). The model aimed to capture all relevant aspects of motivation, but frequently predicted the exam preparation incorrectly for some students (Rheinberg 1982, 1989). When asking these students why the model did not make correct predictions, it became clear that the model missed an important aspect: the incentives of the learning activities themselves. The model merely looked for incentives that lay in the consequences of learning activities (e.g., being proud, grades, avoiding blame), as it was the case for the prevalent motivational model at that time (cf. Heckhausen and Rheinberg 1980; Weiner 1972).

Having recognized this desideratum, Rheinberg concluded that the incentives of activities could best be studied in leisure activities and began with an analogous research question to that of Csikszentmihalyi: why are individuals highly engaged in activities with no obvious rewards or even with high costs? Besides the analogous research question, the methodological approach of Rheinberg's and Csikszentmihalyi's work wasw very similar as well. Rheinberg also conducted in-depth interviews with individuals engaging in motorcycling and windsurfing (Rheinberg 1982, 1986), which were later supplemented with musicians and skiers (Rheinberg 1993; cf. Rheinberg 2008). All of these activities have in common that the motivation to engage in the activity is hardly understood if the incentives of the activity itself are not considered.

In Box 1.3, we list examples of verbalizations of activity-specific incentives. Some of them sound familiar when considering the components of flow experience above (see Box 1.1). This includes being totally absorbed in the activity, forgetting about everything else and the feeling of control. One quotation listed here points to the activity incentive related to sensation seeking in high-risk sports (Rheinberg 1986; cf. Zuckerman 1994), another highlights the immediate enjoyment of being in nature, and one states that self-expression is part of the personal identity (cf. Csikszentmihalyi 1975, p. 15 for activity incentives not subsumed under flow).

Box 1.3 Examples of Verbalizations of Activity-Specific Incentives in Leisure Activities (Rheinberg 1993, Translations by the Authors; cf. Rheinberg 1982, 2008)

"The most important thing is that when I sit on the motorbike, everything else is gone—no troubles with the company, with the children, just driving, driving, driving" (motorcycling, p. 10)

"To feel how the board, the rig and one's own movements become an entity which deals with the wind and waves" (windsurfing, p. 7)

(continued)

Box 1.3 (continued)

"To have just mastered a threatening and anxiety-inducing situation" such as a storm (windsurfing, p. 12)

"To experience nice and elegant movements; the perfect interplay between the skis and one's own movements" (skiing, p. 9)

"To enjoy the atmosphere of the mountains" (skiing, p. 10)

"When I play music, I am totally concentrated on what I am playing. No disturbing thoughts, the environment, even pain, I do not feel them anymore" (music, p. 10)

"Through music I can express myself: I put all my personality into it" (music, p. 13)

A systematic classification of all aspects which were mentioned in the interviews had been begun by Rheinberg (1993), but unfortunately had not attracted further systematic research. Although not enough systematic work has been conducted, there seems to be a limited number of possible activity-related incentives and a wide intersection of incentives between activities. The limited number and the wide intersection of incentives provide ideal grounds upon which to understand engagement in activities that, from the perspective of outsiders, initially appear insane. It is very likely that an in-depth interview will reveal at least some incentives with which the outsider is familiar. For example, a more recent analysis of graffiti spraying (Rheinberg and Manig 2003) showed that the engagement in this risky and costly activity offers well-known incentives: these young people enjoy experiencing and improving their painting skills, being in the company of others, and state that "when you're out spraying, your completely forget all the stress you have at home and at school" (p. 228; translations by the authors).[1]

Although Rheinberg and Csikszentmihalyi had a similar research question and similar methods and obtained comparable results, they looked at these results differently. Rheinberg studied the incentives discovered in in-depth interviews separately. He did not focus on the commonalities of all the activities which he studied. Csikszentmihalyi, on the other hand, focused on incentives that were regularly mentioned in different activities and ended up with the description of the flow experience. One advantage of this research strategy is that it also allows researchers to look at any activity to find out whether flow is experienced.

This brings us back to the starting point of Rheinberg's research. He recognized how important task-specific incentives are in respect to learning motivation and engagement in learning activities. The prediction of the learning activity in Rheinberg's early work has increased considerably when considering task

[1] Compare the description of Csikszentmihalyi's work on the basis of Callois, above.

incentives (Rheinberg 1989; cf. Rheinberg 2008).[2] This implies that flow and other task incentives are important to understand the motivational aspects of activities.

The research revealed that task-specific incentives are important even for activities that are conducted as purpose-related incentives or for "extrinsic" reasons. If activity incentives are in line with the purpose-related reasons, the activity should run smoothly on motivational grounds. On the other hand, if an activity is motivated by purpose-related incentives alone and the task incentives are not given or even aversive, motivation becomes fragile. This would be the case for a student who is preparing for a math exam but who hates even opening a math book. In this case, volitional control is needed to deal with the aversive nature involved in conducting the activities (Engeser 2009; Rheinberg and Engeser 2010).

The fact that task-related incentives in general and flow in particular can be relevant in any kind of activity brings us to the next step of flow research, which is described in the following: studying the flow experience in daily actions.

Flow in Daily Experience

Csikszentmihalyi (1975) recognized the importance of the experience while being engaged in activities. He had already studied a great variety of activities, relying on retrospective or summative measures. What could be more progressive than to study flow while the person is actually doing the activity and to study a wide range of activities?

In an advancement of Csikszentmihalyi's (1975) diary method to study flow patterns in everyday life, Csikszentmihalyi et al. (1977) developed and used the ESM, which provided an appropriate tool for such an enterprise. Using the ESM, subjects receive signals at random times during waking hours of a normal week. Each time the subject gets beeped, he or she fills out an experience sampling form (ESF; cf. Chap. 2). Among other things, subjects indicate where they are and what they are doing, rate how they feel on a list of 13 adjectives (e.g., friendly, happy), state whether they are in control of the action, and provide information on the "challenge in the activity" and "skills in the activity." It is worth noting that the self-report form did not include indicators of all components of flow (cf. "methodological approaches" below and Chap. 2).

The ESM technique provides rich data based on what the subjects did and how they experienced it. For example, it provides us with the frequencies of watching television and how people feel about it compared to other leisure activities or work (cf. Csikszentmihalyi and LeFevre 1989). As the ESM, along with the ESF,

[2] When individual differences in the incentive focus were considered, the predictions were almost perfect. The incentive focus can be seen as a construct similar to Csikszentmihalyi's autotelic personality (cf. Chap. 9). A questionnaire to measure the incentive focus is presented by Rheinberg, Iser and Pfauser (1997).

Box 1.4 ESM and Measuring a State of the Loss of Self-consciousness

A standard criticism of ESM with regard to measuring flow is that the beep signal ruins this state of consciousness. This is clearly the case, but it does not mean that the measure of flow will not be valid. Imagine that the subject gets beeped when he or she is totally immersed in an activity. The beep brings him or her out of this state, but the subject will still remember what he or she was doing and feeling some seconds ago. Strictly speaking, the person is not unconscious or insensible when in flow. It may be compared to a dream; when we wake up, we stop dreaming, but we can still remember the contents and feelings of the dream and could report them.

was soon used by other researchers in different countries (e.g., Massimini and Carli 1988), it also allowed cross-cultural comparisons (cf. Moneta 2004a). The possibilities for conducting research with the ESM (and similar methods) also established it as a standard tool not only for research on flow (Trull and Ebner-Priemer 2009). Furthermore, the ESM has been advertising the concept of flow, which should not be underestimated.

In Box 1.4, we highlight a criticism of the ESM method, and there are other potential weaknesses besides its strengths (cf. Scollon, Kim-Prieto and Diener, 2003). We also want to highlight an important conceptional finding of the Csikszentmihalyi et al. (1977) ESM study, which gives an impression that task incentives are important for motivation. The ESF also asked the subjects "Why were you doing this?" The results revealed that nearly 80% of the actions were subjectively considered, with the response "I wanted to do it." In this case, we would expect that the subject enjoys the activity or at least does not feel bad while doing it. This interpretation fits in with an early study by Rheinberg (1989), which tapped into daily experience. Here, only 12% of the actions were experienced as aversive and 61% as positive (the rest being neutral in this respect). This shows that we predominantly enjoy things we are doing, and the hedonistic principle leads to the expectation that we will actively seek such activities and avoid things we do not enjoy. This cannot be ignored when attempting to understand human striving.

Well-Being and Creativity

Csikszentmihalyi (1975) explored the implications relating to "big questions" of human happiness, well-being, and creativity. What does it take to live a happy, meaningful, and creative life? Flow is a rewarding experience, as it has been reiterated throughout this chapter. Experiencing it more often does make life more satisfying and should prevent a person from living a dull life. It is a thrill that stands out from routine and uneventful times (Csikszentmihalyi 1997, p. 97). Moreover, flow can be experienced in a wide variety of activities.

Where and how people find flow depends on the opportunities an individual has. And these opportunities at least partially depend on the cultural or sociocultural context in which an individual lives. For example, in a secular society, there may be fewer opportunities to experience it in a religious vocation but more options to find it in leisure activities. Or, in a well-educated home, learning and discussion about science may provide a means of becoming completely absorbed. Massimini et al. (1988) used this as a basic principle to outline a theory about biocultural evolution. Society offers opportunities to experience flow and activities in which individuals experience flow will be more likely to be positively selected. Subsequently, these opportunities are reinforced and become an even more central part of culturally offered opportunities for action. "Clearly, enjoyment is the main reason for the selection of most artistic cultural forms. Painting, music, drama, and even the mere ability to write are symbolic skills adopted because they produce positive states of consciousness" (Massimini et al. 1988, p. 62).

The rewarding nature of flow has a further implication, which Csikszentmihalyi emphasizes in relation to what makes a happy and meaningful life (Csikszentmihalyi 1996, 1997). Flow provides means to help a person to live up to one's individual potential. A person actively searching for challenging situations that stretch his or her skills will increasingly develop more skills (see Chap. 9). The person evolves into a more and more complex individual. He also outlined this pattern in his book on creativity (Csikszentmihalyi 1996), in which he interviewed nearly one hundred outstanding personalities from around the world who had made substantial contributions "to a major domain of culture" (p. 12; e.g., science, art). Once again, he found that such individuals got a thrill out of their work, dedicated much of their energy to it, and increasingly developed skills and expertise.

In general, this means that a society should provide opportunities for actions that allow individuals to enjoy these activities, experience flow, and live up to their potential (cf. Rheinberg and Engeser 2010). Modern societies should make culturally valued activities like studying science prone to enjoyment in order to ensure the motivational basis for excellence in these areas.

The implications drawn from Csikszentmihalyi for a better life are inspiring and of great value. The assumption utilized the broad implication of the concept of flow. On the other hand, such broad implications are difficult to test empirically and risk overstretching the construct. Moreover, we have to keep in mind that "flow is a powerful motivator, but it does not guarantee virtue" and that "a culture that enhances flow is not necessarily 'good' in any moral sense" (Csikszentmihalyi and Csikszentmihalyi 1988a, b, p. 186; see also Chap. 7). Csikszentmihalyi and Csikszentmihalyi take an extreme example: the Nazi fascist regime. They speculated that a game plan was provided here, which "set simple goals, clarified feedback, and allowed a renewed involvement with life that many found to be a relief from prior anxieties and frustrations" (p. 186).

Current Lines

To provide an initial impression of the quantitative coverage of the flow concept, we conducted database searches of PsycBOOKS and PsycINFO (APA 2011) as well as PSYNDEX (ZPID 2011) for publications on flow. We searched for the term (1) "flow" mentioned in the title, (2) "flow" in the abstract, plus "Csikszentmihalyi," and (3) "optimal experience" in the abstract from the years 2005 to 2010. We manually checked all hits and ended up with 244 references dealing with flow as one main topic. Our search should cover a great deal of the work on flow and should provide at least a rough estimate of the lower limit of quantitative coverage.

The number of references shows that the flow concept is intensively recognized and studied and will possibly even attract more research in the future, as the number of references slightly increased over the 5-year period. Of greater relevance should be the topics dealt with in the literature. We at least consulted the abstract of the references in order to gain an overview of the topic, which we present in the next paragraphs. Finally, we discuss the methods used to study flow.

Current Topics and Concerns

Thirty-five years of research has provided the time to study various topics. As presented above, intensively practiced leisure activities, daily experiences and the implications for creativity and well-being have already been examined. These topics are still topics of interest, but, for example, aspects of well-being only rarely explicitly attract empirical research besides studies on daily experience with ESM (e.g., Rathunde 2010).

Flow itself is regarded as a positive state, and therefore, the question of well-being is implicitly part of much of the research conducted. In the majority of the references, flow is being the explained variable and does not serve as an independent variable. Thus, understanding the conditions for flow is of major interest, and the consequences of flow are less intensively studied (see Chaps. 3 and 4). Another main topic is the measurement of flow (with questionnaires; e.g., Yuan, Hu, and Wang 2009).

The two major areas of research are sports and learning in educational settings (together making up over a third of the references). Besides the motivational importance of flow, it is seen as a predictor of higher performance, of being "in the zone" (e.g., Schüler and Brunner 2009; Engeser and Rheinberg 2008). Understanding the conditions and consequences of flow would therefore give trainers, athletes, teachers, and students a better way to enjoy and improve the respective activities. Moreover, physical activities to improve health are of interest for some studies.

Another major topic is in the area of human–computer interaction, game-based learning, and media use. Of special interest is the understanding when interaction with a computer runs smoothly and the user is highly concentrated on the task (e.g., Liu et al. 2009). A derivate of this research relates to how flow will influence consumer behavior and might tap into marketing purposes (e.g., Drengner et al. 2008).

Similarly present is research in the area of work and the endeavor to understand the working conditions under which flow can be fostered (Salanova et al. 2006). Research on the consequences of flow on working motivation, well-being (health), and performance is less frequent, which, as mentioned above, is generally the case.

A smaller proportion deals with the clinical implications of flow and how flow could be used to improve therapeutic settings or to offer new and rewarding experiences (Wanner et al. 2006). Some of these studies are concerned with the negative consequences of flow, a topic that has fortunately attracted some research interest. Schüler (Chap. 7) focuses on this topic in detail.

Classical areas of flow research such as music, religious experiences, and arts are still attracting a reasonable amount of interest from researchers, as well as research which addresses personality aspects (cf. Chap. 9). A topic that is garnering increasing attention is flow in social contexts. This examines flow in therapeutic settings, flow in the interaction between teachers and students, flow and relationship satisfaction, and flow in team sports (e.g., Bakker 2005; Graham 2008; Mugford 2006; see also Ackerman and Bargh 2010). Only one empirical work has considered physiological correlates of flow experience (de Manzano et al. 2010). We expect this area of research interest to heavily increase over the next years, and a whole chapter of this volume is dedicated to this kind of research (Chap. 8).

Methodological Approaches

When conducting empirical studies, researchers have to find ways to measure flow somehow. Initially, (semi)structured interviews served this purpose and led to the description and definition of flow (see Box 1.1 and section "The Beginning"). In today's research, interviews are still a substantial part of the research conducted (representing roughly 10%). They are used to explore new aspects such as new sports (e.g., Seifert and Heddersen 2010), flow in groups (Mugford 2006; Sutton 2005), and possible new aspects of antecedences and consequences of flow at work (Wright et al. 2007).

The vast majority of studies use questionnaires to assess flow. The measurement of flow with questionnaires can be differentiated in (1) measuring all components of flow experience or (2) capturing some components. Furthermore, subjects have to indicate (3) the experience of flow in a global manner or (4) flow is inferred according to the flow model. Moneta (Chap. 2) will address the measurement and its implications for the conceptualization of flow in detail (see also Chap. 3).

The first two approaches of questionnaires to measure flow are dominant in the research conducted. Probably accelerated by a widespread measuring of all components of flow in sport (e.g., Andrew and Jackson 2008; Jackson and Marsh 1996), the first approach is becoming more prevalent and is gaining momentum in areas other than sport (e.g., Cermakova et al. 2010; Fullagar and Kelloway 2009; see also Engeser and Rheinberg 2008). The advantage of measuring all components becomes clear if we recall the description of "flow as a multifaceted experience" provided above.

In the ESM, using the ESF, the components of concentration, self-consciousness, and the feeling of control are measured as indicators of flow (e.g., Delle Fave and Bassi 2009). Others use the perception of time as an indicator of concentration (Keller and Bless 2008). Keller and Bless additionally asked about the feeling of control and tapped into the autotelic nature of flow. Other researchers rely heavily on the intrinsic or autotelic aspect of flow (e.g., Bakker 2008), which reduces the validity of the measure (see "Flow as an Autotelic Experience").

The third approach of questionnaires is rarely used (e.g., Asakawa 2010) and goes back to the research on talented teenagers (Csikszentmihalyi et al. 1993). Individuals have to indicate how often they experience "… something where your concentration is so intense, your attention so undivided and wrapped up in what you are doing …" (p. 275). In interview studies, such descriptions sometimes also used to start with, or have the qualitative data accompanied by a quantitative measure (Seifert and Heddersen 2010).

The fourth approach is entirely restricted to ESM studies. The ESF questionnaire additionally asked for the level of challenge and skills and used the ratio of both as an indicator of flow. Although the ESF questionnaire does measure components of flow too, researchers take this ratio as the indictor of flow and do not rely on a direct measure of components. However, as indicated above, recently the measurement of all components is also beginning to occur in ESM studies (e.g., Fullagar and Kelloway 2009; Nielsen and Cleal 2010; Rheinberg et al. 2007).

Alternative measures besides asking subjects in interviews and standardized questionnaires arise from neuroimaging and other psychobiological correlates of the experience of flow. Peifer (Chap. 8) goes into detail in this respect, and Moneta (Chap. 2) discusses further potential alternatives.

Apart from how flow is measured, most of the studies are correlational, with a cross-sectional design. A great proportion of this studies correlate questionnaires of flow with questionnaires of other construct of interest. This allows the inclusion of a variety of constructs and for the interrelation with high numbers of subjects and different populations to be looked at in an economical manner.

However, correlational data do not allow causal relationships to be tested, and this is a weakness of this approach (cf. Chap. 4). A second weakness is that questionnaires share common method variance (e.g., due to social desirability), and correlations between flow and other measures might be attributed to this (Podsakoff et al. 2003). Correlational data between flow and behavioral data (e.g., records of behavior, performance measures) are less frequent but are found across most areas of research (e.g., Abuhamdeh and Csikszentmihalyi 2009; Schüler, and Brunner 2009). Although correlational, this clearly reduces the problem of common method variance.

One particular correlational approach can be found in the ESM. This approach provides rich data in a variety of contexts and gives a good description of daily experiences. It allows the researcher to identify conditions and consequences of flow and to look at the flow concept in more detail. ESM data are predominantly analyzed as cross-sectional correlational data. However, they do provide repeated measures and longitudinal data for the period studied. The potential of this data

format has rarely been used (Graham 2008) even though it offers a good opportunity to test causal relationships more effectively.

Experimental designs were virtually absent in the first 25 years of flow research (cf. Moller et al. 2010). Possibly, researchers were convinced that it is too difficult to induce flow in the lab or to appropriately manipulate conditions in natural settings. However, recent research showed that games could best be used to induce flow in the lab (cf. Chaps. 3 and 4), and it has been demonstrated that this is not restricted to games alone (cf. Schüler 2010). Game-based learning and media do also provide a good framework for experimental analysis, and research shows that this could be used in experimental designs to tap into causal relationships (van Schaik and Ling 2011). In the area of sports, Reinhardt et al. (2006) manipulated conditions for runners on a treadmill in order to gain an understanding of the conditions for flow in running.

We hope that this overview will facilitate the understanding of methodological aspects of the chapters in this book. We also hope that the introduction of this chapter provides a framework for understanding flow research in general and how it became such an interesting research topic.

Study Questions

- What are the components of flow? Are some components more important than others? Could flow be reduced to a single component?

  Csikszentmihalyi (1975) listed six components of flow. These components are widely shared and adopted by other research, with only minimal differences and changes over the decades. The components describe an experience of total immersion into the activity, the feeling of control and of knowing what to do. The action runs smoothly and is experienced as enjoyable. All components (see Box 1.1) constitute flow, and no component could be regarded as more important than another on the basis of the momentary knowledge. This also means that flow could not be reduced to a single component (at least to the current level of understanding). Other researchers see some of the components as conditions of flow rather than components, as described in the next chapters of the book. We argued that all components are a constitutional part of the flow experience in the section "Flow as a Subjective Experience." The main argument is that flow is a subjective experience that is only partly dependent on objective conditions.
- What are the pros and cons of including the "autotelic nature" of flow as one definitional component of flow?

  Flow is a rewarding experience, and individuals would strive to attain experience in its own right regardless of the consequences. Csikszentmihalyi speaks of an autotelic nature because the experience of enacting is the reason for action itself (from the Greek "auto," meaning self, and "telos," meaning goal or purpose). Therefore, it is self-evident to include it in a componential description of flow. However, flow has been, and is, used as a construct to describe the positive

aspects of the experience and to gain a better understanding of the quality experiences. The aim was to explain the autotelic or intrinsic aspect of the activity. To integrate the variable which "has to be explained" poses the problem of circular explanations when integrating this variable into the definition. Further, the question of when an autotelic or intrinsic experience will prove to have negative outcomes may be confusing.

- Why should flow be associated with higher motivation and performance? Is flow supposed to be an optimal experience in every instance?

  Due to the rewarding nature of the experience of flow, individuals are motivated to do this activity again. Doing an activity all over again should, in general, lead to better skills. In order to experience flow again, they will set themselves more challenging goals. Thus, flow is a motivating force for excellence. Second, flow could be regarded as a highly functional state (e.g., high concentration) and should therefore foster performance for most activities. (See also Chap. 4 on the discussion of flow and performance.)
- How are flow and happiness related?

  The relationship between happiness and flow is somewhat complicated and delicate. Flow is not happiness, but it is correlated with or related to happiness. A person in flow does not have the conscious experience of being happy. This would even terminate the total immersion in the activity. Flow is not defined by affective means and is possibly correlated more strongly with interest and positive activation than with happiness. However, flow is a rewarding experience, which subsequently leads to happiness and satisfaction. In general, it also provides fulfillment for the person who experiences flow, and lends structure and meaning to life, even to the point of being part of the personal identity.
- What do we call the "mission" of Csikszentmihalyi's work? What was the starting question of his work?

  We termed the wish and the engagement to understand human enjoyment, what makes an activity valuable and satisfying, the "mission" of the work of Csikszentmihalyi. This mission is still alive today, as a "new branch" of psychology, called positive psychology, has been stimulated and inspired by the work on flow. Related to this mission, he asked himself what makes an activity enjoyable in its own right, instead of understanding the experience in relation to the means or drive or similar explanations. He therefore started to study activities where the enjoyment of the action seems to be highly important, such as rock climbing or playing chess.
- Please mention the major contributions of Csikszentmihalyi's and Rheinberg's work on the concept of flow.

  Both regarded the experience of an activity as an important aspect of human motivation and began a research agenda that provided insights into this respect. Csikszentmihalyi focused on the recurrent experiences in activity and ended up defining the flow experiences. He also provided a model that provided an explanation of when flow should occur. Finally, he started to study daily experience with the methodologically progressive approach of the ESM.
- Please name the basic ideas of the precursors of the flow concept.

Understanding intrinsically motivated behavior was a vivid research question at the time Csikszentmihalyi started his research on flow. Hebb and Berlyne proposed that the right amount of simulation will explain intrinsic motivation. If humans or other animals are "bored," they look for stimulation, and too much simulation is experienced as aversive and is avoided. White expanded this idea and proposed that an individual aims to learn about how to influence the environment ("effectance" motivation). DeCharms emphasized that individuals want the feeling of being the origin of their own actions. This wish for self-determination was adopted by Deci and Ryan and incorporated in their SDT, along with the effectance motivation of White. Both aspects are also important aspects of the research tradition in achievement motivation, with McClelland and Heckhausen as prominent figures. Piaget and Callois both see play as an intrinsic motivation to develop skills, test limits, and gain new experiences to better adapt to the challenges of life. Callois also suggested that seeking danger and altered states of consciousness are rewarding in their own right. Groos and Bühler concentrated more on the experience itself. Similar to the flow research, the experience is regarded as rewarding in its own right, although it basically functions through evolutionary means similar to White, Piaget, and Callois. Finally, Maslow is mentioned as a precursor, as he described peak experience as especially joyous and exciting moments of life, such as sudden feelings of intense happiness, transcendental experiences of unity, or knowledge of higher truth.

- What are current topics of flow research and what topics are expected to gain more research interest in the coming years?

  Studying flow experience in intensively practical leisure activities, daily experiences, and the implications for creativity and well-being has been, and remains, an important part of research topics. Flow is mainly studied as the dependent variable, and researchers therefore try to understand the emergence of this experience (in certain kind of activities). Another main topic is the measurement of flow itself, and major areas of research are sport and learning in educational settings. Upcoming areas are work, human–computer interaction, game-based learning, media use, and flow under the perspective of marketing aspects. In sports and work, flow also serves as the independent variable to explain performance and motivation. The consequences of flow for well-being and health are also of importance in the research on flow, although flow serves here as the independent variable and the effects of flow on positive outcomes are taken as self-evident. A small proportion of the work deals with clinical implications. Research on possible negative aspects has rarely been undertaken, but we expect this to be an upcoming aspect (but not a main focus). Classical areas of flow research such as music, religious experiences, and arts are still attracting a reasonable amount of interest from researchers, as are personality aspects. We expect that flow in a social context and, most prominently, physiological aspects, is a topic that will attract much research interest in the future.

Chapter 2
On the Measurement and Conceptualization of Flow

Giovanni B. Moneta

Abstract This chapter introduces in chronological order the three main measurement methods–the flow questionnaire, the experience sampling method, and the standardized scales of the componential approach–that researchers developed and used in conducting research on the flow state. Each measurement method and underlying conceptualization is explained, and its strengths and limitations are then discussed in relation to the other measurement methods and associated conceptualizations. The analysis reveals that, although the concept of flow remained stable since its inception, the models of flow that researchers developed in conjunction with the measurement methods changed substantially over time. Moreover, the findings obtained by applying the various measurement methods led to corroborations and disconfirmations of the underlying models and hence provided indications on how to interpret and possibly modify flow theory. The final section outlines new directions for developing more valid and useful measurement methods that can help to advance the understanding of flow, its antecedents, and its consequences.

Theory, Models, and Measurement Methods

Engeser and Schiepe (see Chap. 1) argued that the definition of flow has changed very little since Csikszentmihalyi's (1975/2000) original formulation in 1975, and that there is strong agreement among researchers on the definition itself. Yet, they pointed out that there is a certain level of disagreement among researchers as to how flow should be measured. Indeed, over the past 35 years, researchers have kept developing and validating new measurement tools for flow, and modifying and revalidating established ones, which indicates that a gold measurement standard for

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flow has yet to be achieved. How is it possible to have agreement on a concept and disagreement on how to go about measuring it? This apparent paradox is not uncommon in the history of psychology and can be understood by recognizing that the path from the theoretical definition to the operationalization of a construct goes through the intermediate process of modeling.

A theory, such as flow theory, essentially is a set of interrelated constructs—including their definitions—and propositions that describe systematically the relationships among the constructs with the purpose of explaining and predicting a range of measurable outcomes. A measurement method, such as the experience sampling method (ESM), is an apparatus and a technique for using it that is designed to measure some—but not necessarily all—theoretical constructs in order to test some predictions made by the theory. When researchers use a measurement method in order to test specific predictions derived from a theory, they typically simplify the theory and condense it into a simpler and more precise model. The model can be an authentic mathematical model, which states relationships among constructs in the form of equations, or simply a graphic representation, such as a conceptual diagram, a path diagram, or a flow chart. Modeling is helpful because it reduces the gap between words and numbers and hence allows testing abstract relationships expressed in natural language on real-world data using statistics. Yet, because it implies a somewhat arbitrary interpretation and simplification of the underlying theory, researchers may end up adopting different models in their research and hence disagreeing on how certain constructs should be measured.

To some extent, this is what has happened in the field of flow research. Therefore, a historical approach is adopted in this chapter. In the following three sections, each major measurement method and underlying conceptualization (i.e., the modeling) is explained, and its strengths and limitations are then discussed in relation to prior measurement methods and conceptualizations. The last section outlines some novel directions of methodological research that will hopefully lead to a more accurate, complete, and integrated modeling and hence a gold measurement standard for flow.

Capturing Flow in Special Endeavors

Description of the Measurement Method

The interviews that Csikszentmihalyi (1975/2000) conducted with participants from a wide range of occupations produced a wealth of textual descriptions of the flow experience in various domains of human endeavor. Some of the most insightful and clear descriptions of flow were then selected and condensed to create the first measurement method for flow, the flow questionnaire (FQ; Csikszentmihalyi and Csikszentmihalyi 1988b). The FQ proposes definitions of flow and asks respondents to recognize them, describe the situations and activities in which they experi-

ence flow, and rate their subjective experience when they are engaged in flow-conducive activities. Understanding how this is achieved requires entering the "nuts and bolts" of the instrument.

Box 2.1 shows the key sections of the FQ. Section 1 presents three quotes that vividly describe the flow experience. Section 2 requires just a yes/no answer and hence allows classifying participants into flow-ers (i.e., those who experienced flow in their lives) and non-flow-ers (i.e., those who did not experience flow in their lives). The following sections are directed only to flow-ers. Section 3 asks them to freely list their flow-conducive activities. Section 4 asks participants who reported two or more flow-conducive activities to select one activity that best represents the experience described in the quotes, that is, the best flow-conducive activity. Section 5 asks respondents to rate their subjective experience when they are engaged in the best flow-conducive activity and in other activities, such as work or being with family, using Likert-like scales. The scales include expressions that had emerged from interviews, such as "I get involved" and "I enjoy the experience and the use of my skills," and the two cornerstone variables of flow theory, "challenges of the activity" and "your skills in the activity."

Box 2.1 The Key Sections of the Flow Questionnaire (Adapted from Csikszentmihalyi and Csikszentmihalyi 1988b, p. 195)

1. Please read the following quotes:
   My mind isn't wandering. I am not thinking of something else. I am totally involved in what I am doing. My body feels good. I don't seem to hear anything. The world seems to be cut off from me. I am less aware of myself and my problems.

   My concentration is like breathing I never think of it. When I start, I really do shut out the world. I am really quite oblivious to my surroundings after I really get going. I think that the phone could ring, and the doorbell could ring or the house burn down or something like that. When I start I really do shut out the world. Once I stop I can let it back in again.

   I am so involved in what I am doing. I don't see myself as separate from what I am doing.
2. Have you ever felt similar experiences?
3. If yes, what activities were you engaged in when you had such experiences?
4. Please write here the name of the activity—among those you quoted, if any—which best represents the experience described in the three quotations, that is, the activity where you feel this experience with the highest intensity.
5. On the next pages, there are a number of items referring to the ways people could feel while doing an activity (e.g., ratings on the activity quoted in section 4, work or study, or spending time with the family). For each item, please tell us how you feel doing each of these activities.

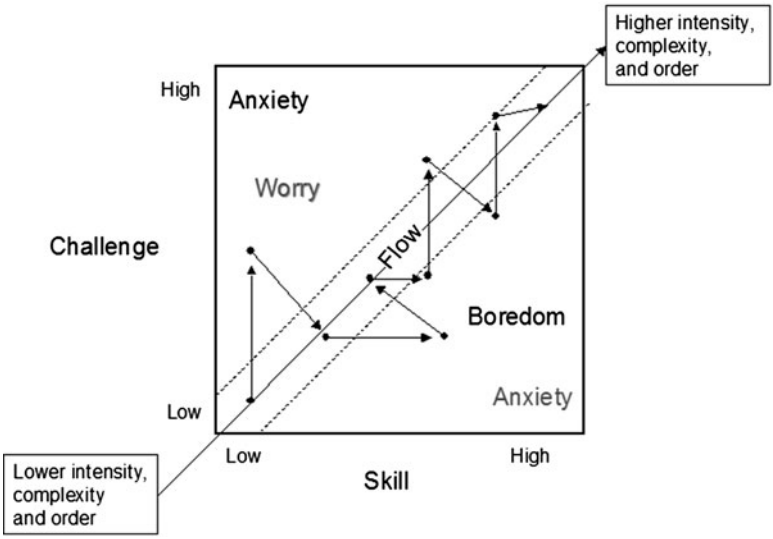

Fig. 2.1 The first model of the flow state (Adapted from Csikszentmihalyi 1975/2000)

The First Model of the Flow State

The FQ is a way to approach the empirical study of flow as represented by the first graphic model of the flow state (Csikszentmihalyi 1975/2000, p. 17), which is reproduced with some additions in Fig. 2.1. The model partitions the world of experience in three main states—flow, anxiety, and boredom—that are represented as nonoverlapping areas of a challenge by skill Cartesian space. The flow state is posited to occur when there is an equivalent ratio of perceived challenges from the activity to perceived skills in carrying out the activity. This can occur when both challenges and skills are low, when both are medium, and when both are high: in all these cases, there is a balance of challenges and skills, and hence a person should be in flow. Yet, not all flow states are the same: when achieved in high-challenge/high-skill situations, flow will be more intense, ordered, and complex than when it is achieved in low-challenge/low-skill situations (Csikszentmihalyi, personal communication, 1987).

The anxiety state is posited to occur when the perceived challenges from the activity exceed the perceived skills in carrying out the activity, whereas the boredom state is posited to occur when the perceived skills in carrying out the activity exceed the perceived challenges from the activity. As Engeser and Schiepe pointed out (see Box 1.2), Csikszentmihalyi later removed the "anxiety" label for situations in which skills are very high and challenges are very low and no longer referred to "worry" for situations in which skills are very low and challenges are medium, so that the model of Fig. 2.1 was later simplified into the threefold partition flow–anxiety–boredom. In the second edition of his 1975/2000 book, Csikszentmihalyi renamed

"boredom" as "boredom/relaxation," indicating that a situation of overcontrol may be either aversive or mildly hedonic depending on personal and situational factors.

Finally, Csikszentmihalyi (1975/2000) viewed the model as the experiential map through which a person "walks" in the quest of flow of ever growing complexity: the shown trajectories represent the hypothetical walk of a person who starts an endeavor in a state of low-complexity flow, crosses into the anxiety and boredom states, and eventually reaches a state of high-complexity flow.

Strengths and Weaknesses

The potential for application of the FQ can be evaluated in respect to the model of Fig. 2.1. The FQ has four main strengths. First, it provides a single and clear definition of flow that identifies with no ambiguity the diagonal region of the model and can be used to estimate the prevalence of flow (i.e., the percentage of people in specific populations that experience flow in their lives) as a single construct, and hence it allows studying differences in prevalence across genders, age groups, occupations, or cultures. The flow quotes capture directly *merging of action and awareness* (e.g., "I don't see myself as separate from what I am doing"), *centering of attention* (e.g., "my concentration is like breathing I never think of it"), and *loss of self-consciousness* (e.g., "I am less aware of myself and my problems") and implicitly *autotelic nature*, *feeling of control,* and *coherent, noncontradictory demands and feedback*. In all, the quotes seem to capture the kernel of the construct, as defined by Csikszentmihalyi (1975/2000) in 1975.

Second, unlike the approaches presented in sections "Capturing Flow in Daily Experience" and "The Componential Approach: Capturing Flow as a Multidimensional State-Trait Variable" of this chapter, the FQ does not "impose" flow to respondents, that is, it does not arbitrarily assume that everybody experiences flow in general or in a specific context. An important implication is that participants who would be classified as non-flow-ers based on the FQ because they did not recognize the proposed flow quotes could obtain an artificial flow score on standardized flow questionnaires simply because they reported some level of concentration or absorption—which per se do not signify flow—when engaged in the target activity. Therefore, the FQ may be considered a more valid method for measuring the prevalence of flow.

Third, because it asks respondents to freely list the activities in which they experienced flow, the FQ can be used to estimate the prevalence of flow in specific contexts. For example, Moneta (2010, in press) used a two-step procedure to assess the prevalence of flow in work: in the first step, independent judges coded the listed activities into either "work" or "leisure"; in the second step, participants were classified into those who (a) do not experience flow (non-flow-ers), (b) best experience flow when engaged in a work activity (work flow-ers), and (c) best experience flow when engaged in a leisure activity (leisure flow-ers).

Finally, by virtue of asking flow-ers to rate various facets of subjective experience as well as the levels of challenge and skill perceived when they were engaged

Box 2.2 Quotes Used to Capture "Shallow" and "Deep" Flow (Moneta 2010)

"Shallow" Flow

- "My mind isn't wandering. I am totally involved in what I am doing and I am not thinking of anything else. My body feels good… the world seems to be cut off from me… I am less aware of myself and my problems."
- "My concentration is like breathing… I never think of it… When I start, I really do shut out the world."
- "I am so involved in what I am doing… I don't see myself as separate from what I am doing."

"Deep" Flow

- "I am really quite oblivious to my surroundings after I really get doing in this activity."
- "I think that the phone could ring, and the doorbell could ring or the house burn down or something like that…"
- "Once I stop I can let it back in again."

in their best flow-conducive activity, the FQ allows testing whether flow occurs when challenges and skills are in relative balance with each other and whether subjective experience is more positive in the flow state than in the anxiety and boredom states.

The FQ has three main weaknesses. First, do the flow quotes constitute a single description of the flow state? In an ongoing study (Moneta 2010, in press), the original flow quotes were streamlined and divided in two separate sections of the FQ, one designed to measure a shallower flow and the other a deeper flow,[1] as shown in Box 2.2.

The quotes of "deep" flow differ from those of "shallow" flow in that they emphasize the condition of isolation from the environment that is central to the construct of flow. A sample of 393 workers located in the United Kingdom and from a wide range of occupations was cross-classified according to whether they had both types of flow, only one type, or neither one, as shown in Table 2.1. Although the majority of participants ($n = 250$, 63.6%) provided concordant answers, a third of the sample ($n = 130$, 33.1%) experienced shallow flow but did not experience deep flow, and a small group ($n = 13$, 0.3%) experienced deep flow but did not experience shallow flow. As such, the quotes seem to constitute a reasonably homogeneous set, with the caveat that a flow state characterized by a strong sense of isolation from the environment is less prevalent than, and perhaps qualitatively different from an ordinary flow state. Yet, because deep flow and shallow flow appear to be somewhat

[1] The separation of quotes was suggested by Antonella Delle Fave in 1997 (personal communication).

Table 2.1 Cross-classification of 393 workers in the United Kingdom based on whether they experienced shallow flow and whether they experienced deep flow

	Deep flow		
Shallow flow	No	Yes	Total
No	115	13	128
Yes	130	135	265
Total	245	148	393

distinct phenomena, mixing shallow flow quotes with deep flow quotes creates uncertainty as to exactly what a respondent's yes/no answer refers to.

Second, the FQ does not allow measuring the intensity or level of flow in specific endeavors. Although it is possible to infer whether a flow-er experienced flow in a specific activity (e.g., work) by checking whether that activity appears in the list of flow-conducive activities, the FQ does not allow measuring how intense flow was in that activity. Section 5 of the FQ contains scales measuring intensity of experience when engaged in a flow-conducive activity, irrespective of whether one experiences flow while engaged in that activity; because people experience flow only a percentage of times when they perform a flow-conducive activity, such intensity measures do not specifically tap flow intensity in that activity. Moreover, if a flow-er reports no flow-conducive activity in the target category (e.g., work), it is still possible that the participant experienced flow in the target activity but simply forgot listing the activity. Therefore, the FQ is useful primarily for assessing prevalence of flow in general, and it is open to the risk of false negatives when used to estimate prevalence of flow in specific contexts of activity.

Finally, the FQ does not allow a straightforward assessment of how perceived challenges of the activity, perceived skills in the activity, and the ratio of the two variables influence the occurrence of the flow state. This is because participants are asked to indicate their *average* challenge and skill levels in the best flow-conducive activity, and hence they are not necessarily reporting challenge and skill levels when in the flow state. The problem is that an average rating also is affected by the frequency with which flow—versus other states, such as anxiety and boredom, which are associated with other challenge/skill ratios—is experienced in the best flow-conducive activity. Therefore, the FQ is not a method of choice for testing the core tenet of flow theory and for investigating the dynamic "walks" in the challenge by skills Cartesian space that are represented in the model of Fig. 2.1.

Overall Assessment

In all, the FQ is a good measurement method for studying the prevalence of flow, but it is a limited measurement method for investigating the effects of challenges and skills on subjective experience, and it cannot measure the intensity of flow in

general and in specific endeavors. The measurement methods presented in the next two sections can be viewed as attempts to overcome such limitations.

Capturing Flow in Daily Experience

Description of the Measurement Method

The empirical test of flow theory in respect to everyday life experience became possible with the introduction of the ESM (Csikszentmihalyi et al. 1977; Csikszentmihalyi and Larson 1987). The ESM is a measurement method designed to infer the time budget (i.e., the sequence and times in which individuals are in specific states) in everyday life and the associated variation of subjective experience. The ESM seeks a random sampling of the population of experiences in respect to activities and contexts of action and associated subjective feelings. The ESM pursues the goal of ecological validity by studying subjective experience while participants are acting in their natural environments. The ESM consists of administering a questionnaire to a sample of participants repeatedly over random time intervals during their daily activities. The ESM is designed to overcome mnemonic distortions and *post hoc* rationalizations by asking appropriate questions just when the participants are engaged in their daily activities.

The original form of the ESM (Csikszentmihalyi and Larson 1987) gathers eight self-reports per day in response to electronic signals randomly generated by pagers that respondents wear for a week. After each signal, participants provide their answers on the experience sampling form (ESF). Figure 2.2 shows sample sections and items of the ESF.

The ESF contains 13 categorical items and 29 scaled items. The categorical items serve to reconstruct the activity (main activity, concurrent activities, and content of thought), the context (date, time beeped, time filled out, place, companionship, and influential facts which have occurred since the last pager signal), and some aspects related to motivation and interest (reasons for the activity, sources of physical discomfort, wished activity and companionship if different from the current ones, and comments). Except for reasons for the activity and companionship, the categorical items are open-ended and have to be coded by the researcher after collecting the data. The scaled items are designed to measure the intensity of a range of subjective feelings. Sixteen items are ten-point scales coded from zero (not at all or low) to nine (very or high); they measure the following variables: concentration, difficulty in concentrating, feeling good, feeling self-conscious, feeling in control, living up to the person's expectations, living up to the expectations of others, physical discomfort, challenges from the activity, skills in the activity, importance of the activity to the person, importance of the activity to others, and importance of the activity to the person's overall goals, success in the activity, wish to be doing something different, and satisfaction. The remaining thirteen scaled variables are

Date:	Time Beeped:	Time Filled Out: am/pm

As you were beeped ...
What were you thinking about? _____
Where were you? _____
What was the MAIN thing you were doing? _____
What other things were you doing? _____
WHY were you doing this particular activity?
☐I had to ☐I wanted to do it ☐I had nothing else to do

Indicate how you felt about the main thing you were doing:

	low									*high*
Challenges of the activity	0	1	2	3	4	5	6	7	8	9
Your skills in the activity	0	1	2	3	4	5	6	7	8	9
Was this activity important to you?	0	1	2	3	4	5	6	7	8	9
Were you satisfied with how you were doing?	0	1	2	3	4	5	6	7	8	9

Describe your mood as you were beeped:

	very	*quite*	*some*	*neither*	*some*	*quite*	*very*	
Alert	O	o	.	-	.	o	O	Drowsy
Happy	O	o	.	-	.	o	O	Sad
Active	O	o	.	-	.	o	O	Passive
Involved	O	o	.	-	.	o	O	Detached

Fig. 2.2 Selected sections and items of the experience sampling form (ESF) (Adapted from Csikszentmihalyi and Larson 1987, p. 536)

Likert scales, coded from one to seven, with the following positive poles: alert, happy, cheerful, strong, active, sociable, proud, involved, excited, open, clear, relaxed, and cooperative.

The ESM is a more complex measurement method than typical standardized questionnaires that are administered on a single occasion. This has both positive and negative consequences. On the positive side, the ESM allows investigating a wider range of phenomena. On the negative side, the data collected using the ESM are prone to biases that need to be carefully controlled for in the statistical analysis. Box 2.3 examines two important sources of bias affecting the ESM data and statistical strategies used to control them.

Box 2.3 Potential Biases of the ESM Data and Statistical Strategies Used to Control Them

The data gathered using the ESM have the structure of person-specific streams of experiential data points. These streams exhibit two potential sources of bias that have to be controlled for in data analysis. First, the scaling of the experiential variables differs between participants so that a value of 5 on a 1–9 scale may represent a high score for a participant who tends to give low ratings across situations and times and a low score for a participant who tends to give

(continued)

Box 2.3 (continued)

high ratings across situations and times. Csikszentmihalyi and Larson (1984) addressed this problem using individual standardization, an approach that many other researchers adopted in their ESM studies. For example, consider the variable challenge. Each participant's vector of raw scores of challenge is individually standardized as follows: (a) the mean value and standard deviation of the vector is computed, and (b) the mean value is then subtracted from each raw score and the difference is divided by the standard deviation. As such, a value of *z*-challenge for an observation represents the extent—measured in standard deviation units—to which that observation departs from the weakly mean of challenge for that participant. Using *z*-scores in lieu of raw scores removes individual differences in scaling under the assumption that participants experienced the same overall level of challenge throughout the week of the study.

Second, because participants are allowed to defer filling out an ESF after receiving a signal or not to fill it out at all if the activity they are engaged in at the time of signal does not allow, the number of data points differs between participants so that traditional techniques for the analysis of repeated measures cannot be used on the beep-level data. The majority of studies addressed this problem using individual aggregation (for a comprehensive explanation see Larson and Delespaul 1992 and Hektner et al. 2007). For example, consider again the variable challenge as measured in two contexts, work and leisure. Each participant's vector of raw scores of challenge is individually aggregated by calculating the mean of *z*-challenge for those observations that occurred when the participant was working and the mean of *z*-challenge for those observations that occurred when the participant was engaged in leisure activities. As such, each participant has just one aggregate score for work (i.e., mean *z*-challenge of work) and one aggregate score for leisure (i.e., mean *z*-challenge of leisure). Using individually aggregated scores in lieu of beep-level scores removes individual differences in number of observations and hence allows the use of standard statistical techniques for repeated measures at the expense of loss of information from the data.

The Quadrant Model

In the first large-scale application, Csikszentmihalyi and Larson (1984) administered the ESM to a sample of 75 high-school students in the Chicago area and analyzed how the quality of subjective experience varies as a function of four contexts of activity: life in the family, companionship with friends, solitude, and life in class. They found that those contexts yield quite different patterns of average values of subjective experience variables. Life in the family is associated with feeling happy but aggravated by lack of concentration and involvement; companionship with friends yields higher happiness and involvement but still a low concentration;

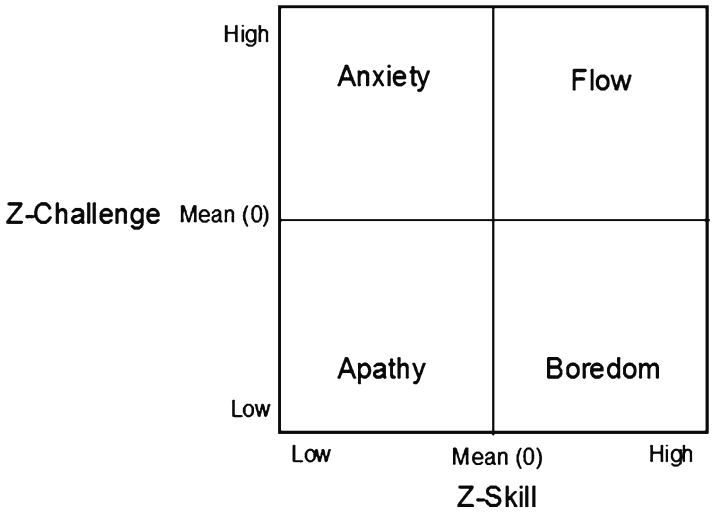

Fig. 2.3 The quadrant model of the flow state (Adapted from Csikszentmihalyi and LeFevre 1989)

solitude yields poor experience in respect to happiness and involvement but higher concentration; school life yields unhappiness but high concentration and average involvement. Csikszentmihalyi and Larson interpreted these patterns in terms of flow theory, that is, by analyzing the types of activities that are carried out within each of these contexts in respect to the levels of challenges and skills that they involve, but they could not test the theory because they had not included the challenge and skill scales in the ESF. Nevertheless, the provided interpretations were so interesting that stimulated researchers to find ways to use the ESM to test the core predictions made by flow theory.

Csikszentmihalyi and LeFevre (1989) administered the ESM to a sample of 78 workers in Chicago with the main aim of disentangling the effects on the quality of subjective experience that are due to being in flow from those that are imputable to being engaged in work or leisure. They pursued the goal by introducing a new model and operationalization of the flow state, the quadrant model, which is shown in Fig. 2.3. The model partitions the world of experience in four main states—flow, anxiety, boredom, and apathy—that are represented as quadrants of a challenges by skill Cartesian space in which both axis variables are standardized with the 0 value representing the weakly mean. The model represents flow as a state in which a participant perceives challenge and skill greater than the weekly average and in relative balance with each other.

The main difference between this and the first model of the flow state (see Fig. 2.1) is the addition of the "apathy" state, which is posited to be the least positive of the four states. Therefore, the original claim that flow occurs when challenges and skills are in relative balance with each other independently of their level was abandoned in favor of a more complex representation. In order to achieve flow, two

conditions need to be satisfied: (a) there is balance between challenges and skills, and (b) both challenges and skills are greater than their weekly average.

Strengths and Weaknesses of the Quadrant Model

The quadrant model has two main strengths: it is a simple classification system, and it allows performing disarmingly simple tests of the core predictions made by flow theory. For example, Csikszentmihalyi and LeFevre (1989) estimated an ANOVA model in which subjective experience was the dependent variable, and flow (flow, nonflow) and activity (work, leisure) were the within-participants factors. Flow turned out to explain considerably more variance in subjective experience than activity, thus corroborating the hypothesis that the quality of subjective experience is more influenced by flow than by context of activity.

The quadrant model has two main and interrelated weaknesses. First, it is an approximate classification system, particularly for what concerns the region allocated to the flow state. In the original model (see Fig. 2.1), the flow region was represented as a narrow diagonal stripe, whereas in the quadrant model, it includes medium-challenge/high-skill and high-challenge/medium-skill points. Second, the flow state region is overinclusive. If the variables of challenges and skills were uncorrelated, about 25% of the beep-level observations would be classified as flow. Because the correlation between challenges and skills ranges from moderate to fair in most samples, more than 25% of the beep-level observations are actually classified as flow when using the quadrant model. This figure is by far too optimistic and at odds with estimates than can be derived from the FQ.

The Experience Fluctuation Model

In an attempt to provide a more accurate and realistic classification system, Massimini and colleagues (Massimini and Carli 1988; Massimini et al. 1987) proposed the Experience Fluctuation Model (which is often referred to as the "channel model" or the "octant model"), which is shown in Fig. 2.4. The model partitions the world of experience in eight main states that are represented as arc sectors ("channels") of 45° each of a challenge by skill Cartesian space in which both axis variables are standardized with the 0 value representing the weakly mean. Similar to the quadrant model (see Fig. 2.3), the model represents flow as a state in which a participant perceives challenge and skill greater than the weekly average and in relative balance with each other. The main differences from the quadrant model are that the channel model provides a narrower operationalization of the construct of challenge/skill balance and a more detailed characterization of the nonflow states.

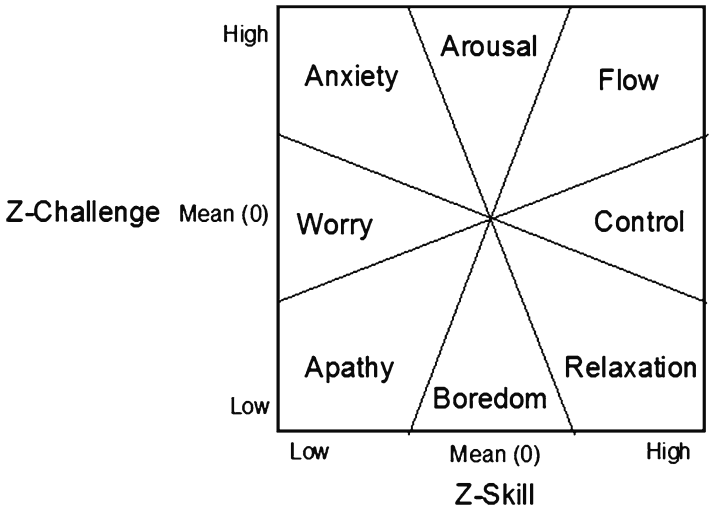

Fig. 2.4 The experience fluctuation model of the flow state (Adapted from Massimini et al. 1987)

Strengths and Weaknesses of the Experience Fluctuation Model

The main strength of the channel model stems from the rich and robust empirical findings it generated. Massimini et al. (1987) administered the ESM to a sample of 47 Italian high-school students in Milan in order to investigate the variation of subjective experience across channels. The eight channels were considered as eight levels of one within-participants factor. Eighteen facets of experience were treated as dependent variables, each in a separate analysis. Univariate *F*-testing was used to ascertain whether the variation of the mean *z*-scores of each dependent variable across the eight challenge/skill conditions was overall significant. Flow theory was substantially corroborated in that (a) the *F*-test was highly significant for each of the dependent variables, showing that the challenge/skill ratio is influential for all facets of experience, (b) for 14 dependent variables (78%), the maximum occurred in the condition high-challenge/high-skill (flow), (c) for nine dependent variables (50%), the minimum occurred in the condition low-challenge/low-skill (apathy), and (d) every time the maximum and the minimum of a dependent variable did not fall in the conditions high-challenge/high-skill and low-challenge/low-skill, respectively, it fell in an adjacent sector. Furthermore, *t*-testing was performed to detect, for each dependent variable, the conditions in which the mean *z*-scores differed from the week average. The *t*-test relative to the condition high-challenge/high-skill reached significance for 12 dependent variables (67%), further supporting the hypothesis that in the situations defined as high-challenge/high-skill, the quality of subjective experience is significantly better than average. These findings were substantially replicated across age groups, cultures, and life domains (Carli et al. 1988; Csikszentmihalyi 1990, 1997; Delle Fave and Bassi 2000; Delle Fave and Massimini 2005; Haworth and Evans 1995).

Although superior to the quadrant model, the channel model shares with it two key limitations. First, there are problems with the operationalization of flow-conducive situations as characterized by "above-average" levels of challenge and skill. Such operationalization rests on the strong assumption that participants would rate the challenges and skills perceived while doing a specific activity with reference to a global standard of measurement that is common to all activities. Keller and Landhäußer (see Chap. 3 of this volume) discuss in depth this assumption and question its tenability on conceptual and empirical ground.

Second, both the quadrant model and the channel model are classification systems, and hence they do not allow testing the implicit assumptions underlying the classification itself. In particular, the superiority of the flow channel over the other channels was universally interpreted as being due to the equivalent ratio of perceived challenges from the activity to perceived skills in carrying out the activity. Yet, is the balance of challenges and skills needed to explain the pattern of findings? A number of researchers found, somewhat independently of each other, that the answer is no. They adopted a regression modeling approach and first considered a standard additive model in which experience is the dependent variable and challenge and skill are the predictors:

$$\text{experience} = \beta_0 + \beta_1 \,\text{challenge} + \beta_2 \,\text{skill} \tag{2.1}$$

If the regression coefficients of challenge β_1 and skill β_2 are both positive and of equal size, then the quality of experience will be highest in the flow channel and lowest in the apathy channel, and will decrease as one rotates, either clockwise or anticlockwise, from the flow channel to the apathy channel. Thus, such model and its simple variants—obtained by changing the relative size of the two coefficients—would account for all the findings gathered using the quadrant and channel models. This raises a problem: the regression model 1 considers challenge and skill as two independent predictors, each contributing to experience independently of the other; therefore, there is no need to invoke the concept of balance in order to explain the findings. Thus, all the interpretations of the findings were speculative at the time they were put forth.

The Regression Modeling Approach

Once it became clear that neither the quadrant model nor the experience fluctuation model could be used to test key predictions made by flow theory, researchers set out to develop a regression modeling approach with three aims: (a) to ascertain if the balance of challenges and skills matters, (b) to identify a model of subjective experience that is estimated using the ESM data, as opposed to a classification model that somewhat arbitrarily allocates observations to channels or quadrants, and (c) to use the estimated model, as opposed to an imposed model, in order to identify the optimal challenge/skill ratio and the extent to which the effects that

challenges, skills, and their balance have on subjective experience vary between individuals. The concomitant development of multilevel or hierarchical linear modeling (e.g., Goldstein 1995; Bryk and Raudenbush 1992) made possible to estimate the models more efficiently than previously done. Because the technique allows to control for incomplete streams of repeated observations and individual differences in scaling (for comprehensive explanations of how this is achieved with ESM data see Moneta and Csikszentmihalyi 1999 and Conti 2001), the regression models were estimated on raw, beep-level scores without having to resort to individual standardization and aggregation (see Box 2.3).

The first aim was addressed by adding the challenge by skill cross-product (Ellis et al. 1994; Moneta 1990) or the absolute difference of challenge and skill to the regression model 1 (Moneta and Csikszentmihalyi 1996; Pfister 2002), or using quadratic terms of challenge and skill following a rotation of the predictor axes (Moneta 1990; Moneta and Csikszentmihalyi 1999). Because these different models have comparable statistical fit to the data, the simplest, the absolute difference model, is chosen here for illustrative purpose:

$$\text{experience} = \beta_0 + \beta_1 \,\text{challenge} + \beta_2 \,\text{skill} + \beta_3 \,|\text{challenge} - \text{skill}| \qquad (2.2)$$

The predictor |challenge–skill| is the absolute difference between challenge and skill, which can be equal to 0 (if challenge equals skill) or greater than 0 (if challenge and skill differ in any way). Its coefficient β_3 represents the effect of the imbalance of challenge and skill on experience. The model is fully consistent with the theory if the following conditions are all satisfied: (a) $\beta_1 > 0$, (b) $\beta_2 > 0$, and (c) $\beta_3 < 0$. The first two conditions imply that both challenge and skill have a positive linear effect on experience. The third condition implies that the imbalance of challenge and skill has a negative linear effect on experience. Box 2.4 provides a graphic representation and interpretation of the model. In all, this and similar models, when estimated on ESM data, can either corroborate or disconfirm key predictions made by flow theory.

Box 2.4 Graphic Representation of the Absolute Difference Model (Adapted from Moneta and Csikszentmihalyi 1996; Pfister 2002)

Graphically, the regression model 2 represents a surface on a three-dimensional Cartesian space in which experience is the vertical axis and challenge and skill are the horizontal axes. In the ideal case in which challenge and skill have identical and positive coefficients ($\beta_1 = \beta_2 > 0$) and the absolute difference of challenge and skill has a negative coefficient ($\beta_3 < 0$), the surface will look like a roof, as shown in Fig. 2.5. The edge of the roof (i.e., the line where the two sloped planes of the roof intersect each other) represents the optimal challenge/skill ratio. In this ideal case, the edge of the roof is perpendicular to

(continued)

Box 2.4 (continued)

the diagonal line of balance of the challenge by skill plane (i.e., each point of the edge corresponds to an observation in which challenge equals skill). If the linear effect of challenge is greater than that of skill ($\beta_1 > \beta_2$), the edge of the roof will rotate horizontally towards the challenge axis, whereas if the linear effect of skill is greater than that of challenge ($\beta_1 < \beta_2$), the edge of the roof will rotate horizontally towards the skill axis. The effect of the imbalance is represented by the slope of the roof: the steeper the slope, the greater the negative effect of the imbalance of challenge and skill. If the slope of the roof is null, then the roof will just be an inclined plane with no edge, and hence there would be no optimal challenge/skill ratio. The ideal flow state can be operationalized as the absolute maximum of the surface, which in this case is on the edge of the roof, perpendicular to the observation for which both challenge and skill achieve their maximum.

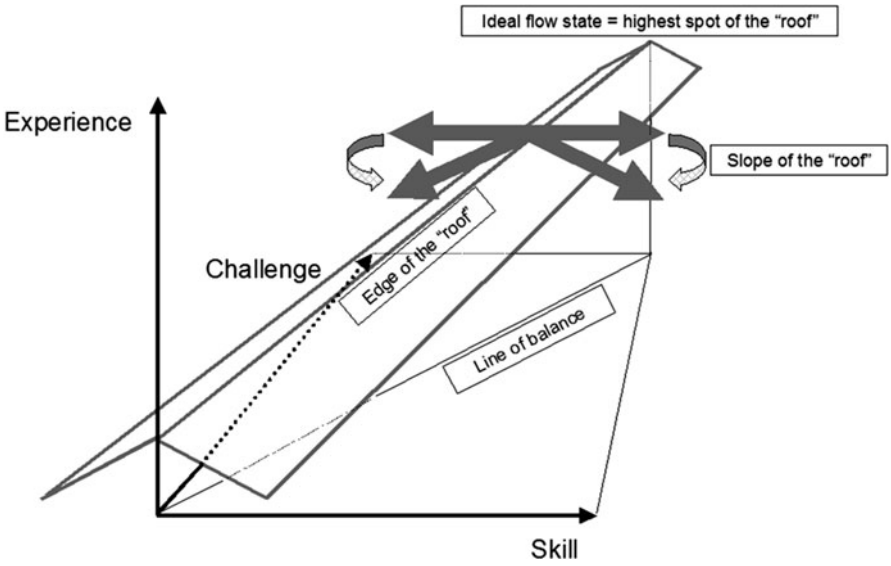

Fig. 2.5 The three-dimensional representation of the absolute difference regression model of the flow state (Adapted from Moneta and Csikszentmihalyi 1996)

Strengths and Weaknesses of the Regression Modeling Approach

The main strength of the regression approach stems from the specific empirical findings it generated, which could not be generated using the quadrant and channel models. First, it was found that many facets of subjective experience—such as

concentration, interest in the activity, enjoyment of the activity, or happiness—are predicted by challenge and skill independently as well as by their relative balance; therefore, balance has an effect on the quality of experience over and above the effects of challenge and skill, although the effect of balance is small compared to the independent effects of challenge and skill (Moneta and Csikszentmihalyi 1996).

Second, the regression coefficients of challenge, skill, and the balance of the two were found to differ between facets of experience in such a way that the optimal ratio was about 1:1 for some facets (e.g., involvement), biased towards higher levels of challenge for others (e.g., concentration), and biased towards higher levels of skill for yet other variables (e.g., happiness) (Moneta and Csikszentmihalyi 1996); therefore, there seem to be different optimal challenge/skill ratios, and hence optimization of experience requires trade-offs between facets of experience.

Third, the model fitted better and was more consistent with theoretical predictions in achievement contexts than in nonachievement contexts (Moneta and Csikszentmihalyi 1996); therefore, the theory would appear to be more applicable when achievement goals and opportunities are salient. Fourth, the effects of challenge, skill, and the balance of the two differed across individuals (Moneta and Csikszentmihalyi 1996, 1999) so that, for example, balance has a strong, positive effect on some individuals, and no effect or even a negative effect on other individuals; therefore, the theory would appear to be fully applicable only to some individuals.

Finally, the effects of challenge, skill, and balance were found to be linked to personality traits—such as trait intrinsic motivation and interdependent self-construal (Moneta 2004b), situational variables—such as goals, interests, importance of the activity, and state intrinsic motivation (Csikszentmihalyi et al. 2005; Ellis et al. 1994; Rheinberg et al. 2007), and culture (Moneta 2004b); therefore, the theory would need to be expanded to account for conceptual relationships with other psychological theories. In all, these studies corroborated the kernel assumptions of flow theory and provided indications on how to further develop the theory.

Although the regression models constitute an advancement in respect to the quadrant and channel models, they share with them three key limitations. First, as Ellis et al. (1994) pointed out, many of the investigated facets of experience are not clearly connected to the flow construct and hence cannot be regarded as indicators of flow. In particular, variables like "wish to do the activity," "active," or "sad–happy" have never been theorized to be an integral part of the flow experience. Moreover, the construct validity of the scales used to tap the investigated facets of experience has never been assessed by standard psychometric methods, such as exploratory and confirmatory factor analysis (EFA, CFA).

Second, in all applications, the key predictors challenge and skill were measured by only one item each. This is obviously unacceptable from a psychometric stand.

Finally, there is a conceptual problem with the construct of challenge. Rheinberg et al. (2007; cf. Rheinberg 2008) argued that in addition to challenge and skill, also the perceived difficulty level or "demands" of the activity should be assessed because challenge implies a compound of difficulty and skill. For example, an easy task can be very challenging to a novice, and a difficult task can be unchallenging to an expert. Although Pfister (2002) found similar effects of the difficulty/skill and

challenge/skill ratios on the quality of experience, the construct of difficulty may be relevant when achievement motivation is taken into account. According to Atkinson's (1957) model, people with more achievement motivation prefer tasks of medium difficulty, in which there should be a balance between difficulty and skill, whereas people with less achievement motivation prefer tasks of low difficulty, in which skill should be greater than difficulty. Therefore, difficulty is an item that, together with others tapping the constructs of challenge and skill, should be considered for inclusion in future developments of the ESM.

Overall Assessment

In all, the ESM proved to be superior to the FQ for the purpose of measuring the flow state in daily life and for testing hypotheses concerning the effects that challenge, skill, and their balance have on flow. Yet, the ESM somehow "imposes" flow on respondents and hence is inferior to the FQ for the purpose of measuring prevalence of flow. Finally, the ESM scales developed to date do not achieve satisfactory levels of content validity, and their construct validity is largely unknown. The measurement methods presented in the next section can be viewed as attempts to overcome the latter limitation.

The Componential Approach: Capturing Flow as a Multidimensional State–Trait Variable

Description of the Measurement Method

The methods for measuring flow presented in the previous sections were definitely original at the time they were developed, and they proved to be innovative in generating many insightful and robust findings. However, they are far from being psychometrically sound. For this reason, some researchers set out to construct and validate questionnaires that would measure flow to the standards required by traditional test theory. Several scales were developed pursuing essentially the same aim (e.g., Engeser and Rheinberg 2008; Keller and Bless 2008; Schüler 2010). This section will focus on the scales developed by Jackson and Eklund (2002, 2004a). These scales are consistent with Csikszentmihalyi's (Jackson and Csikszentmihalyi 1999) componential view of flow, measure flow both as a state and as a trait and are the most frequently used in research and practice, particularly in the sports context.

Jackson and Marsh (1996) and Jackson and Csikszentmihalyi (1999) described flow as a state characterized by nine components: focused concentration on the present activity (concentration), sense of control over one's actions (control), merging of action and awareness (merging), autotelic experience (autotelic), loss of

self-consciousness (self-consciousness), loss of time awareness or time acceleration (time), clear proximal goals (goals), unambiguous feedback (feedback), and dynamic balance between challenge and skill (balance). These components can be regarded as correlated dimensions of the flow construct that can trade off in determining the intensity or level of flow. If the level of all components is highest, a person will be in a most intense, complex, and ordered flow state. If some components reach highest level whereas others reach only medium or low levels, the contributions to flow of the different components will trade off in producing a flow state that will be overall less intense, complex, and ordered than the ideal flow state.

Jackson and Eklund (2002, 2004a) applied the componential view of flow to measure flow as a state, a broad trait (i.e., the tendency to experience flow frequently and intensely across a wide range of situations), and a domain-specific trait (i.e., the tendency to experience flow frequently and intensely in specific contexts of activity). They developed, refined, and validated two standardized questionnaires: the Flow State Scale-2 (FSS-2), which measures intensity of flow as a state, and the Dispositional Flow Scale-2 (DFS-2), which measures intensity of flow as either a general trait or as a domain-specific trait. The item content of the two questionnaires is similar. As is it is customary in test construction, the main difference between the state and trait questionnaires resides in the initial instructions given to participants: the state questionnaire asks participants to answer the questions thinking of the specific activity they just completed, whereas the trait questionnaire asks participants to answer the questions thinking of their general experience across situations and times or of their average experience when they are engaged in a context of activity (e.g., work or leisure). Both the state and the trait questionnaires have good psychometric properties (Jackson and Eklund 2002, 2004a).

The Componential Model

Construct validity is a key property of any measurement method, and it is customarily assessed using CFA. The specific way CFA is applied fully clarifies the model that was used to construct the measurement method. Jackson and Eklund (2002, 2004a) estimated two CFA models, and they used the same pair of CFA models for the data provided by the state questionnaire and the data provided by the trait questionnaire.

The first model is the nine-factor model with correlated factors shown in Fig. 2.6. This is a classical test theory model in which nine intercorrelated latent facets of the construct of flow cause responses on the measured indicators; that is, the behaviors described by the items of the questionnaire are manifestations of nine latent facets. This model represents flow as a multifaceted construct.

The second model is the single-factor model shown in Fig. 2.7. This is a classical test theory model in which the latent construct of flow causes responses on the measured indicators; that is, the behaviors described by the items of the questionnaire are manifestations of a single latent construct. This model represents flow as a single construct.

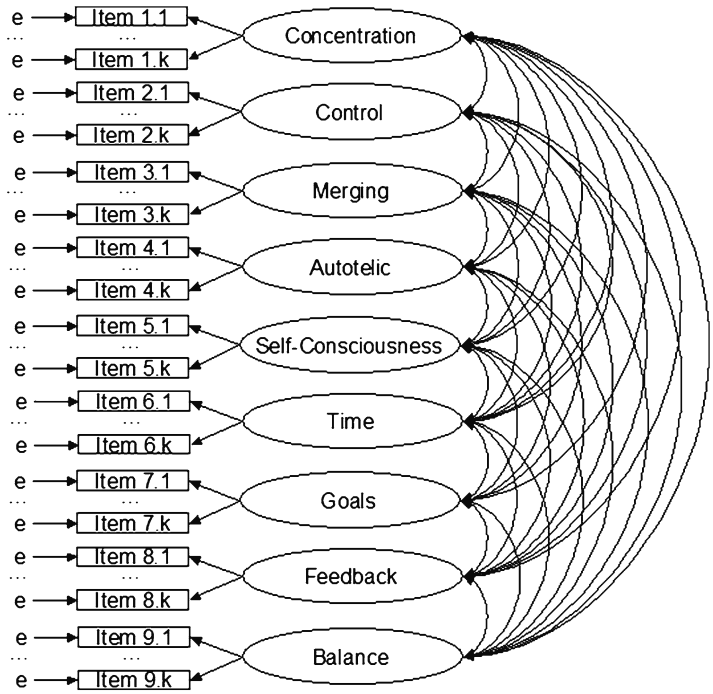

Fig. 2.6 The nine-factor measurement model for the Jackson and Eklund (2002, 2004a) Flow State Scale-2 and Dispositional Flow Scale-2. e = measurement error

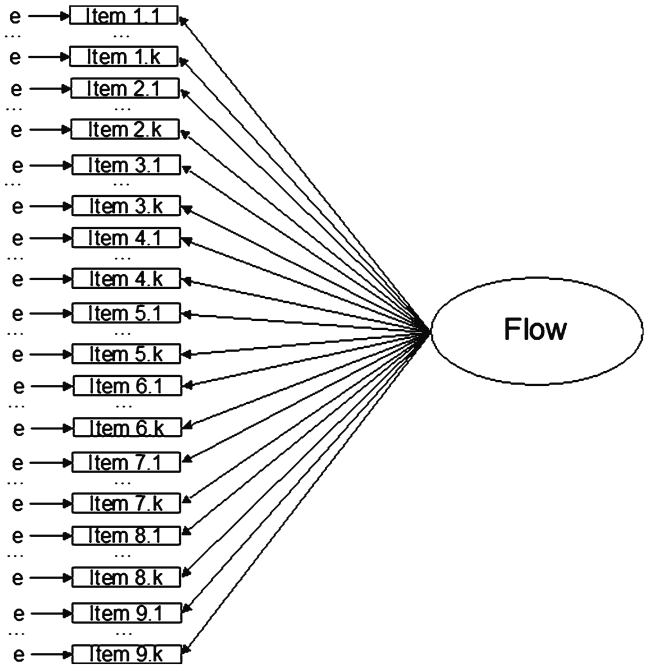

Fig. 2.7 The one-factor measurement model for the Jackson and Eklund (2002, 2004a) Flow State Scale-2 and Dispositional Flow Scale-2. e = measurement error

Which of the two models should be adopted? Jackson and Eklund (2002, 2004a) found that both models have good statistical fit, but the nine-factor model fits better than the single-factor model. Therefore, they recommended using nine subscale scores, each measuring a somewhat distinct component of flow, in research. Yet, they acknowledged the parsimony and theoretical usefulness of an overall scale score to measure flow as a single construct.

Strengths and Weaknesses

The componential approach has two main strengths. First, it provides a comprehensive characterization of flow that is by far more complete than that provided by the FQ and the ESM. Second, it provides measures of flow that are psychometrically more valid and reliable than those provided by the FQ and the ESM. In all, the componential approach achieves the psychometric standards that flow research needs in order to earn full recognition in the field of psychology.

The componential approach has three main and interrelated weaknesses. First, like the ESM, it "imposes" flow on all respondents, even if some would be classified as non-flow-ers using the FQ. As such, both the componential approach and the ESM are inferior to the FQ for the purpose of estimating the prevalence of flow.

Second, the componential approach as implemented in the FSS-2 and DFS-2 assumes a model of flow that contradicts the various models that researchers have adopted in conjunction with the FQ and the ESM, in that it has to date ignored the distinction between antecedents of flow (i.e., factors that can, under some circumstances, cause flow) and indicators of flow (i.e., experiences and behaviors that are, under some circumstances, caused by flow). In particular, the balance of challenge and skill was consistently regarded as an antecedent of flow in research using the FQ and the ESM, whereas it is considered a component of flow in the model that drove the development of the FSS-2 and DFS-2.

Finally, the componential approach can hardly handle what can be called the paradoxes of attention. Csikszentmihalyi (1978) pointed out that states of heightened and focused attention occur in two different contexts: when a person is in flow and when a person is facing an overwhelming threat. Building on this distinction, Engeser and Schiepe (see Chap. 1) consider a hypothetical state in which a person would score high on concentration and low on all other components of flow and argue that such a state could not be called flow. How does the componential approach deal with that case? If one adopts the single-factor measurement model of Fig. 2.7, the overall flow score for that state would be the sum (or the mean) of all the item scores. Because only a small number of items measure concentration, the overall flow score for that hypothetical state would be low. Hence, the impact of this paradox on the componential model is not severe. Yet, consider the diametrical paradox, a hypothetical state in which a person would score low on concentration and high on all other components of flow. That could be the case of a hallucinogenic or even a near-death experience, but arguably not a flow state, because attention is an essential component of executive functioning (Mathews et al. 2004). How does the componential approach deal with that

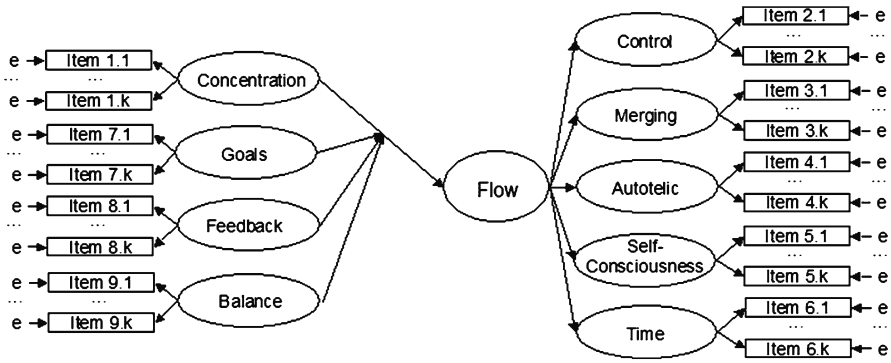

Fig. 2.8 A hypothetical hybrid model of the flow state that separates antecedents and facets of flow and states that the path from concentration to flow is moderated by goals, feedback, and balance. e = measurement error

case? Because only a small number of items measure concentration, the overall flow score for that hypothetical state would be high. Hence, the componential model cannot handle this paradox.

How could the second and third weaknesses of the componential approach be tackled? A possible solution is to shift from a classical test theory measurement model to hybrid models (for a review of classical, composite variable, and hybrid models see Finch and West 1997). For example, consider the model shown in Fig. 2.8. Drawing, with some imagination, from the original formulation of flow theory (Csikszentmihalyi 1975/2000, 1978), the four latent facets concentration, goals, feedback, and balance are defined as antecedents of flow. A second-order measurement model for flow is defined, in which flow is presumed to cause the five latent facets: control, merging, autotelic, self-consciousness, and time. The latent facet concentration is presumed to cause the latent construct flow, and the latent facets goals, feedback, and balance are presumed to moderate the effect that concentration has on flow. If the moderation pattern is antagonistic, the path from concentration to flow will be positive for high levels of the moderators and negative for low levels of the moderators. As such, the model states that concentration fosters flow if goals are clear, feedback is unambiguous, and challenge and skill are high and in relative balance with each other, and that concentration prevents flow if goals are unclear, feedback is ambiguous, and there is an imbalance of challenge and skill. Therefore, this type of hypothetical model can handle the paradoxes of attention. Yet, the specific model presented here may be faulty in many other ways, and hence it is proposed mainly for illustrative purpose.

Overall Assessment

In all, the componential approach has generated methods for measuring intensity or level of flow that are more complete and psychometrically sound than the FQ and

the ESM. Yet, the componential approach cannot measure prevalence of flow and hence is inferior to the FQ in that respect. Finally, the componential models have too simple a structure to account for the complexity of flow.

Directions for Future Methodological Research

The analysis conducted in this chapter suggests four main directions for future research aimed at developing more valid and useful measurement methods for flow. First, as Engeser and Schiepe (see Chap. 1) suggest, there is a need of integration and standardization of the existing measurement methods. Although it still needs conceptual development, the componential approach produced the most complete and psychometrically sound measures of flow, both as a state and as a trait, and hence should inform and guide an improvement of the FQ and the ESM. In particular, the quotes section of the FQ should be expanded to include quotes of all facets that are considered to be expression of flow (i.e., that are theorized to be caused by the latent construct flow); moreover, section 5 of the FQ should be modified to provide a systematic assessment of flow intensity in specific activities. By the same token, the ESM should contain scaled items that tap validly and reliably each facet of flow and each antecedent of flow (e.g., Rheinberg, et al. 2007). Finally, researchers may consider applying and further developing the day reconstruction method (DRM; Kahneman et al. 2004) for the purpose of assessing prevalence and intensity of flow. The DRM assesses systematically significant everyday life events that occurred the day before, with procedures designed to minimize recall bias. As such, the DRM has the potential of capturing brief but intense flow experiences that might instead be missed by the ESM due to its time-sampling structure.

Second, all three main types of measurement methods need to be developed in order to ascertain whether flow is a single construct or a label for a constellation of constructs. Moreover, there is the need of providing evidence of convergent and discriminant validity of each measurement method for flow in relation to measurement methods that were designed to tap other types of optimal experience, such as "peak performance" (Privette 1983) and "peak experience" (Maslow 1964). Section "Capturing Flow in Special Endeavors" showed some evidence supporting the idea that the quotes of the FQ may capture a shallow flow—which may support activities that require social interaction, such as teaching or football playing—and a deep flow—which may support activities for which social interaction would be detrimental, such as chess playing or proving mathematical theorems. Section "Capturing Flow in Daily Experience" reported evidence indicating that the optimal challenge/skill ratio differs across facets of experience, suggesting that there may be different types of optimal experience, such as a high-challenge/medium-skill one that optimizes cognitive efficiency and a medium-challenge/high-skill one that optimizes hedonic tone. This evidence suggests that all three main types of measurement methods for flow should be improved in order to enable them to test the tenet that there is one and only one flow state.

Third, all three main types of measurement methods need to be developed in order to ascertain whether flow and its antecedents are substantially the same across cultures. The FQ was administered to samples from various cultures and provided evidence of cultural invariance (Delle Fave and Massimini 2004). The ESM was administered to Japanese (Asakawa 2004) and Chinese (Moneta 2004b) university student samples and provided evidence of cultural variations in flow models that, however, could be explained based on cross-cultural theories of psychosocial development (Moneta 2004a). The FSS-2 and DSF-2 were translated and validated in various languages (e.g., Kawabata et al. 2008). Although these studies suggest that cultural variation is small, a more basic test has not yet been conducted. The key question is: if we were to repeat the whole process that led to the componential model of flow—starting with interviews and proceeding to the construction of the FQ and componential measurement scales—in a new culture (e.g., the Chinese or Indian cultures), would we identify exactly the same facets of flow and antecedents of flow?

Finally, all three main types of measurement methods need to be developed in order to account for the role of metacognitions in achieving flow. Ceja and Navarro (2011) administered the ESM to measure flow states of employees as they engage in work activities and used dynamical system theory to investigate the patterns of flow occurrence. They found that the dynamic pattern of flow in work is chaotic for the majority of employees and that the different facets of flow are associated with distinct dynamic patterns (i.e., chaotic, linear, and random). These findings indicate that individuals may need a high level of awareness of flow and its antecedents and a strong self-regulation in order to achieve flow in natural environments that are not really designed to facilitate flow, such as open-plane offices and clustered cubicles. Metacognition refers to the knowledge and beliefs about one's own cognitive regulation and the capability to deconstruct and understand them through reflection and problem solving, which in turn enables self-regulation (Flavell 1979). Two key types of metacognitions should be considered in flow research: general metacognitions supporting the correct interpretation of emotional cues and flexible goal restructuring in facing challenges (Beer and Moneta 2010) and specific metacognitions of flow for which we still have no firm conceptual definitions and measurement scales (Wilson and Moneta, in press).

In conclusion, this chapter has shown that following the original formulation of flow theory, researchers developed three main methods for measuring flow, the FQ, the ESM, and the standardized scales of the componential approach. Researchers used each measurement method in conjunction with one or more models, which were somewhat arbitrary interpretations and simplifications of the theory. Researchers interpreted the empirical findings of their studies with reference to the model of flow they had adopted hypothetically, and the gathered evidence provided a mixture of corroboration and disconfirmation of their model, which in turn led to small but important modifications of the theory. This process had some chronological order but was not always linear or perfectly logical. This pattern is common in science, and in the history of psychology in particular, although researchers may differ in the extent to which they are aware of it. The key message of this chapter is that no existing measurement method for flow and associated model is watertight and that a gold

standard for the modeling and measurement of flow is not at close reach. Hopefully, this chapter helped to convince young flow researchers that models and measurement methods are paramount to the development and application of flow theory and hence need continuous improvement.

Study Questions

- What are the main measurement methods for flow? Is one of these methods better overall than the others? If yes, why?

  The main measurement methods for flow are the flow questionnaire, the ESM, and the standardized scales of the componential approach. The chapter suggests that none of these three main measurement methods is overall superior to the others: each one has pros and cons that trade off depending on the specific question the researcher is tackling (see subsections "Overall Assessment" in "Capturing Flow in Special Endeavors," "Capturing Flow in Daily Experience" and "The Componential Approach: Capturing Flow as a Multidimensional State-Trait Variable," and section "Directions for Future Methodological Research" of this chapter). You may, of course, disagree with this conclusion; but if you do, you should state your rationale. For example, if you believe that construct validity is paramount, then the standardized scales of the componential approach would be the likely winners.
- Think of one research question about flow and select a measurement method to test it. What criteria did you use in making your choice?

  Once you have listed the criteria, check them against the subsections "Overall Assessment" in "Capturing Flow in Special Endeavors," "Capturing Flow in Daily Experience" and "The Componential Approach: Capturing Flow as a Multidimensional State-Trait Variable" of this chapter and determine by yourself if you have made a sensible choice. As a final check, read the first paragraph of section "Directions for Future Methodological Research" of this chapter and determine by yourself if your research question would require a modification or adaptation of the measurement method you have chosen.
- What are the main strengths and main limitations of the flow questionnaire?

  On one hand, the flow questionnaire is a good measurement method for assessing the prevalence of flow, that is, whether participants sampled from a population (e.g., students or workers) have ever experienced flow in their lives. This is because the flow questionnaire proposes a description of flow and asks respondents to freely report whether or not they had similar experiences. As such, it does not "impose" flow on respondents and does not lead to inflated prevalence rates (see subsection "Strengths and Weaknesses" in "Capturing Flow in Special Endeavors" of this chapter). For this reason, the flow questionnaire can be validly used to compare the prevalence rates of different populations, such as Chinese versus British college students or white-collar versus blue-collar workers.

  On the other hand, the flow questionnaire is a limited measurement method for investigating the effects of challenges and skills on subjective experience

and the intensity of flow in general and in specific endeavors (e.g., work and leisure). This is because the scaled items of section 5 of the flow questionnaire (see Box 2.1) refer to the experience while doing the best flow-conducive activity but do not refer specifically to those instances in which a respondent experiences flow while doing that activity (see subsection "Strengths and Weaknesses" in "Capturing Flow in Special Endeavors" of this chapter). However, these limitations could be overcome by modifying the flow questionnaire (see Box 2.1) (see the first paragraph of section "Directions for Future Methodological Research" of this chapter).

- What are the main strengths and main limitations of the ESM?

  On one hand, the ESM is a good measurement method for studying the flow state in daily life and for testing hypotheses concerning the effects that perceived challenges from the activity, perceived skills in the activity, and the balance of the two perceptions have on the occurrence of flow while engaged in the activity. This is because the ESM gathers repeated measures of subjective experience at random times while participants are engaged in daily activities, minimizing memory bias. For this reason, the ESM can be validly used to test and compare alternative models of how various situational factors (e.g., context of activity or levels of challenges and skills and their balance) and various personal factors (e.g., personality traits, culture, gender, or occupation) conjointly influence the quality of daily experience, including intensity of the flow state (see section "Capturing Flow in Daily Experience" of this chapter).

  On the other hand, the ESM is a limited method for studying prevalence of flow. This is because it somehow "imposes" flow on respondents, as opposed to asking them explicitly to report whether or not they experienced flow at the time they were beeped. Moreover, the ESM uses scales for measuring flow intensity that lack content validity and have unknown construct validity. As such, it does not provide a sound measure of the construct of flow intensity. However, these limitations could be overcome by modifying the ESM (see the first paragraph of section "Directions for Future Methodological Research" of this chapter).

- *What are the main strengths and main limitations of the componential approach?*

  On one hand, the componential approach has generated methods for measuring intensity of flow that have good content and construct validity, and hence are the most psychometrically sound among the available measurement methods. On the other hand, the componential approach is not good for assessing prevalence of flow because it "imposes" flow on respondents and hence leads to inflated prevalence rates. Moreover, the componential approach, as implemented in the FSS-2 and DFS-2, does not distinguish antecedents and facets of flow (see next study question) and has too simple a structure to account for the complexity of the relationships between antecedents of flow and flow itself. Yet, these limitations could be overcome in future developments of the componential scales (see subsection "Strengths and Weaknesses" in "The Componential Approach: Capturing Flow as a Multidimensional State-Trait Variable" of this chapter).

- What is the key difference between "antecedents" of flow and "components" or "facets" of flow?

  Antecedents of flow are internal states and perceptions that precede and foster the flow state but are not themselves expressions of flow. These include, for example, clarity of goals, unambiguous feedback, and perceptions of challenge and skill in carrying out an activity. These factors are theorized to have a causal impact on flow by either increasing the likelihood that flow occurs or by augmenting the intensity of flow.

  Components or facets of flow are internal states and perceptions that represent expressions of flow. These include, for example, merging of action and awareness and loss of time awareness or time acceleration when carrying out an activity. These factors are theorized to be caused by flow (see subsection "Strengths and Weaknesses" in "The Componential Approach: Capturing Flow as a Multidimensional State-Trait Variable" of this chapter).
- How many models of flow have been proposed to date and in which way(s) they differ from each other?

  Many models of flow have been proposed to date. The subset of models presented in this chapter includes the first model of the flow state (see Fig. 2.1), the quadrant model (see Fig. 2.3), the experience fluctuation model (see Fig. 2.4), the absolute difference regression model (see Fig. 2.5), the nine-factor componential model (see Fig. 2.6), and the one-factor componential model (see Fig. 2.7).

  These six models can be grouped into three pairs of similar models. The first model of the flow state and the absolute difference regression model are similar, except for the latter is defined by a mathematical model and can be tested using regression analysis (pair A). The quadrant model and the experience fluctuation model are similar, except for the latter is more detailed (pair B). The one-factor componential model and the nine-factor componential model are similar, except for the former represents flow as a single construct whereas the latter represents flow as nine interrelated constructs (Pair C).

  Pair A and pair B of models are similar to each other in that they explain the occurrence of flow as a function of challenge and skill, whereas pair C of models measures intensity of flow without explaining the causal factors underlying it. Finally, pair A and pair B of models differ in that the latter assumes that flow is more likely to occur when challenge and skill exceed a person's weekly average and do not operationalize—and hence allow testing—the construct of balance of challenge and skill.
- How is the flow state represented in the various models of flow that have been proposed?

  With reference to the previous question and answer, pair A of models represents flow as a state that is more likely to occur when there is a balance of challenge and skill, and it is more intense as the sum of challenge and skill grows. Pair B of models represents flow as a state that is more likely to occur when both challenge and skill exceed a person's weekly average. Finally, Pair C of

models represents flow as either a single construct with nine facets (see Fig. 2.7) or as a nine-faceted construct (see Fig. 2.6).

- Compare the original flow model with the quadrant model, pointing out similarities and differences.

  The most noticeable difference between the quadrant model (see Fig. 2.3) and the first model of the flow state (see Fig. 2.1) is that the former includes the "apathy" state, which is posited to be the least positive state. Therefore, the claim made by the first flow model that flow occurs when challenges and skills are in relative balance with each other independently of their level is modified by the quadrant model as follows. In order to achieve flow, two conditions need to be satisfied: (a) there is balance between challenges and skills, and (b) both challenges and skills are greater than their weekly average.
- Compare the quadrant model and the experience fluctuation model with the absolute difference regression model, pointing out similarities and differences.

  Similarities. The quadrant model and the experience fluctuation model are similar to the absolute difference regression model in that they all explain the occurrence of flow as a function of challenge and skill (see Figs. 2.3–2.5).

  Differences. The quadrant model and the experience fluctuation model are classification systems, in which subjective experience is grouped into distinct states (see Figs. 2.3 and 2.4) as a function of levels of perceived challenge from an activity and perceived skill in conducting an activity. As such, these models assume that the balance of challenge and skill fosters flow but do not allow testing this assumption. Moreover, these models assume that flow occurs only when challenge and skill levels exceed their weekly average, which is somewhat questionable on theoretical and empirical ground (see subsection "Strengths and Weaknesses of the Experience Fluctuation Model" in "Capturing Flow in Daily Experience" of this chapter) and in contradiction with the first model of the flow state (see Fig. 2.1).

  The absolute difference regression model represents flow as a state that is more likely to occur when there is a balance of challenge and skill, and it is more intense as the sum of challenge and skill grows. This model assumes that the balance of challenge and skill fosters flow, and allows testing this assumption controlling for the effects that challenge and skill have on flow independently of each other. Moreover, this model does not assume that flow occurs only when challenge and skill levels exceed their weekly average, and in that it is consistent with the first model of the flow state (see Fig. 2.1).

Chapter 3
The Flow Model Revisited

Johannes Keller and Anne Landhäußer

Abstract This chapter addresses the question of what builds the basis for flow experiences to emerge. We focus our discussion on the situational *antecedents* of flow and emphasize the fact that the emergence of flow is basically dependent on a perceived fit of skills and task demands. We also refer to additional factors relevant regarding specific components of flow. In addition, we critically discuss the "above average" perspective and the related quadrant and octant models of flow highlighting the fact that the "above average" notion is based on problematic assumptions. Finally, we discuss determinants of *flow intensity* and propose a revised flow model which builds on the original notion of perceived fit of skills and task demands and includes the value attributed to the relevant activity as additional crucial factor.

Introduction

Individuals experiencing a state of flow typically describe the experience as a particularly pleasant one, and it is empirically well documented that flow experiences can contribute substantially to individuals' level of subjective well-being (Massimini and Carli 1988; Csikszentmihalyi and LeFevre 1989; Clarke and Haworth 1994; Shernoff et al. 2003; Fritz and Avsec 2007; Schüler 2007). Accordingly, the question of what builds the basis for flow experiences to emerge is one of great relevance.

The present chapter is devoted to this important question. It should be noted at the outset that we apply a specific perspective in addressing this topic. Precisely, what we are presenting is a systematic discussion of the specific *conditions* under which an individual engages in an activity that have to be met in order to enable individuals to enter a state of flow. Note that this chapter focuses specifically on *situational* conditions. Of course, personality factors can also be considered as

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"boundary conditions" of the flow experience. This topic is systematically addressed in a special contribution (see Chap. 9), and accordingly, we are specifically focusing on situational factors in discussing the boundary conditions for the emergence of flow (i.e., whether an individual enters a state of flow or not). However, we refer to personal characteristics when we refer to the question of what determines the *intensity* of flow experiences because individual differences are crucial in our theoretical considerations in this respect (e.g., the subjective value attached to an activity).

Before we enter into the details of the discussion, two conceptual clarifications seem indicated regarding the term "challenge" and the term "flow experience." The term "challenge" is frequently mentioned in the flow literature in the discussion of the notion that a perceived fit of skills and challenge builds the basis for the emergence of flow experiences. We want to clarify that we consider the term "demands" much more appropriate than the term "challenge" (for a detailed discussion of this conceptual aspect, see Rheinberg 2008).

Moreover, in line with the discussion of the flow phenomenon presented in Engeser and Schiepe-Tiska (Chap. 1), we are referring to flow as a subjective experience that is characterized by the *combination* of distinct (experiential) states that co-occur during engagement in a skill-related activity, specifically (1) reduced reflective self-consciousness, (2) modified experience of time ("time stands still"), (3) involvement and enjoyment, (4) focused concentration, (5) a strong feeling of control, and (6) the activity is perceived as rewarding in and of itself. It is evident that each of these states can be experienced by individuals who are definitely not in a state of flow. For example, a person can experience a strong sense of control during routine activities (such as teeth brushing or setting the table) while none of the other flow-specific experiences are involved. Also, an individual sitting at the beach watching a sunset can experience a loss of self-consciousness and still be far from a state of flow given the lack of the characteristic strong sense of control that accompanies the execution of a skill-related activity in a state of flow. It is important to acknowledge the fact that flow experiences reflect a distinct *combination* of experiential states, particularly when one is considering the boundary conditions that enable (or prevent) the occurrence of the subjective experience.

Antecedent Factors Outlined in Flow Theory

One notable and very positive aspect of flow theory is the parsimony regarding the factors postulated as antecedents of this distinct type of intrinsic motivation (other models of intrinsic motivation are much more complex and complicated, e.g., the self-determination account proposed by Deci and Ryan 2000). Specifically, flow theory refers to three antecedents (1) clear goals (in the sense of a clear understanding of the task structure, which is frequently based on clear *task instructions*), (2) immediate and unambiguous feedback (in terms of diagnostic information regarding one's progress or success in executing the activity), and (3) a balance of perceived skills and perceived task demands (Nakamura and Csikszentmihalyi 2009). One aspect is

noteworthy in this context: the activity has to be *skill-related* for flow experiences to emerge (given the fact that a balance of *skills* and task demands represents one crucial antecedent). That is, activities that are passive in character (such as watching a sunset or taking a relaxing bath) and do not involve a skill component cannot be associated with a flow experience. Note that the terms skills and achievement (or accomplishment) need to be distinguished here. Specifically, the reference to skills does not imply that flow can only emerge to the degree that an individual reaches a certain degree of (prior) achievement or accomplishment.

It seems worthwhile to consider the three antecedent factors in some detail because such an examination reveals that two of the antecedents (clear goals and feedback) are incorporated in the most crucial antecedent, the fit of perceived skills and perceived task demands. That is, we argue that the propositions regarding the boundary conditions of the flow experience can be simplified and reduced to a perceived skills-demands-compatibility.

This notion rests on the insight that individuals can only attain a meaningful subjective construal of their level of skill and the level of task demands involved in the relevant activity if (a) the structure of the task is clear to them ("clear goals" in the terminology used in the flow literature; the goal concept is typically used differently in the psychological literature; cf. Austin and Vancouver 1996) and (b) they can diagnose the degree to which they are successful in the execution of the activity (based on some kind of feedback). It is evident that a meaningful evaluation of one's skill in executing an activity is hardly possible under conditions where the structure of the task is not clear. For example, how should one reasonably rate one's level of skill in playing cricket or the level of demands one is confronted with in a game of cricket without knowledge on the structure of this game? In parallel, how should one reasonably rate one's level of skill in playing cricket without diagnostic information (feedback) regarding the quality of one's actions? Also, it seems hardly possible to construct a meaningful judgment regarding progress or success in an activity when the structure of the task remains obscure. Thus, the antecedent factor "clear goals" can be considered a prerequisite of the antecedent factor "immediate, unambiguous feedback." And both of these antecedent factors are incorporated in the antecedent factor "perceived fit of skills and task demands."

In line with other contributions to the flow literature (cf. Csikszentmihalyi 1975; Chap. 2), we want to emphasize the fact that the antecedent factors of flow are interrelated. Accordingly, we argue that it is not meaningful to consider the three antecedents mentioned above as *distinct* (i.e., unrelated or independent) factors. In our view, it is simply not possible to perceive a fit of skills and task demands when engaging in an activity without clear task instructions or without diagnostic information regarding one's progress or success in the activity.

In sum, we propose that the antecedents in the flow model can be reduced to the factor "perceived fit of skills and task demands" which implies "clear goals" and "immediate, unambiguous feedback" as crucial aspects that have to be met for flow experiences to emerge. Note that the important role of a (perceived) fit of skills and task demands regarding the emergence of flow has been well documented in correlational research (cf. Bakker 2005; Jackson and Marsh 1996; Moneta and

Csikszentmihalyi 1996; Schiefele and Roussakis 2006) and in experimental studies as well (cf. Eisenberger et al. 2005; Engeser and Rheinberg 2008; Keller and Bless 2008; Keller et al. 2011b; Keller and Blomann 2008; Reinhardt et al. 2006; Schüler 2010).

Perceived Fit of Skills and Task Demands "Above Average"

Elaborating on the role of perceived fit of skills and task demands, some flow researchers proposed revisions to the original flow model, basically driven by empirical findings that seemed incompatible with the original flow channel model (Csikszentmihalyi and Rathunde 1993; Csikszentmihalyi and Csikszentmihalyi 1991; Massimini and Carli 1988; see also Chap. 2). The basic notion according to which flow is most likely to emerge when individuals perceive a fit of skills and task demands (see Fig. 2.1 depicting the flow channel model) has been qualified. Specifically, the notion was added that a perceived fit of skills and task demands is only likely to result in a flow experience when skills and demands are located *above the average level* of skills and demands across various activities the individual is engaging in. In line with this specification, a quadrant model (see Fig. 2.3; cf. Csikszentmihalyi and Csikszentmihalyi 1991) and an octant model (see the respective figure in Chap. 2; cf. Massimini and Carli 1988) have been proposed.

As depicted in the relevant figures in Moneta (Chap. 2), both of the revised models differ from the original flow model in that the notion that a perceived fit of skills and task demands (challenge) is associated with flow experiences is substantially qualified. Both models assume that such a perceived fit is *not* associated with flow (but with apathy) when skills and demands are located *below* the average level of skills and demands across various activities the individual is engaging in. That is, these revised models introduce a further condition for flow experiences to emerge: perceived skills and demands have to be above the average level of skills and demands an individual experiences across the various activities he or she is engaging in.

At first sight, the "above average thesis" and the related models seem plausible. In fact, it seems fairly reasonable to assume that individuals are likely to feel largely apathetic when washing the dishes or in other activities that are low in the perceived skills and in the perceived demands involved in the activity ("low" meaning that perceived skills and demands are lower than those typically experienced in other activities). However, the "above average thesis" and the revised flow models (quadrant and octant model) rest on several assumptions that can be questioned.

First, it is questionable whether perceived demands (or "challenges") and perceived skills can be considered to represent orthogonal (independent) constructs (note that this problem is also relevant regarding the original flow channel model; cf. Pfister 2002). In our view, individuals have to take the demands of the task into account to arrive at an evaluation of their skills in the task (and vice versa). Note that a demanding task is typically defined as one that requires much skill (similarly, a challenging task is typically defined as one that is testing one's abilities). That is, evaluating demandingness of a task requires a reference to skills (or abilities), with higher (lower)

demandingness implying a higher (lower) level of skill. Stated differently, skills and demands (or challenges) are confounded. Accordingly, we think it is not particularly meaningful to conceptualize the two constructs as orthogonal dimensions. We suggest to replace the "classic" flow channel concept with a unidimensional construct reflecting the perceived fit of skills and task demands (which can vary from low to high level).

Second, it is an open question whether it is meaningful to compute average levels of perceived skills and perceived demands across the various activities an individual is engaging in. Such a comparison across activities implies that individuals evaluate the perceived skills and demands with an absolute standard in mind (e.g., the *typical* levels of skills and demands they experience when engaging in activities). The computation of an average level is only meaningful if one assumes that the ratings of various activities (e.g., on seven-point scales with endpoints labeled "very low" and "very high") are based on a general or absolute standard that the respondents have in their in mind. We cannot be sure that this is actually the case when participants respond to questions regarding perceived skills and demands with respect to different activities. Given that we know from substantive research on survey methodology (cf. Sudman et al. 1996) that responses are constructed on the spot and therefore heavily context dependent, it seems not particularly plausible to assume that questions regarding skills and demands levels and the related response scales are interpreted equivalently (i.e., with a general or absolute standard in mind) across activities.

Third, even if respondents had an absolute or general standard in mind and were largely unaffected by contextual influences, it is unclear how they construct the activity they are (or have been) engaging in. Specifically, it is unclear how they construct their response to the question of how they perceived their ability (and the task demands) involved in the activity. For example, think of a person who is solving math problems. This person can construct the activity with reference to the superordinate or global category (e.g., solving mathematical problems) in mind or with reference to the specific types of math problems involved in the task (e.g., solving relatively simple algebraic problems, such as $24+18+7$). What does "skills in the activity" actually mean in this context? Respondents may refer to skills in solving relatively simple algebraic problems (which would likely result in a response reporting a high level of skills) or to skills in mathematics (which would probably result in a response reporting a lower level of skills). Moreover, participants can refer to different aspects of the activity in their evaluation of their ability and the perceived task demands (e.g., the speed of their responses, the proportion of correct reactions during task execution, the degree to which they perceived the activity as taxing or straining). This ambiguity in the construction of the activity and the relevant responses renders the interpretation of the values indicated by participants responding to questions concerning the level of skills and task demands highly problematic.

Given these interpretative ambiguities, we think it is not particularly meaningful to compute and interpret average scores based on respondents' evaluations of perceived demands and skills across activities. It is much less problematic to ask respondents to rate the level of skills and demands they perceived while engaging

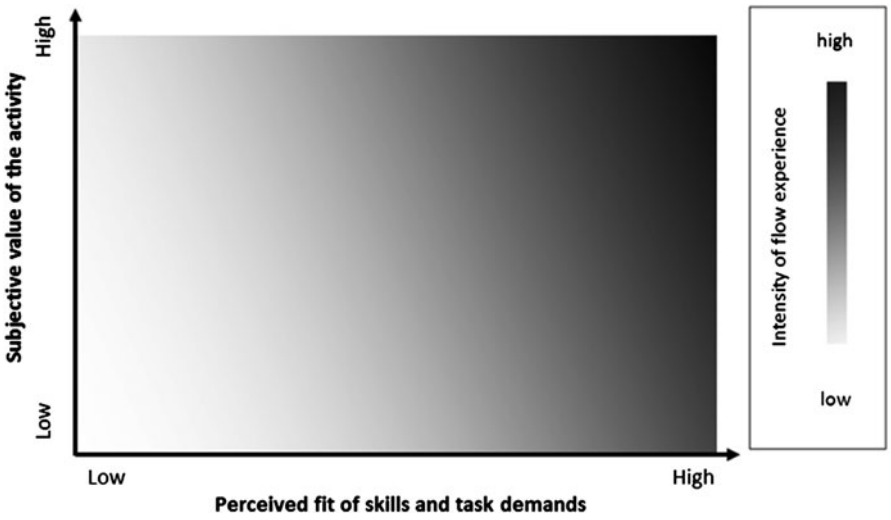

Fig. 3.1 The revised flow model: Flow intensity as a function of perceived fit and subjective value of the activity

in the specific task they were confronted with (e.g., by asking "Please indicate whether the demands of the task you have been working on were too low, too high or matched with your skills"; cf. Flow short scale as used by Schüler 2007, and by Engeser and Rheinberg 2008). This is not problematic because (a) the question refers specifically to the task at hand and (b) an absolute level of skills or demands (across activities) is not relevant in order to address the question whether a fit experience was present or not.

Fourth, the "above average thesis" is also questionable in view of recent experimental findings based on fairly trivial activities (e.g., playing the computer game "Tetris"; Keller and Bless 2008). These studies show that flow experiences can emerge even in situations where it seems not particularly plausible to assume that the levels of skills and demands involved in the activity (a simple computer game) were "above average."

In sum, we are skeptical regarding the "above average thesis" and suggest a different type of revision of the original flow channel model (diverging from the quadrant and octant model). Even more important than the methodological problems addressed above seems to be the fact that the flow models proposed so far do not allow for predictions regarding the *intensity* of flow experiences that emerge under conditions of a perceived fit of skills and task demands. Accordingly, we think that an extension of the original flow channel model is meaningful. We stick to the basic idea of the perceived fit of skills and demands (as basic condition for flow to emerge) and suggest the inclusion of a second dimension representing the subjective value assigned to the relevant activity (see Fig. 3.1). Diverging from the original flow channel model, we do not consider perceived demands (or challenges) and perceived skill as orthogonal constructs but simply refer to perceived fit as

crucial factor (we suggest to measure perceived fit with questions such as "To what degree did the demands of the task fit with your skills in the task?" rather than to measure perceived demands and perceived skills separately—since the latter method neglects the fact that perceived skills and perceived demands can hardly be considered as independent constructs).

It is important to note that we refer to a conceptualization of "subjective value" recently proposed by Higgins (2006). According to this theoretical account, value is "an experience of strength of motivational force. It is an experience of how intensely one is attracted to or repulsed from something" (Higgins 2006, p. 456). Value as motivational force is conceptualized as resulting from two basic ingredients (a) hedonic experience (pleasure/pain properties of the value target) and (b) engagement strength, which can be based on regulatory fit (cf. Higgins 2000) or the use of proper means (for a detailed discussion of the various potential sources of engagement strength, see Higgins 2006). Subjective value of an activity can be assessed based on free choice task engagement (higher subjective value is reflected in a stronger tendency to re-engage in a task with strong engagement, such as for a relatively long period of time, cf. Higgins et al. 2010). An alternative method is the assessment of the anticipated enjoyment of task engagement or the actual experience of task enjoyment (cf. Freitas and Higgins 2002).

Based on subjective value as critical dimension in the revised flow model, it is possible to derive predictions regarding the *intensity* of flow experiences that has not been systematically addressed so far. In fact, flow theory is largely silent regarding the question of how differences in the intensity of flow experiences can be explained. Although the terms "deep flow" and "micro flow" that refer to variations in flow intensity have been briefly discussed by flow theorists (Csikszentmihalyi 1975, 1992), a systematic theoretical perspective addressing the potential bases of such variations is missing so far. Some flow researchers referred to the absolute level of skills and demands in discussing this question (Privette 1983; Percival et al. 2003), suggesting that flow intensity is a function of the level of skills and demands involved in the activity (such that "deep flow" is possible at high levels of skills and demands relative to some kind of an absolute standard). Given our skepticism regarding the interpretation of respondents' evaluations of perceived demands and skills across activities, we think it is problematic to answer the intensity question with reference to the level of skills and demands involved in an activity. Instead, we propose that the subjective value individuals assign to an activity is a crucial factor regarding flow intensity.

Frequency and Intensity of Flow Experiences

We argue that the distinction between frequency and intensity of flow experiences is worthwhile to consider—building on the differentiation of frequency and intensity of affective states (cf. Diener et al. 1985; see also Chap. 2). With respect to factors predicting these two aspects of flow experiences, we suppose that flow frequency is mainly dependent on (1) factors that affect the frequency of engagement in

skill-related activities (e.g., one may suppose that personality constructs such as the achievement motive may be relevant in this context) and (2) factors that determine whether an individual perceives a fit of skills and task demands during task engagement (e.g., task structure is most likely to affect this antecedent of flow). In contrast, we consider flow intensity as mainly dependent on the value attributed to the activity, which is fundamentally affected by the experience of regulatory compatibility (as outlined in greater detail below). It should be noted that a strict distinction of the factors determining flow frequency and intensity is not meaningful because it is plausible to assume that determinants of flow frequency are also relevant (at least to some extent) regarding flow intensity and vice versa. Accordingly, the distinction mentioned above is basically heuristic in nature.

To date, the distinction between frequency and intensity of flow experiences has not been thoroughly addressed, and we hope that future research on flow will take this distinction into account more systematically (see Chap. 2 for a discussion of measures focusing on the intensity or the frequency of flow experiences). We hope that the revised flow model outlined in the next section will contribute to more systematic analyses addressing the question of what determines the intensity of flow experiences. In general, it seems worthwhile to address the (conceptual) differentiation of the intensity and the frequency aspect of flow experiences in future work.

The Revised Model of Flow Experiences

The graphical representation of the revised flow model in Fig. 3.1 reveals that we propose that flow intensity is a function of two factors (1) perceived level of fit between skills and task demands and (2) subjective value assigned to the activity. The model builds on the established notion that flow emerges under conditions of a perceived fit of skills and task demands and adds the notion that the intensity of flow experienced during task engagement increases with the amount of subjective value an individual attributes to (or perceives in) the activity. According to this revised model of flow, individuals experience a higher intensity of flow under conditions of a perceived fit of skills and task demands the more they are subjectively attached to the activity. For example, a guitar player who loves to play (i.e., who perceives a large amount of value in guitar playing) experiences a higher intensity of flow under conditions of a perceived fit of skills and task demands than a guitar player who is not so enthusiastically attached to guitar playing (i.e., who perceives a lower amount of value in guitar playing). The revised model implies the assumption that "deep flow" should be possible even in fairly trivial activities (e.g., when a person is setting the table) given that the person perceives fit and assigns a high level of subjective value to the activity (e.g., a passionate homemaker).

It should be noted that we refer to the subjective value assigned to the activity, *not* to the consequences of the activity. That is, deep flow cannot simply be fostered by way of announcing a (material) reward for the successful completion of an activity. Such a reward enhances the subjective value of the consequences of the activity which is to be distinguished from the subjective value of the activity itself.

It is also noteworthy that there is reason to assume a bidirectional relation between the value perceived in an activity and the intensity of flow experienced during engagement in the relevant activity. As outlined above, it is plausible to assume that individuals experience flow more intensely the more value they perceive in an activity. However, it is plausible to argue that a reverse causal pathway is possible as well. That is, individuals are likely to perceive more value in an activity the more intensely they experienced flow in previous episodes where they engaged in the relevant activity.

What Determines a Skill-Related Activity's Subjective Value?

Our revision of the original flow model which refers to the subjective value of activities raises the question of what determines an activity's subjective value. Given that the flow model focuses exclusively on skill-related activities, the question can be focused more specifically on factors that determine the subjective value individuals perceive in the execution of skill-related activities. In addressing this question, we refer to the general notion of regulatory compatibility (cf. Keller and Bless 2008) defined as the *compatibility of person characteristics* (e.g., habitual goal orientation, personal needs or standards) *and* structural settings or *environmental characteristics* (e.g., task framing, availability of distinct means, salience of specific outcomes or incentives). That is, regulatory compatibility can be described as "a phenomenological experience that arises when individuals experience a compatibility of (personal and situational) factors that are involved in performing a task or activity" (Keller and Bless 2008, p. 197; see Box 3.1).

Box 3.1 Regulatory Compatibility and Subjective Value of an Activity

Regulatory compatibility reflects "a phenomenological experience that arises when individuals experience a compatibility of (personal and situational) factors that are involved in performing a task or activity" (Keller and Bless 2008). This experience can be based on various types of compatibilities, such as regulatory fit (Higgins 2000), thematic endogeny (Kruglanski 1975), or goal congruency (Harackiewicz and Sansone 1991). The flow experience reflects regulatory compatibility as well (compatibility of skills and task demands).
Following the ideas proposed by Higgins (2006), we argue that the value assigned to an activity is not only determined by the hedonic quality (pleasure/pain, i.e., the direction of the motivational force) associated with the activity but reflects the repulsion or attraction force of the activity in a broader sense, which is also a function of the motivational force experience associated with the activity. We argue that regulatory compatibility is an important basis for the emergence of a pleasurable hedonic experience with a high level of motivational force. That is, regulatory compatibility can be understood as an important basis for the subjective value assigned to an activity.

Some examples illustrate this perspective. For example, starting out from regulatory focus theory (Higgins 1997, 1998, 2000), research on regulatory fit addresses the compatibility of the manner of goal pursuit (e.g., eager vs. vigilant strategies) and habitual or current regulatory orientations or goal standards (e.g., need for security or need for nurturance, ideals or oughts as relevant standards, gains or losses as relevant outcomes). Regulatory fit thus reflects a specific type of a regulatory compatibility that focuses on goal-related factors in the person and the environment. Regulatory fit has been studied extensively by Higgins and his colleagues as well as other researchers in the field (cf. Keller and Bless 2006; for a review, see Higgins and Spiegel 2004). In one exemplary study, Freitas and Higgins (2002, Study 3) activated distinct self-regulatory standards (ideals or oughts) and then asked participants to work on a visual search task that was framed with reference to either eagerness or vigilance. In the case of a regulatory fit (i.e., combining an ideal standard with eagerness framing and an ought standard with vigilance framing), participants reported significantly more task enjoyment than they did in other conditions.

Also, Kruglanski's (Kruglanski et al. 1975a, b) demonstration of enhanced intrinsic motivation as a consequence of thematic similarity or endogeny can also be interpreted as a regulatory compatibility effect. Testing the thematic similarity hypothesis, this research group found that when monetary payments are part of task content (e.g., in a coin-toss guessing game), monetary rewards can actually enhance intrinsic motivation, whereas when they constitute the task's exogenous consequences, monetary rewards decrease intrinsic motivation (overjustification effect). According to Kruglanski (1975), intrinsic motivation underlies an individual's behavior when the person's self-attributed cause for an activity inheres in the task's content and not in the consequences of the activity. From our perspective, the effect of thematic endogeny can be conceptualized as a regulatory compatibility effect, in the sense that a person characteristic (the basic desire to see one's behavior as self-determined) is compatible with the structural characteristic of the task, meaning that the individual perceives no external reasons or causes that may have determined his or her engagement in the behavior under conditions of thematic endogeny.

Based on regulatory mode theory (Kruglanski et al. 2000), researchers documented regulatory compatibility effects in the context of leadership. Specifically, Benjamin and Flynn (2006) found that individuals with a dominant "locomotion orientation" (who are driven by a desire to move away from a current state to a different state) are more strongly motivated by transformational leaders than individuals with a dominant "assessment orientation" (who focus on making comparisons; for similar research, see Avnet and Higgins 2003).

Conceptually similar regulatory compatibility effects have been reported with respect to goal congruency effects on intrinsic motivation (Harackiewicz and Sansone 1991). For example, Harackiewicz and Elliot (1998) found an increase in intrinsic motivation when target goals and higher order purpose goals were compatible. Similar effects on intrinsic motivation were obtained when distinct achievement goals and habitual achievement orientations were combined (Elliot and Harackiewicz 1994;

Harackiewicz and Elliot 1993) or when competitive versus noncompetitive conditions were combined with achievement orientations (Epstein and Harackiewicz 1992; Tauer and Harackiewicz 1999).

In sum, the phenomenon of regulatory compatibility as reflected in person–environment compatibilities seems either explicitly or implicitly embedded in several approaches that address intrinsic motivation. As this brief overview indicates, there are numerous ways in which regulatory compatibility can be instantiated. Accordingly, multiple strategies can be applied in order to enhance the value attached to an activity and thus the intensity of flow experiences.

In concluding this section, we want to highlight the fact that regulatory compatibility may also emerge in the context of skill-related activities in individuals characterized by personality traits that are linked to the execution of skills and competencies. Specifically, achievement motivation (McClelland et al. 1953), autonomy orientation (Deci and Ryan 1985b), internal locus of control (Rotter 1966) as well as action orientation (Kuhl 1994a) seem to fit well with the competence aspect of skill-related activities. That is, we suppose that individuals with a strong (a) autonomy orientation, (b) internal locus of control, or (c) action orientation are most likely to experience flow (given a perceived fit of skills and task demands) at a particularly high level of intensity based on the fact that these orientations are particularly well compatible with situations that require the execution of skills and competencies. First studies addressing these notions support this perspective (action orientation: Keller and Bless 2008; internal locus of control: Keller and Blomann 2008).

Antecedent Factors Beyond a Perceived Fit of Skills and Task Demands and Subjective Value of the Activity

Further determinants of the flow experience can be derived from a consideration of the defining elements of the flow experience. As noted above, flow reflects a distinct *combination* of experiential states, and this suggests that factors related to the specific elements of the flow experience may function as antecedents (in addition to the crucial factor of a perceived fit of skills and task demands). We suggest that three elements of the flow experience are specifically relevant in this context: a reduced level of self-consciousness, a strong sense of control, and intensely focused concentration.

Regarding the reduced level of self-consciousness that is characteristic of flow experiences, we argue that situational influences that increase individuals' self-consciousness are likely to prevent (strong) flow experiences. For example, we suppose that the emergence of flow experiences should be hampered when individuals engage in the relevant activity in front of a mirror—a manipulation that is known to increase self-consciousness (Wicklund and Duval 1971; Carver and Scheier 1978). Similarly, individuals characterized by a strong fear of failure (Elliot

and Thrash 2004) seem likely to show an enhanced level of (negative) thoughts about the self (worry as reflecting a skeptical self-focus) under conditions where they are involved in an activity that requires the execution of skills and that may reveal the individual's level of ability (cf. Engeser and Rheinberg 2008).

With respect to the strong sense of control that typically emerges under conditions of flow, we suggest that factors triggering an experience reflecting lack of autonomy (a basis for the experience of control) are likely to reduce the chances that an individual enters a state of flow. For example, it seems plausible to argue that employees in a work context characterized by low autonomy are less likely to experience flow (under conditions of a perceived fit of skills and task demands) than those working under high autonomy conditions.

Finally, we argue that physiological aspects should also be considered in the discussion of antecedents of flow experiences, particularly in view of recent studies documenting several physiological correlates of the flow experience (cf. DeManzano et al. 2010; Keller et al. 2011b; see Chap. 8). Specifically, given the evidence pointing at enhanced mental load under conditions of flow (indicated by reduced levels of heart rate variability, cf. Keller et al. 2011b) which may be related to the high level of focused concentration that is characteristic of flow experiences, we argue that individuals are much less likely to experience a state of flow when their psychophysiological system is in an energetic state of depletion that prevents strong engagement (including highly focused concentration) in an activity. That is, we suppose that exhaustion, fatigue, or self-regulatory resource depletion (Baumeister et al. 1998) is likely to inhibit individuals' readiness to enter a state of flow. Moreover, the state of the psychophysiological system is most likely to affect the period of time an individual is able to remain in a state of flow.

Summary and Conclusion

The present chapter was devoted to the question of what builds the basis for flow experiences to emerge and what may determine the intensity of flow experiences. We focused our discussion on three main topics. First, we addressed the *antecedents* of flow and highlighted the fact that the emergence of flow is basically dependent on a perceived fit of skills and task demands. We also identified some additional factors relevant regarding specific components of flow (reduced self-consciousness, strong feeling of control, focused concentration). Second, we critically discussed the "above average" perspective and the related quadrant and octant models of flow. We argue that the "above average" notion is based on assumptions that seem quite problematic. Finally, we addressed determinants of *flow intensity* that have not been systematically discussed so far. In this context, we propose a revised flow model which builds on the original notion of perceived fit of skills and task demands and includes the value attributed to the relevant activity as additional crucial factor. We highlighted the concept of regulatory compatibility as important theoretical construct in the analysis of the determinants of flow intensity.

Study Questions

- Describe the antecedents of flow experiences proposed in flow theory and how these factors are conceptually linked to each other.

  According to flow theory, a state of flow emerges when three antecedents are met (1) clear goals in the sense of clear task instructions, (2) immediate, unambiguous feedback reflecting diagnostic information regarding one's progress or success in executing the activity, and (3) a balance of perceived skills and perceived task demands. Antecedents (1) and (2) can be considered to be incorporated in antecedent (3) because individuals can only arrive at a meaningful evaluation of their skills and the task demands to the degree that they (a) understand the nature of the task (based on clear task instructions) and (b) can diagnose whether they are successful in their task execution or not.
- Explain the "above average" thesis introduced by the proponents of the quadrant and octant model of flow. Discuss the problematic assumptions that are entailed in the "above average" thesis.

  The "above average" thesis holds that individuals can only enter a state of flow when the perceived level of skills and task demands is above the average level across various activities the individual is engaging in. This thesis can be considered as problematic for three main reasons (1) it is questionable whether perceived demands (or "challenges") and perceived skills can be considered to represent orthogonal (independent) constructs; it is evident that individuals have to take the demands of the task into account to arrive at an evaluation of their skills in the task (and vice versa), and accordingly, measuring perceived skills and demands separately and considering the constricts as orthogonal in nature seem not particularly meaningful; (2) comparing the evaluations of skills and task demands involved in different activities (e.g., washing the dishes and playing chess) would only be meaningful if respondents had an absolute comparison standard in mind when editing their responses (such as measuring the length of a table and comparing the resulting value with the value obtained when measuring the length of a bed is only meaningful when both measurements refer to same measurement standard). Such a standard is typically not available when individuals evaluate the skills and task demands of different activities they are engaging in; (3) individuals construe their evaluations of skills and task demands on the spot, and it is highly likely that evaluations of skills and task demands involved in one and the same activity vary substantially depending on contextual factors; (4) if the above average thesis was correct, individuals should not be able to experience flow when they engage in activities that are not particularly demanding (such as playing a trivial board game such as Ludo) where skills and demands are definitely not "above average." Empirical studies based on fairly trivial activities are not consistent with this perspective because individuals were found to enter a state of flow even under conditions where skills and demands were most likely clearly "below average."
- Discuss potential antecedent factors (or boundary conditions) of flow—beyond the perceived fit of skills and task demands and the subjective value of the

activity—that can be derived from a consideration of the defining elements of flow experiences.

Given that flow represents a combination of experiential states—such as a reduced reflective self-consciousness, a modified experience of time, strong involvement and enjoyment, focused concentration, and a strong feeling of control—it is plausible to argue that the experience of flow can be prevented or interrupted based on influences that disrupt the emergence of the experiential states that are characteristic for flow experiences. For example, factors that increase individuals' self-consciousness are likely to prevent (strong) flow experiences. Similarly, factors triggering an experience reflecting lack of autonomy (a basis for the experience of control) are likely to reduce the chances that an individual enters a state of flow. Also, individuals should be much less likely to experience a state of flow when their psychophysiological system is in an energetic state of depletion that prevents strong engagement (including highly focused concentration) in an activity.

- The state of flow can be considered with a focus on the frequency or the intensity of this subjective experience. Which factors can be assumed to play an important role regarding the question of how frequently individuals experience a state of flow?

  It can be assumed that flow frequency is mainly dependent on (1) factors that affect the frequency of engagement in skill-related activities (e.g., one may suppose that personality constructs such as the achievement motive may be relevant in this context) and (2) factors that determine whether an individual perceives a fit of skills and task demands during task engagement; that is, the task structure (specifically, the availability of feedback and the nature of task instructions) is most likely to affect this antecedent of flow.
- Specify the revised flow model and exemplify the reasoning concerning the intensity of flow experiences contained in the theoretical perspective underlying the revised flow model.

  The revised flow model builds on the original notion of perceived fit of skills and task demands and refers to subjective value of the activity as a crucial second factor. That is, the model rests on the "classic" notion that flow can emerge under conditions where individuals perceive a balance between skills and task demands in an activity. Moreover, the intensity of flow experienced under such conditions is conceptualized as a function of the subjective value the individual assigns to the relevant activity. Subjective value is defined with reference to the perspective outlined by Higgins (2006) who noted that value is resulting from two basic ingredients (a) hedonic experience (pleasure/pain properties of the value target) and (b) engagement strength, which can be based on regulatory fit or the use of proper means (among other factors). It can be assumed that regulatory compatibility—a phenomenological experience that arises when individuals experience a compatibility of (personal and situational) factors that are involved in performing a task or activity—builds one important basis for the subjective value individuals assign to activities and hence as a basis for the intensity of flow experiences.

Chapter 4
Flow and Its Affective, Cognitive, and Performance-Related Consequences

Anne Landhäußer and Johannes Keller

Abstract This chapter focuses on the specific autotelic quality and the affective, cognitive, and performance-related consequences of the flow experience. Research findings documenting a positive relationship between skills–demands compatibility (the central precondition of flow experiences) and components of an autotelic experience (intrinsic motivation, enjoyment, and involvement) are discussed. Besides, possible consequences of flow experiences are addressed. A review of currently available findings indicates that flow may foster positive affect and even lead to enhanced performance. Unfortunately, the findings, which are mostly correlational in nature, do not provide conclusive evidence regarding the consequences related to flow experiences—reflecting the fact that the empirical analysis of flow experiences is quite complex. Important intricacies of flow research and theorizing and their implications are discussed—specifically, the lack of methods to test for causal effects of flow experiences and the tendency to equate flow experience with skills–demands compatibility.

Introduction

Flow is a psychological concept that clearly passed the sometimes all too wide gap between the scientific sphere and the general public. Almost everyone can picture something when hearing the term "flow experience," and many people react immediately with sentences like "Oh, yes, that's what I typically feel when I'm playing computer games!" When individuals did something with great pleasure and enthusiasm, statements as "I've been in flow!" are common. So, surely, many people associate something with flow—but what exactly do they associate? Sometimes it seems as individuals have a simple equation in mind: "It was fun, so I've been in flow."

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However, in passing the gap back from the general public to the scientific sphere—it is important to note that flow is not just "having fun." Flow is much more specific than that.

The experiential state of flow is characterized by a combination of several specific aspects, namely, (1) concentration, (2) a merging of action and awareness, (3) reduced self-consciousness, (4) a sense of control, (5) a transformation of time, and (6) an experience of the activity as intrinsically rewarding (i.e., an "autotelic experience"; Nakamura and Csikszentmihalyi 2009). Of course, those aspects can appear independently of each other, but in combination, they constitute what we call "flow experience."

The Distinction Between Flow Experience and Skills–Demands Compatibility

Positive consequences of flow experiences are widely discussed. International bestsellers by Csikszentmihalyi (1990, 1997) suggest that enhancing the time spent in flow makes our lives more happy and successful. Flow is not only supposed to be a highly enjoyable state itself, frequent flow experiences should also have desirable outcomes. But regarding to consequences of flow experiences, flow researchers are confronted with a basic problem: Up to now, there is no ideal possibility available to directly investigate causal consequences of flow experiences. The most obvious strategy to test for causal effects would be an experimental paradigm, but the potentials to directly manipulate a subjective state of experience in a laboratory are limited. What one surely can do is to measure flow experiences and possible consequences using a correlational design. However, by using correlational designs, one cannot rule out that there are other factors than flow that cause its supposed consequences.

Actually, a close look into the literature (cf. Chap. 1) on flow reveals that authors for the most part did not investigate correlates or consequences of the flow experience but those of a skills–demands compatibility[1]—which is the central *precondition* of flow (see Chap. 3). In many studies, researchers seem to equalize the precondition of flow with the experience itself (e.g., Csikszentmihalyi and LeFevre 1989; Eisenberger et al. 2005; Hektner and Csikszentmihalyi 1996; Heo et al. 2010;

[1] Csikszentmihalyi and others usually refer to "challenges" instead of "demands." Also, in most flow studies, "challenges" are measured. However, the use of the term "challenge" in the conceptualization and measurement of skills–demands compatibility is problematic because from the viewpoint of motivational psychology, challenges occur as a consequence of compatibility between demands of the situation and the individual's skills (cf. Rheinberg 2008). Furthermore, it should be noted that the term "challenge" typically implies the notion that an individual perceives the relevant situation as stimulating, whereas the term "demands" does not include an implication regarding the individual's experiential state. Accordingly, we argue that to put challenges in relation to skills (a common praxis in flow research) is conceptually not particularly meaningful. Therefore, we prefer the term "demands" and will use it in the course of the chapter.

Nakamura 1988; Wells 1988). In their empirical work, they only measure perceived challenges and skills and infer that participants experience flow in case both are above the individuals' mean and in balance (cf. Chap. 2). Because the association between the preconditions of flow and the experience itself is definitely not deterministic (for further discussion, see Keller and Landhäußer 2011; Rheinberg 2008), this is problematic. As already pointed out in Moneta (Chap. 2), a specific combination of demands and skills does not equally predict flow experiences across different contexts (e.g., achievement vs. nonachievement contexts; Moneta and Csikszent-mihalyi 1996) and different individuals (Moneta and Csikszentmihalyi 1996, 1999). Experimental evidence shows that a balance between skills of the individual and demands of the task (compared to boredom and overload) indeed enhances enjoyment and involvement, which are central components of the flow experience, but this causal effect is moderated: It holds only for individuals with specific characteristics (e.g., internal locus of control, Keller and Blomann 2008; action orientation, Keller and Bless 2008; motivational orientation, Abuhamdeh and Csikszentmihalyi 2009).

As there are situational as well as personal moderators regarding the relation between skills–demands compatibility and flow experience, a measure of skills–demands balance should not be used (or interpreted) as a measure of the flow experience per se.

Most notably when discussing possible consequences of flow experiences, it is essential to clearly differentiate between consequences of a specific skills–demands combination and consequences of the flow experience itself. For example, if a skills–demands fit leads to positive mood, this could also be due to a feeling of self-efficacy and cannot automatically be attributed to the flow experience that typically emerges under conditions of a skills–demands compatibility. As in several flow studies the experiential components of flow are not even measured (e.g., Csikszentmihalyi and LeFevre 1989; Eisenberger et al. 2005; Hektner and Csikszentmihalyi 1996; Heo et al. 2010; Nakamura 1988; Wells 1988), one has to be careful in drawing conclusions regarding the consequences of flow experiences based on such a narrow empirical basis. Even experimental flow studies do not completely get rid of that problem as flow experiences are typically induced by manipulating a skills–demands fit (cf. Moller et al. 2010). Hence, it seems possible to draw causal conclusions about the consequences of a skills–demands fit. It seems much more complex to analyze causal consequences of the flow experience.

One possibility to address this problem is to measure (or induce) a skills–demands fit combined with an assessment of the experiential components of flow and to check whether the effect of the skills–demands compatibility on the supposed consequences is actually mediated by the experience of flow.

Outline

First, we want to focus on the quality of the experience. As most descriptions of flow accentuate the autotelic quality of the experience (i.e., engagement in the activity

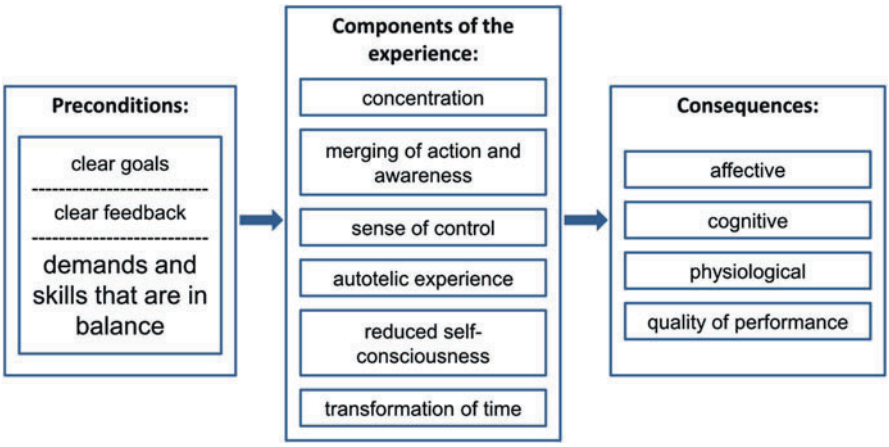

Fig. 4.1 Preconditions, components, and consequences of the flow experience

is perceived as rewarding in and of itself; cf. Csikszentmihalyi 1990) and flow theory is generally conceptualized as a theory of intrinsic motivation (Rheinberg 2008), we focus in this section on intrinsic motivation, involvement, and enjoyment (i.e., the autotelic experience) as central components of the flow state.

Second, consequences of flow experiences will be discussed. There are several possible outcomes mentioned in the literature. On the one hand, a positive effect of flow experiences on performance is postulated (cf. Engeser and Rheinberg 2008). On the other hand, flow should have an effect on affective, cognitive, as well as physiological factors (see Fig. 4.1). Since the physiological consequences of flow are covered in Peifer (Chap. 8), they will not be discussed here. This chapter addresses affective and cognitive consequences of flow as well as its impact on performance.

The Autotelic Experience

Csikszentmihalyi (1990) described the flow experience in the following words: "The state in which people are so intensely involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it" (p. 4). The desire to engage in an activity for its own sake typically is referred to as intrinsic motivation (Deci 1975; Rheinberg 2008), albeit there are several different conceptualizations of "intrinsic motivation" that may be similar to each other but have to be differentiated because the term "intrinsic" is interpreted in distinct ways (see Box 4.1).

Box 4.1 Different Conceptualizations of Intrinsic Motivation According to Rheinberg (2008)

1. ***The activity-oriented approach***
   Activities are seen as intrinsically motivated when the main incentive lies in the performance of the activity itself, while activities are seen as extrinsically motivated when the main incentive lies in its expected results (e.g., Woodworth 1918).
2. ***The self-determination approach***
   People are seen to be intrinsically motivated when they perceive their behavior as self-determined, that is, their needs for autonomy and competence are satisfied (Deci and Ryan 1980, 1985a).
3. ***The "interest and involvement" approaches***
   These approaches are best applied to learning situations, which are considered as intrinsically motivating when learners are interested in the object of their studies and (a) perceive their actions to be self-determined (Krapp 1999) or (b) enjoy their engagement in the activity (Sansone and Smith 2000).
4. ***The "correspondence of means and ends" approach***
   Intrinsic motivation is assumed to be a consequence of a correspondence between means and ends, that is, specific target goals are clearly assigned to an abstract purpose goal (e.g., reading a textbook to learn more about a specific subject; Heckhausen 1989; Kruglanski 1989).

Flow is assumed to be a state characterized by intrinsic motivation in the sense of an activity-oriented approach. When individuals are in flow, the main incentive lies in the performance of the activity itself, it is perceived as enjoyable.

Currently, however, the assumption that intrinsic motivation is a central part of the flow experience has been put to discussion (Quinn 2005; see also Chap. 1). Indeed, the inclusion of intrinsic motivation into the definition of flow experiences can be challenged taking into account that Csikszentmihalyi (1975) conceptualized flow to explain *why* people do special activities for the sheer sake of doing it, and hence, why they are intrinsically motivated. This perspective suggests that intrinsic motivation is a consequence of flow experiences and not part of the experiential state itself. Regardless of whether intrinsic motivation is understood as a component, a consequence, or even an antecedent (cf. Fullagar and Mills 2008; Jackson et al. 1998) of flow experiences, both should be closely related as reflected in the fact that descriptions of flow in most cases capture the autotelic quality of the experience.

As there are different ways to measure intrinsic motivation—and, of course, for definitional clarity—we want to differentiate between two components of this autotelic quality that usually accompany each other: The autotelic experience comprises a motivational component (one is motivated to do what one actually does) and an experiential component (the activity is enjoyable). That is, we want to conceptually

dissociate the kind of motivation (i.e., intrinsic) from the experiential state (i.e., enjoyable), but both together render the experience autotelic.

When analyzing the autotelic quality as a component of the flow experience, some studies focus on the motivational aspect (e.g., Csikszentmihalyi and LeFevre 1989; Csikszentmihalyi and Schiefele 1994; Keller et al. 2011d), and others concentrate on the experiential aspect (i.e., involvement and enjoyment; e.g., Keller and Bless 2008; Keller and Blomann 2008; Shernoff et al. 2003). Corresponding to the "interest and involvement" approach (see Box 4.1), some researchers also include the degree of interest in the activity in their measurements of intrinsic motivation (e.g., Hektner and Csikszentmihalyi 1996; Moneta 2004b).

The following paragraphs deal with those different kinds of measurement and give a quite clear answer to the empirical question, that is: Does a skills–demands compatibility, which reflects the central precondition of flow experiences, indeed lead to intrinsic motivation, involvement, enjoyment, and interest?

Intrinsic Motivation as a Consequence of Skills–Demands Compatibilities

A direct measure of intrinsic motivation in the sense of an activity-oriented approach would be to ask respondents whether they adopted an activity because of the activity itself or because of expected outcomes. However, researchers measuring the motivational component of the autotelic experience often tried to capture it in rather indirect ways.

For example, in studies adopting the experience sampling method (ESM; for a detailed description, see Csikszentmihalyi and Larson 1987), sometimes the single item "Do you wish you had been doing something else?" was used (e.g., Csikszentmihalyi and LeFevre 1989; Csikszentmihalyi and Schiefele 1994; Haworth and Hill 1992; Moneta and Csikszentmihalyi 1996). A low score on this item was interpreted to indicate intrinsic motivation. Under flow conditions (challenges and skills in balance), participants had significantly lower scores on the item than participants under nonflow conditions, thus indicating higher intrinsic motivation (Csikszentmihalyi and LeFevre 1989; Moneta and Csikszentmihalyi 1996). Haworth and Hill (1992), who coded an activity as "intrinsically motivated" when the participant ticked either 1 or 2 on a 7-point scale to answer the question "Do you wish you had been doing something else?" *and* reported that she/he wanted to do the activity (as an answer to the question "Why were you doing this activity?"), found that under optimal flow conditions (skill challenge level of 7:7 on scales ranging from 1 to 7), a great amount of the activities (71%) were—according to that definition—intrinsically motivated.

Indeed, the item "Do you wish you had been doing something else?" may capture intrinsic motivation as one could conclude that one who does not want to do something else is really motivated to do what she/he actually does. However, in our view, the

item is somehow problematic as a low score could also indicate something other than intrinsic motivation. On the one hand, the participant also could have been in a depressive mood thinking "It doesn't matter what I do, I'm in a bad mood anyway." On the other hand, and more important, a low score could also reflect extrinsic motivation as the individual could have wanted to do what she/he did because she/he got paid or earned respect for what she/he did—not because she/he liked the activity itself. Also, a high score on the item (meaning "yes, I did wish I had been doing something else") does not automatically preclude intrinsic motivation. For example, one can be highly motivated playing a computer game and at the same wish to be with one's new dating partner.

Therefore, it would be more meaningful to measure whether a person is really motivated to do what she/he actually does rather than to measure whether the person wishes to be doing something else. Potentially, it could be helpful to explain participants the activity-oriented concept of intrinsic motivation (e.g., to illustrate that one can have intrinsic and extrinsic motives to pursue an activity and give examples of these motives) and then to ask them directly whether they felt intrinsically motivated or not.

A useful alternative to a self-report measure of intrinsic motivation is to adopt a behavioral measure. According to some theorists, the most meaningful measure of intrinsic motivation is a free-choice task (Deci et al. 1994).[2] That is, participants are free to decide what they want to do, and there are no external rewards or sanctions. Individuals who decide in such a situation to continue with the relevant activity can be considered intrinsically motivated (e.g., Deci 1972, 1975). There is one experimental flow study that adopted the free-choice paradigm (Keller et al. 2011d). In the experimental flow studies that have been conducted so far, (non-)flow states were manipulated by establishing a (non-)balance between skills of the participant and demands of a computer task the participant had to perform (Moller et al. 2010). In the relevant study (Keller et al. 2011d), participants worked for 5 min on a computerized knowledge task ("Who wants to be a millionaire?") in three different playing modes (boredom, overload, and a fit condition in which the difficulty of the game was continually adapted to the skills of the participant). After answering a subsequent questionnaire, participants were instructed to memorize a list of words and informed that in order to assess their memory, a time gap of 5 min was necessary. They were told that they could choose freely what they wanted to do over that period of time: working on the knowledge task again, reading a magazine available at their desk, or doing nothing special at all. In the adaptive fit condition, significantly more participants (76%) chose to work on the task again than in the boredom (39%) and the overload condition (54%).

Why decided more than three quarters of the participants in the fit condition to reengage in the knowledge task instead of reading or doing something else?

[2] However, as persistence in a task is often related to ego-involvement rather than previous enjoyment (e.g., Ryan et al. 1991), it is usually used in combination with self-report measures and should not be understood as a replacement of them.

Following the procedure proposed by Kenny et al. (1998) and adapting a Sobel test, it was observed that the effect of the experimental condition on free-choice activity selection was fully mediated by self-reported involvement and enjoyment. This reflects the fact that participants were intrinsically motivated to do what they did because the activity was enjoyable and involving. Therefore, the results of this study clearly indicate that a skills–demands compatibility fosters both the motivational and the experiential components of an autotelic experience.

Enjoyment, Involvement, and Interest as Consequences of Skills–Demands Compatibilities

That flow preconditions (i.e., a skills–demands fit) foster involvement and enjoyment was shown in further experimental studies. By using the game Tetris in three different playing modes (boredom, overload, and a fit condition; for a detailed description, see Keller and Bless 2008), it was repeatedly shown that individuals who played Tetris in an adaptive version enjoyed the game significantly more and were more involved than participants who did not experience a fit between skills and demands (Keller and Bless 2008; Keller and Blomann 2008; Keller et al. 2011b). The same holds true not only for the formerly described knowledge task (Keller et al. 2011b) but also for an arithmetic task (Keller et al. 2011c). Hence, there is causal evidence that a balance between skills and demands indeed leads to enjoyment and involvement which is the core of an autotelic experience.

However, as mentioned before, this causal effect was qualified by moderators. Skills–demands compatibility only fostered flow experiences in individuals with internal locus of control (Keller and Blomann 2008) or high action orientation (Keller and Bless 2008). This can be interpreted as evidence for the assumption that individuals differ in their readiness to experience flow. Csikszentmihalyi et al. (1993) consider autotelic personalities—that is, individuals who tend to experience flow quite often and deeply—to be characterized by receptive qualities (e.g., openness to new experiences) and active qualities (e.g., the tendency to engage in challenging activities). Internal locus of control as well as action orientation could represent a part of the latter aspect and be typical characteristics of autotelic personalities (see Chap. 9 for conceptualizations of the autotelic personality).

When looking at studies applying the ESM, a typical result is that involvement or enjoyment in the flow channel is higher than in most but not all other channels. Shernoff et al. (2003), for example, found interest to be highest when individuals pursued specific activities in the flow quadrant (i.e., skills and challenges were above average); however, enjoyment in the flow quadrant only was significantly higher than in the apathy and anxiety quadrants but comparable to enjoyment in the relaxation quadrant. Applying the octant model of flow experiences (see Chap. 2), Clarke and Haworth (1994) did not find significant differences regarding enjoyment between the flow channel and the control, relaxation, boredom, and ease channels. Yet, when only looking at the proportion of the total time spent in episodes that were

characterized as highly enjoyable (either 6 or 7 on a 7-point scale), the flow and control channels had most incidences of high enjoyment.

Measuring involvement, Moneta and Csikszentmihalyi (1996) found the highest values when participants experienced high challenges and skills that were in balance. Csikszentmihalyi and Rathunde (1993), on the other hand, report on findings indicating that involvement values were highest in the arousal channel (i.e., high challenges and moderate skills).

An intrinsic motivation measure by Moneta (2004b) comprised two items assessing enjoyment and interest. In a US sample, he found intrinsic motivation to be highest when challenges and skills were high and in balance. However, in a Chinese sample, the highest scores of intrinsic motivation were obtained for low challenges in combination with high skills.

Therefore, results from experimental and experience sampling studies suggest that, overall, enjoyment and involvement is fostered by a skills–demands compatibility, though (a) the relationship is not deterministic, and (b) other challenges–skills constellations can be enjoyable (e.g., relaxation or control) or involving (e.g., arousal) to a similar extent.[3]

Nonetheless, qualitative (cf. Chen et al. 2000; Csikszentmihalyi 1975; Massimini et al. 1988; Partington et al. 2009), correlational, and experimental studies suggest a tight entanglement between flow preconditions and autotelic experiences. On average, a balance between demands and skills makes intrinsic motivation, enjoyment, involvement, and interest more likely. This is reflected in the main effects of skills–demands compatibilities found in most of the reported studies. Nevertheless, one should keep in mind that this relationship does not hold for every individual and not for every situation as there seem to be personality as well as situational aspects that inhibit the positive effects of skills–demands compatibilities.

Positive Affect and Life Satisfaction

It appears intuitively plausible to assume that an experience that is so enjoyable as the flow experience should lead to positive affect and happiness. Of note, Csikszentmihalyi (1999) concluded that his studies "have suggested that happiness depends on whether a person is able to derive flow from whatever he or she does" (pp. 824f) and even goes as far as to term flow "the bottom line of existence (because) without it there would be little purpose in living" (Csikszentmihalyi 1982, p. 13). He states that happiness is derived from personal development and growth—and flow situations (i.e., situations in which we are confronted with challenges that can be handled) permit the experience of personal development. The feeling of progress

[3]Inconsistencies in ESM studies could also be attributed to the measurement of "challenges" instead of "demands." This especially holds for the cross-cultural study by Moneta (2004b) as the term "challenge" may be interpreted differently in different cultures.

Box 4.2 Subjective Well-Being

Subjective well-being comprises an affective as well as a cognitive component. Whereas pleasant and unpleasant affective states constitute the affective component, the cognitive component is *life satisfaction* (Pavot and Diener 1993). Life satisfaction refers to a cognitive judgmental process and can be defined as "a global assessment of a person's quality of life according to his chosen criteria" (Shin and Johnson 1978).

should lead to positive affect after an experience of flow but also in the long run (Csikszentmihalyi 1990). As Moneta (2004a) wrote, additional to the postulated direct effect of flow on happiness, an indirect effect on general subjective well-being (see Box 4.2) is assumed:

> [F]low theory states that flow has an (…) indirect effect on subjective well-being by fostering the motivation to face and master increasingly difficult tasks, thus promoting lifelong organismic growth. In particular, flow theory states that the frequency and intensity of flow in everyday life pinpoint the extent to which a person achieves sustained happiness through deliberate striving, and ultimately fulfills his or her growth potential (p. 116).

Thus, depending on frequency and intensity of the experience, flow should have a positive impact on affective states as well as life satisfaction, which would also correspond with the fact that a positive influence of intrinsic motivation on well-being has been documented (Sheldon et al. 2004; see also Chap. 1).

However, a confusion of flow and happiness—as reflected in Csikszentmihalyi's (1999) description of flow as a "dimension of happiness" (p. 821)—in our opinion should rather be avoided since flow and positive affect are conceptually distinct states (cf. Chap. 1). Surely, flow experiences are enjoyable and therefore positive. But activity-specific enjoyment (i.e., one enjoys *doing* something) is not the same as the global state of happiness. Indeed, enjoyment of an activity can make one happy. But then, happiness is a consequence of a flow experience and not a component. More so, as individuals may not reflect on their affective state while in flow. As Csikszentmihalyi (1999) stated: "[D]uring the experience people are not necessarily happy because they are too involved in the task (…) to reflect on their subjective states" (p. 825). Nonetheless, the enjoyment of the activity as well as the feeling of personal progress may result in a positive affective state.

Empirical Evidence on the Flow–Affect Relationship

What about empirical tests of the proposed relationship between flow preconditions as well as flow experiences and positive affect? Let us have a look at correlational data first: As expected, authors measuring the flow experience itself found positive relationships with positive affect (Landhäußer et al. 2011; Rheinberg et al. 2007),

even when former affect was controlled for (Schüler 2007). Fritz and Avsec (2007), who surveyed music students and measured dispositional flow in the context of musical activities, in addition to a positive association with general positive affect even found one between action–awareness merging as well as autotelic experience in musical activities and life satisfaction.

A similar pattern emerges when looking at studies that report on correlations between skills–demands compatibilities and positive affect. With some exceptions (e.g., Nakamura 1988), studies using the ESM regularly found significant associations between being in the flow quadrant or octant (challenges and skills above average) and experiencing positive affect (Clarke and Haworth 1994; Csikszentmihalyi and LeFevre 1989; Massimini and Carli 1988; Schallberger and Pfister 2001; Shernoff et al. 2003). However, results of a study by Csikszentmihalyi and Rathunde (1993) suggest that the positive relationship between flow conditions and affect does not hold for every type of activity. They analyzed 20 types of activities their adolescent participants had reported in an ESM study and found that only in seven of them happiness was significantly higher in the flow quadrant than in the other quadrants. When doing homework or studying for an exam, participants tended to be happiest when skills were high and challenges low (i.e., when being in the boredom quadrant). This suggests that at least the relationship between skills–demands compatibility and positive affect does not hold for every type of activity.

An indication that the association between flow conditions and affect may also depend on personality factors was found by Eisenberger et al. (2005) who assessed flow conditions (challenges and skills above average) for five work activities on which participants spent the most time during their work days. Flow conditions at work only then gave rise to positive affect at work when participants were high in need for achievement. That is, at least in the work context, flow conditions may not for all individuals similarly foster positive affect, and a moderating impact of personality characteristics can be expected.

To our knowledge, there is just one single study that tested the *causal* relationship between a skills–demands compatibility and affect. This study, in fact, did not find a significant effect of a skills–demands fit manipulation within the game Tetris on affect (Keller et al. 2011b; experiment 2). This cannot be attributed to a failed manipulation as participants in the skills–demands fit condition expectedly reported higher enjoyment and involvement (i.e., an autotelic experience) than participants in nonfit conditions. Yet, this task-specific enjoyment and involvement was not reflected in heightened positive affect. Of course, one single study does not allow for precise conclusions. Possibly, the pursued activity has to be meaningful to the participant (for most individuals presumably not the case when playing Tetris) in order that the experience of flow leads to positive affect. That is, characteristics of the activity could not only moderate the relationship between flow *conditions* and positive affect, as the results by Csikszentmihalyi and Rathunde (1993) suggest, but also the relationship between flow *experience* and positive affect. To draw empirically based conclusions, further experimental analyses with different tasks are necessary to test whether skills–demands compatibility and/or autotelic experience in other contexts lead to positive affect.

Future Prospects

Empirical evidence indicates that both flow conditions and flow experiences coincide with positive affect under many circumstances. When individuals experience flow in a situation, they also tend to be happy afterward. The same holds for the experience of a fit between high demands and skills. However, first evidence suggests that those relationships are moderated by situational and personal factors that should be disclosed and analyzed in future research.

In consideration of the fact that there seems to be mutual consent with respect to the notion that positive affective states and even life satisfaction are consequences of flow experiences, researchers should put more effort in the examination of the *causal* relationship to back up their assumption by empirical results. Schüler (2007) did a first step in this direction by using a longitudinal design and controlling for former affect and thus ruling out the possibility that the relationship is driven by a reverse effect (i.e., positive affect makes flow experiences more likely). Another appropriate way would be to test the relationship between a skills–demands compatibility and positive affect in different experimental paradigms, examining a possible mediation of the skills–demands compatibility effect on affect via experienced flow.

Another question that should be addressed is whether it is the frequency or the intensity of flow experiences that leads to enhanced life satisfaction. That is, become people happy because they have frequent instances of flow experiences or become people happy because they sometimes are in this state of consciousness called "deep flow" (e.g., Percival et al. 2003)?

Empirically, *either* frequency *or* intensity of flow was measured (cf. Chap. 2). Researchers working with the quadrant or octant model of flow experiences as a matter of fact only differentiate between flow and nonflow situations and thus only measure frequency but not intensity. Researchers measuring the flow *experience* usually correlate flow scores (which can be seen as a measure of intensity but include flow as well as nonflow situations) with proposed correlates and consequences. It would be interesting to analyze whether frequency and intensity of flow instances are differentially related to affect. First data from a day reconstruction study indicate that it is the frequency rather than the intensity of flow that promotes happiness (Landhäußer et al. 2011). In this study, flow was measured for every reported episode with items assessing components of the flow experience on scales ranging from 1 to 7. We calculated the frequency of flow experiences for every person by counting the instances in which the flow score was at least 5 and dividing the number of flow instances by the number of reported episodes. An intensity measure was established by calculating the mean flow score of all flow instances a participant experienced (i.e., episodes in which the flow score was at least 5). To analyze the influence of both frequency and intensity on affect, a regression analysis was conducted in which the average net affect (positive minus negative affect, averaged across all reported episodes) served as the dependent variable. Whereas frequency of flow instances accounts for 32% of the variance of net affect, intensity does not yield a significant effect when both independent variables are included in the analysis.

Indeed, individuals who often experience flow seem to be on the sunnier side of life. However, there is still much to be done to uncover the specific interrelation between flow and affect.

Cognitive Consequences of Flow

Flow as a specific state of consciousness may also trigger particular cognitive states and mechanisms, that is, it could have an influence on cognitive capacity and processing styles, at least directly after the experience (or even in the long term). Yet, the cognitive consequences of flow experiences have not been systematically addressed in the literature so far, and there is hardly any empirical evidence available. Accordingly, we can only address this issue on a conceptual and theoretical level discussing possible relationships that may be systematically tested in future studies.

Cognitive Capacity

Deep concentration is a distinctive attribute of the flow experience which may transfer to tasks and situations following a flow experience. An individual who is engaging in a task in a deeply concentrated mode may maintain this working style even when the flow experience is over. Moreover, frequent flow experiences (and, thus, frequent episodes involving a deep concentration on a task) could enhance the ability to concentrate and the attention span.

The ability to concentrate could also be fostered by the experience of successful self-regulation during a state of flow. As one aspect of flow is reduced self-consciousness, individuals experiencing flow could have more self-regulatory resources available in a successive situation than individuals not in flow. That is, such individuals could be less ego depleted than individuals in nonflow (see the concept of ego depletion as discussed by Baumeister et al. 1998) what may facilitate the ability to concentrate.

Processing Styles

Based on the assumption that flow experiences are characterized by a focusing of attention (i.e., a narrowed focus on the details of the current task, rendering other information less important), one may assume that individuals in a flow state—and probably after, as well—adopt a thinking style characterized by a focus on details, reflecting a "tunnel vision." Thus, flow experiences may foster bottom-up processing strategies.

However, if flow experiences indeed put individuals into a positive mood state (as described above), they also could foster top-down processing strategies. Note that a substantial amount of research indicates that positive mood states influence cognitive processing styles in a way that heuristic processing strategies (based on general knowledge structures) dominate individuals' information processing and judgments (e.g., Bless et al. 1996; Chartrand et al. 2006; Huntsinger et al. 2010). Insofar as individuals after the experience of flow are indeed in a happy mood, flow should have an indirect effect on processing styles in such a manner that individuals *after* the experience of flow should tend to rely on top-down processing strategies. That is, there are contradictory hypotheses regarding the influence of flow experiences on processing styles.

There is only one single study analyzing cognitive consequences of flow experiences we know about. This experimental study found a significant relationship between a flow manipulation (i.e., skills–demands compatibility in a computer task) and degree of clustering in a free recall task which is an indicator for level of processing (Keller et al. 2011a). After a flow manipulation by means of a computerized knowledge task, participants were asked to learn 16 words (four words selected from each of the categories plants, furniture, animals, and vehicles) and had to recall as many words as possible after a delay of 5 min. The authors assessed the degree to which the recalled information was clustered based on the categories the words were selected from. The degree of clustering served as an indicator of how much participants encoded and recalled the presented pieces of information referring to higher-order categories (vs. a lower level of abstraction; e.g., Hamilton et al. 1980). Participants in the flow condition showed a significantly lower level of clustering relative to their counterparts in two nonadaptive conditions (boredom and overload). This finding indicates that working under skills–demands compatibility may trigger narrow, low-level categorization processes (reflecting a "tunnel" vision perspective as proposed by flow theory).

As one can see, elaborate analyses of the cognitive consequences of flow experiences could generate interesting findings, and different mechanisms are possible. As there is almost no research available in this field until now, we hope that research on cognitive consequences of flow will be more in the focus of attention in the next generation of flow research.

Flow and Performance

Since the beginning of flow research, a close relationship between flow experiences and performance has been postulated. This association has two plausible reasons. First of all, flow is characterized by high concentration and a sense of control, which are facilitators of performance (Eklund 1996). As such, flow is a highly functional state and should result in better performance by itself. Second, flow could be seen as a motivating force for excellence (Engeser and Rheinberg 2008). As the flow state is experienced as intrinsically rewarding, individuals seek to replicate

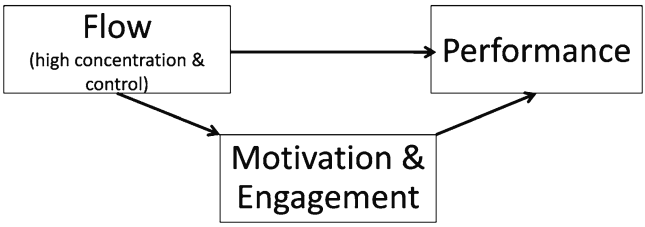

Fig. 4.2 Assumed direct and indirect effect of flow on performance

flow experiences. This introduces a selective mechanism into psychological functioning that fosters personal growth. People develop greater levels of skills whenever they master challenges in an activity. To maintain the optimal level of demands that fosters flow experiences, they must engage progressively more complex tasks. Therefore, flow experiences imply a growth principle, whereby more complex demands are sought after and more complex abilities are likely to develop (Csikszentmihalyi 1975; Nakamura and Csikszentmihalyi 2009; Shernoff et al. 2003). That is, individuals who tend to experience flow in a special set of activities should be motivated to engage in those activities and therefore gain expertise, at least in the long run. Thus, flow should have a direct as well as an indirect effect on performance, which are both depicted in Fig. 4.2.

However, a reciprocal relationship has to be assumed as the central precondition of flow experiences is a perceived fit between skills and demands. But such a fit should only be perceived in case the individual has the competence to deal with the demands of the situations. And obviously, an association between competence and performance can be postulated. Given the reciprocal nature of the relationship, correlational data regarding the relation between flow and performance have only limited information content. It remains unclear whether flow leads to a better performance or a good performance makes flow experiences more probable. Besides, certain personality variables (e.g., achievement motivation; cf. Eisenberger et al. 2005; Engeser and Rheinberg 2008) may foster both flow experiences and good performance, so that a spurious correlation between the two variables cannot be excluded.

To show positive correlations between skills–demands compatibility and performance seems even more trivial than finding positive associations between flow experience and performance because the specific skills–demands constellation has a built-in effect on performance—independent of the flow experience. First of all, when flow is operationalized as "challenges and skills above average," the independent and the dependent variables are confounded as high skills (above average) make good performance quite likely. For this reason, only studies measuring components of the flow experience itself (instead of challenges and skills) will be discussed in the following. Reported results were obtained in diverse areas, such as academics, music, sports, and computer games.

Academic Performance

In the academic context, correlational studies indeed found significant associations between flow experiences and performance. Schüler (2007), for example, conducted a study with students of a psychology course and found a positive relation between flow experiences in a typical learning situation and final grades. However, as former performance was not measured, one cannot draw conclusions about the direction of the relationship. Engeser and Rheinberg (2008; see also Engeser et al. 2005) report on two studies in which they confronted this problem. In a first study, students in a voluntary French course rated their actual flow experiences after 60 min of class time at two points during the semester. Those ratings correlated significantly with self-assessed learning progress after class as well as with the final marks which were based on oral participation and results of the final exam. In a second study, more than 250 psychology students reported on their level of flow experiences while working on a statistical task 1 week prior to the final statistics exam. Again, a positive relationship between flow and final grades was found. Moreover, the effect of flow on grades (both in the French course and in the statistics course) was small but remained significant when previous knowledge was controlled for. Thus, the authors conclude that "flow can be seen as a predictor of performance rather than just being part of high performance" (Engeser and Rheinberg 2008, p. 161).

Demerouti (2006) investigated the effect of flow experiences on performance in the work context and found first evidence that the association between flow and performance may be moderated by personality characteristics. Employees in ten companies completed the work-related flow scale (WOLF; Bakker 2008). Their job performance was rated by participants' colleagues. Whereas flow at work did not significantly correlate with peer ratings of job performance, an interaction term between flow and conscientiousness did. Participants who had high scores on conscientiousness *and* flow experiences at work achieved the highest ratings regarding in-role as well as extra-role performance.

In the field of music, there is first evidence that flow experiences and creativity in composition go hand in hand (MacDonald et al. 2006). Students had to meet in groups of three to work on group compositions and were asked to report on flow experiences every time they met. The creativity of their compositions was rated by lecturers and postgraduates, and interestingly, a significant correlation between group levels of flow and rated creativity emerged, suggesting that skilled music students tend to experience flow and/or flow experiences lead to creative compositions.

Performance in Sports

An area where the relationship between flow and performance is frequently assumed is the domain of sport. In this context, the flow experience is often related to the concept of peak performance (cf. Jackson and Roberts 1992; McInman and Grove 1991.

Box 4.3 The Study by Jackson and Roberts (1992)

Jackson and Roberts (1992) had 200 Division I college athletes indicate their general frequency of flow experiences in competition as well as the flow experiences they had while their best and worst performances. Participants represented a broad range of individual sports, including gymnastics, swimming, golf, track athletics, running, field athletics, and tennis. They were asked to answer a flow scale three times (flow in general vs. during best and worst performances) and to rate their ability.

What Jackson and Roberts found was that flow was experienced to a greater degree in the participants' best performances than it was generally in competitions. Another result of the study was that perceived ability was a significant predictor of the frequency of flow experiences. That is, athletes who perceived themselves as highly able reported a higher frequency of flow experiences than athletes who did not. Perceived ability accounted for approximately 7% of the variance in frequency of flow experiences.

These results suggest a considerable association between flow experiences and performance.

Indeed, some studies with professional athletes by Jackson and colleagues found significant associations between flow and sport performance: Flow scores were significantly higher when athletes referred to their best performance than when having rated their general experiences while competing (Jackson and Roberts 1992; see Box 4.3). Also, the amount of flow experience in a competition significantly correlated with both perceived skills and perceived success in that competition (Jackson et al. 1998, 2001) as well as with satisfaction with performance (Stein et al. 1995). Moreover, a small but significant relation between flow experiences in a competition and finishing position was found (Jackson et al. 2001). However, it has to be noted that all these studies do not allow for causal inferences.

In marathon races, no relationship between flow experience and performance in the race (i.e., running time) was found by Stoll and Lau (2005) as well as Schüler and Brunner (2009). Yet, the latter showed that flow during the training fostered pre-race training behavior which again predicted race performance. This provides evidence for an indirect effect of flow on performance, mediated by motivation to exercise.

Performance in Experimental Studies

Almost none of the few experimental flow studies we know about, which involve the measurement of performance, found a significant correlation between flow experiences and performance. The only exception is a study conducted by Engeser and Rheinberg (2008) who instructed their participants to play "Pacman" at different

difficulty levels. When controlling for baseline performance, they found that flow experiences at medium difficulty level (flow condition) explained a small amount of the variance of the performance in this playing mode, but this effect was only marginally significant. Schiefele and Roussakis (2006 using the game Roboguard) as well as Keller and colleagues (Keller and Bless 2008; Keller and Blomann 2008; using the game Tetris) did not find an association between flow experiences and performance when controlling for the different playing modes. The difference in results may be due to different measures of flow experiences. While the Flow Short Scale used by Engeser and Rheinberg (2008) included sense of control and smooth action, which can be presumed to be facilitators of performance, the flow measures applied in the other studies concentrated on other components of the experience (as involvement and enjoyment). Therefore, it would be helpful to clarify which components of the flow experience yield a positive effect on performance and which components do not play an important role in this context.

It has to be noted that even the experimental paradigms that have been developed in flow research cannot test for causality regarding performance as flow usually is induced by a manipulation of task difficulty. Therefore, the best strategy to test for a causal relationship between flow and performance seems to be a longitudinal design.

Toward a Better Understanding of the Relationship Between Flow and Performance

As we have seen, even in correlational studies, evidence regarding better performance in flow situations is mixed. Flow experiences and performance seem to go hand in hand, at least during music composition, in sports, and in learning settings, but the association probably is a reciprocal one, and studies using a longitudinal design, which also control for prior performance (Engeser et al. 2005; Engeser and Rheinberg 2008), suggest that the causal effect of flow experiences on performance is, if existent, of small magnitude. Therefore, when evaluating correlational data in a cross-sectional design, one should consider that a positive association may be basically driven by the influence of good performance on flow experiences, and not the other way around.

Besides, the association does not hold for every kind of activity. While it has been observed in some activities (academics, music, sports), there was no correlation between flow and performance observable in participants playing different computer games (Keller and Bless 2008; Keller and Blomann 2008; Schiefele and Roussakis 2006). It could be that the relationship only holds for activities that are perceived as important (cf. Engeser and Rheinberg 2008). Especially regarding meaningful activities, such as learning statistics as a psychology student, flow should have an indirect effect on performance, mediated by enhanced exercising behavior. This is what Schüler and Brunner (2009) found for marathon runners.

Also, other researchers (Delle Fave and Bassi 2000; Nakamura 1988; Shernoff et al. 2003) note that flow experiences may influence learning behavior in high

school students, and Lee (2005) found a substantial negative correlation between flow in learning situations and procrastination. But as all those studies are correlational in nature, the data do not suit for conclusions regarding the direction of the relationship. However, an indirect effect of flow experiences on performance, mediated by motivation to exercise, seems very likely. Considering the implications for practice (e.g., organizing learning environments in a way that fosters flow experiences; see Shernoff et al. 2003), further longitudinal studies should examine this proposed mediation to come to a better understanding of the relationship between flow and performance.

Conclusion

Studying flow has some nice side effects. Other than researchers in different research areas, one does not need hours to explain the topic one is interested in. Almost everyone knows what flow is, and almost everyone thinks it is a great research topic because the experience of flow is "so cool." Popular books by Csikszentmihalyi like "Flow: The psychology of optimal experience" (1990) or "Finding flow: The psychology of engagement with everyday life" (1998) surely contributed to this trend.

Flow seems to be a popular concept, and this is reflected in psychological research as well. As described in Engeser and Schiepe-Tiska (Chap. 1), the flow experience was intensively studied in the last years. Most researchers seem to regard flow as a quintessentially positive state of consciousness that is not only characterized by an enjoyable and thus autotelic experience but also likely to result in positive consequences as enhanced life satisfaction.

However, as the empirical evidence regarding consequences of flow experiences is not that unequivocal as the literature on flow may suggest, one has to be careful not to draw premature conclusions regarding the positive aspects of flow. In spite of the fact that the flow experience is a phenomenon that received much attention in the last years, there are still many open questions remaining.

We know much about the experience itself, and it seems assured that flow is characterized or accompanied by an autotelic experience. However, we have to learn more about consequences of flow experiences. Even though there is much theorizing about the influence of flow on positive affect and even enhanced performance, most of the studies in this field are correlational in nature and do not allow for causal inferences. Up to now, there have only been few attempts to manipulate flow experiences experimentally (see Moller et al. 2010). And as all these accounts involve manipulations of situational demands, they are not able to directly test causal effects of flow on performance.

Nevertheless, we argue that experimental flow research is absolutely necessary, even if inducing flow under controlled laboratory conditions may be difficult (cf. Moller et al. 2010). Surely, the ESM has proven to be a valuable method in flow research, if nothing else because of its high ecological validity which is not given when flow is induced in the laboratory. Correlational studies made a profound

contribution to the knowledge we have about the experience called flow. And, for sure, they will contribute to that knowledge in the future as well. But, as correlational data do not provide unambiguous information regarding the causal impact of flow-related factors (and even in longitudinal designs, potential confounding variables could be missed), an experimental approach is needed as a meaningful complementary strategy to test the causal assumptions of flow theory as well as hypotheses regarding the consequences of flow experiences. In addition, it would be of great value to further investigate the relationship between flow experience and its consequences in longitudinal studies, especially when following research questions which cannot be successfully answered by using experimental paradigms including the manipulation of a skills–demands fit, like the question whether flow leads to enhanced performance.

To conclude, it would be a great gain for everyone interested in flow experiences to increase the efforts to analyze the precise (causal) relationships between the components of flow, their antecedents, and consequences (see Fig. 4.1). Experimental paradigms as well as longitudinal research studies seem particularly meaningful research strategies. The fact that there are still so many open questions, for example, regarding cognitive consequences of flow experiences, should be a motivating factor for intensive research efforts in this interesting area.

Study Questions

- What is problematic in analyzing consequences of flow experiences?

  The main part of flow research is correlational in nature and does not allow for causal inferences. In experimental studies, flow usually is manipulated by establishing a skills–demands compatibility, which is the central precondition of flow. Hence, it seems possible to draw causal conclusions about the consequences of a skills–demands fit. It seems much more complex to analyze causal consequences of the flow experience itself because skills–demands compatibility could have consequences independent of flow. One possibility to overcome this problem is to measure the experiential components of flow and to check whether the effect of skills and demands on supposed consequences is mediated by the experience of flow.
- How does the relation between flow and intrinsic motivation look like?

  The assumption that intrinsic motivation is a central component of the flow experience per se has been put to discussion, but regardless of whether intrinsic motivation is understood as a component, a consequence, or even an antecedent of flow experiences, both should be closely interwoven as reflected in the fact that descriptions of flow in most cases capture the autotelic quality of the experience. The motivation to do what one does mainly has been documented in qualitative flow research, and correlations from different studies suggest that intrinsic motivation and flow experiences are closely related. However, the flow experience has to be regarded as more than being intrinsically motivated

as it is characterized by a specific combination of aspects that go beyond the element of autotelic experience.

- Does flow experience/skills–demands compatibility lead to positive affect?

  A definite conclusion regarding the relationship between skills–demands compatibility and positive affect is currently not possible. So far, we only can conclude that there is a positive association between flow preconditions as well as flow experiences and positive affect that is also supported by qualitative results, but we cannot draw causal inferences. Even though a causal relationship between flow and affect would make sense, it may be suggested that neither the relationship between skills–demands compatibility and positive affect nor the relationship between flow experience and positive affect is a deterministic one but qualified by characteristics of the individual, the situation, and the task.
- What are the contradictory hypotheses regarding cognitive consequences of flow experiences?

  On the one hand, based on the assumption that flow experiences go along with a focusing of attention, one may assume that individuals in a flow state—and probably after, as well—adopt a thinking style characterized by a focus on details, reflected in bottom-up processing strategies. On the other hand, previous research has shown that positive affect fosters heuristic processing. Insofar as individuals after the experience of flow are in a happy mood, flow should have an indirect effect on processing styles in such a manner that individuals after the experience of flow should tend to rely on top-down processing strategies. Further studies are needed to test these contradictory hypotheses.
- Describe the proposed relationship between flow and performance.

  A positive relationship between flow experiences and performance is postulated because of two reasons. First, flow is characterized by high concentration and a sense of control, which were found to be facilitators of performance. Second, flow could be seen as a motivating force for excellence which fosters personal growth. Individuals who tend to experience flow in a special set of activities should be motivated to engage in those activities and therefore gain expertise, at least in the long run. Therefore, flow experiences imply a growth principle, whereby more complex challenges are sought after and more complex abilities are likely to develop. Thus, flow should have a direct as well as an indirect positive effect on performance. However, one has to keep in mind that the relationship between flow and performance is a reciprocal one in all likelihood.

Chapter 5
Flow in Nonachievement Situations

Anja Schiepe-Tiska and Stefan Engeser

Abstract Flow research began with the study of activities which often occurred in achievement situations. To this day, most flow research still deals with achievement in the areas of sports, academia, and work where the balance of challenge and skill is important to foster flow. This chapter extends traditional flow theory by introducing the concept of implicit and explicit motives as personal needs that explain how individuals can experience flow not only in achievement situations but also in social situations like affiliative or power situations. We propose that flow emerges from the interaction of motive-specific incentives in a situation, such as challenge and skill balance, and a person's motives. Those motives are conducive to structuring situations which in turn foster flow. In this context, we also present studies dealing with flow in groups. We end this chapter by revealing some perspectives on future research on flow in nonachievement situations.

Introduction

The concept of flow was first described by Csikszentmihalyi (1975) in autotelic activities with strong achievement content, such as chess, rock climbing, and surgery. All of these activities have something in common: They provide clear standards of excellence, with unambiguous feedback about success and failure (for additional aspects of achievement situations, see Box 5.1). A chess player gets an immediate impression about his current performance and his own skills. For climbing, standards are clear, and skills can be obtained immediately. Likewise, surgeons have clear

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Box 5.1 Key Characteristics of Achievement Situations (cf. Brunstein and Heckhausen 2008)

1. In the situation, a standard of excellence is salient.
2. The standard of excellence can be the performance of the individual in the past, the performance of others, or a standard inherent in the task.
3. A person can reach (succeed) or not reach (fail) the standard of excellence.
4. The outcome (success and failure) is controllable by the individual and can be attributed to the individual's effort and skill and not (only) to luck or other external or uncontrollable causes.
5. The outcome provides sufficiently clear feedback about success and failure.

standards for success, and we all hope that they have the skills to succeed in their (difficult) tasks. Looking at the topics of current research on flow, achievement still plays a major role (see Chap. 1). Research is dealing with sports performance (Schattke 2011; Schüler 2010), academic learning (Engeser and Rheinberg 2008; Bassi et al. 2007), and innovations in work settings (Steiner et al. 2011).

However, since the first study of daily experiences using the Experience Sampling Method was conducted (see Chap. 2), it has been found that flow can also occur in activities which usually have no obvious achievement aspects like watching TV or meeting friends (Csikszentmihalyi et al. 1977; Csikszentmihalyi and LeFevre 1989). For example, Csikszentmihalyi (1975) discovered that some individuals mainly experienced flow in interactions with others, some in physical movements like walking, some in reading books or watching TV, and some experienced flow while watching people walking down the street. Also, a mother reading alternately with her daughter "loses touch with the rest of the world and is totally absorbed in what she is doing" (Csikszentmihalyi 2004, p. 41).

Aside from that, Csikszentmihalyi (1975) observed very early in his research that chess players perceived different incentives in the same situation while experiencing flow. *Incentives* are situational cues provided by a situation that are inherently affective rewarding for a person (task-intrinsic incentives; Stanton et al. 2010). Besides reaching flow "through self-imposed challenges" (Csikszentmihalyi 1975, p. 62), some chess players attained flow "through beating strong opponents and advancing in the hierarchy of ratings, others achieved flow through interacting with friends, [or] through playing when they feel like it…" (Csikszentmihalyi 1975, p. 62).

In fact, on the one hand, individuals differ in the situations in which they experience flow, and on the other hand, they can get an affective reward from different incentives in the same situation. In the present chapter, we will briefly review aspects of traditional flow theory important for the understanding of flow in nonachievement situations. Next, we aim to extend this theory by introducing the concept of implicit and explicit motives as personal needs that explain how individuals can experience flow in different situations and why they perceive different incentives in the same flow-occurring situation. In this context, we will present studies on flow in social situations like affiliative or power situations as well as research on flow in groups. We will end this chapter by revealing some perspectives on future research on flow in nonachievement situations.

Challenge and Skills in Nonachievement Situations

As outlined in other chapters (Chaps. 1, 2, and 3), challenge and skills have played a prominent role in flow research. In numerous ESM studies, individuals were asked to rate challenge and skills from low to high. If individuals indicate high challenge and high skills at the same time, they are expected to experience flow according to the quadrant model (see Chaps. 2 and 3). This operationalization of flow is problematic because it only gathers one component of flow (see Pfister 2002; Rheinberg 2008; and also Chap. 2 for an extended discussion about this operationalization of flow). Furthermore, the challenge and skill balance seems to make sense only in achievement situations. Here, people can readily indicate how challenging an activity is and how skilled they think they are.

In nonachievement situations, the question is less straightforward. Meeting friends, reasoning with colleagues, or watching TV lie within the range of normal abilities that do not necessarily have a challenging character in the usual sense of the word challenge. But when defining challenge more broadly as "opportunities for actions," as Csikszentmihalyi (1975; p. 49) did in the beginning of his research, one comes closer to an explanation of why flow can be experienced in situations without an obviously challenging character as well.

Csikszentmihalyi stated that there are generally many opportunities for actions in a situation, but a person cannot act upon all of them. "The question becomes one of a choice: which of these possible actions will I attempt to turn into my action?" (Csikszentmihalyi and Bennett 1971, p. 45). According to Csikszentmihalyi, the person would respond to an opportunity that fits one's perceived action capabilities (Csikszentmihalyi and Bennett 1971). This had been later identified as challenge and skills balance. Those action opportunities provide clear goals in the sense that the person knows exactly what to do next, which action opportunity to choose next. Consequently, the situation becomes well structured which in turn fosters becoming completely immersed in an action. As a result, the individual is highly engaged in the activity without consciously thinking about what to do next and flow occurs.

The Importance of Motives for Turning the Spotlight on an Action Opportunity

Besides challenge and skills, we argue that personal needs play an important role in whether or not a person recognizes and responds to an action opportunity. For this purpose, we introduce the concept of motives, which draw a person's attention to different motive-specific incentives of an action opportunity. Those motive-specific incentives are inherently rewarding for individuals high in a given motive. They arouse the individual's implicit motives and accordingly affect one's behavior.

Box 5.2 Assessment of Implicit Motives

Implicit motives are assessed using projective measures such as the Picture Story Exercise (PSE; Pang and Schultheiss 2005) or the Operant Motive Test (OMT; see Chap. 9) as well as semiprojective measures like the Multi-Motive Grid (MMG; Sokolowski et al. 2000). These two types of measures have in common that people are shown different picture cues. For the PSE or the OMT, people are instructed to write imaginative stories (see Pang 2010 to learn more about how to use the PSE) or short statements in response to the pictures. Afterwards these stories or statements are coded for the different motives (Winter 1994; Kuhl and Scheffer 1999). For the MMG, people are instructed to indicate whether or not a series of descriptions (e.g., "Trying to influence other people," "Feeling confident to succeed at this task") following a picture (e.g., a robe climber) describe the way they would think or feel in the situation shown in the picture. Current research also aims to develop a version of the Implicit Association Test (IAT), which was originally developed to measure racial or other attitudes that may be strongly distorted by social desirability, to assess implicit motives (Brunstein and Schmitt 2004, 2010).

Implicit motives are unconscious motivational needs that orient attention and select and energize behavior toward specific classes of rewarding task-intrinsic incentives (McClelland 1987; Schultheiss and Brunstein 2010). They are shaped by ontogenetically early, prelinguistic, affectively toned learning experiences (McClelland et al. 1989). Because people have no insight into their implicit motives, they are assessed using projective or semiprojective measures (see Box 5.2).

The research on motives has focused on the so-called big three motives: achievement, affiliation–intimacy, and power (McClelland 1987; cf. Heckhausen and Heckhausen 2008). The achievement motive is an enduring concern with maintaining or surpassing standards of excellence (McClelland et al. 1953), whereas the affiliation motive is an enduring concern about establishing and maintaining or restoring positive relationships with others (Atkinson et al. 1958). The power motive is a recurrent concern for having an impact on others (Winter 1973). Each motive is aroused by different motive-specific incentives (see Table 5.1).

Individuals differ in the strength of their motives. Depending on the strength, motives elicit different responses to the same situational incentive. For example, in a task of moderate difficulty, people with a high achievement motive increase their efforts more than people with a low achievement motive (Brunstein and Heckhausen 2008). It has also been shown that the implicit achievement motive selectively elicits performance on challenging tasks, but not on easy or difficult tasks (McClelland et al. 1953).

Applying these findings to flow research, the balance of challenge and skills would be expected to be a motive-specific incentive for the achievement motive. Indeed, the achievement motive was found to moderate the relationship between challenge–skill balance and flow experience (Schüler 2007; Engeser and Rheinberg

Table 5.1 Motive-specific incentives

Motive	Task-intrinsic incentive	Example
Achievement motive	Doing better for its own sake	Performing difficult task, getting performance feedback
Affiliation–intimacy motive	Experiencing friendly, warm-hearted social contacts	Chatting with friends, consoling a friend
Power motive	Feeling important, strong, dominant, and influential	Dominating others in competitions, teaching

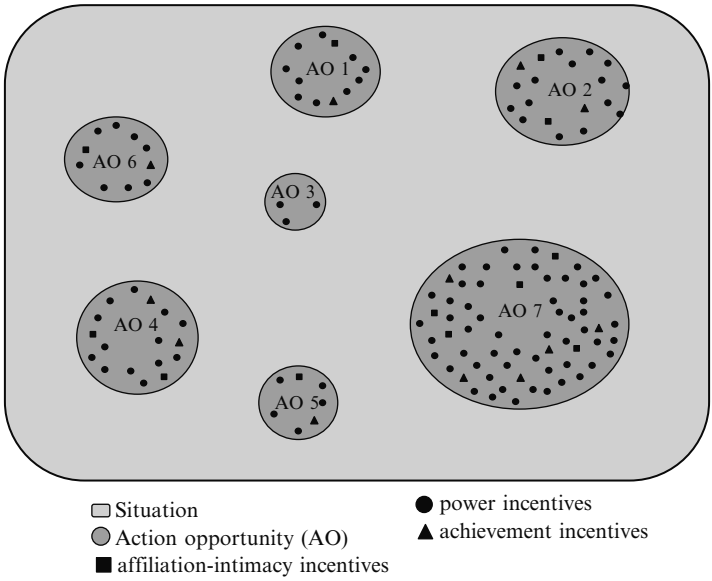

Fig. 5.1 Action opportunities and motive-specific incentives

2008). The challenge–skill balance predicted flow only for individuals high in the achievement motive but not for individuals low in achievement motive. However, for the affiliation and the power motive, other incentives would be more relevant. For these motives, skills are also notable, but they do not need to be in balance with the challenge in order to foster flow. Presumably, the skills have to be perceived as sufficient to act upon the chosen action opportunity (cf. Kehr 2004b).

To summarize, a person has many action opportunities in a situation but cannot attempt all of them; rather, he or she has to choose one. Whether or not a person responds to an opportunity depends in part on his or her skills, but also on his or her motives. The more motive-specific incentives an opportunity contains for the person, the more he or she orients his or her attention to it. Hence, that opportunity becomes more salient to the person. We illustrate this in Fig. 5.1. Circles represent action opportunities and dots, triangles, and quadrates represent different motive-specific incentives inherent in this opportunity. The bigger the size of the circle, the more

incentives are inherent in the respective opportunity. Therefore, action opportunity seven contains the most motive-specific incentives. Hence, it becomes more salient and accordingly will more likely be chosen to act upon.

For instance, let us imagine that a person develops a display for smartphones that prevents not just scratches but also fingerprints. He or she can decide to carry out the task alone (this would be a choice for people high in the achievement motive), to do it in a team and become an equal team member (choice for people high in the affiliation motive), or to do it in a team as well but as the leader of the team (choice for people high in the power motive). Depending on the person's motive pattern, each of those opportunities has the chance to foster flow. If the person chooses the action opportunity that is in line with his or her motives, and the perceived skills are sufficient, the situation becomes structured, and he or she is more likely to experience flow.

The Flow Hypothesis of Motivational Competence

Besides implicit motives, there are also explicit motives influencing the decision for or against an action opportunity (McClelland et al. 1989). *Explicit motives* (also called self-attributed motives) are consciously accessible evaluations of a person's self-concept (McClelland et al. 1989). They are cognitively based on verbal learning of rules, demands, and expectations and reflect people's self-attributed view of their own implicit motives (McClelland 1995; McClelland et al. 1989). Because a person is conscious of his or her explicit motives, they are measured via self-report questionnaires (see Box 5.3). Explicit motives respond to social-extrinsic incentives (e.g., values, beliefs) and influence the conscious decision for choosing an action opportunity. They attempt to channel implicit motives in line with conscious purposes, values, and beliefs (McClelland 1987). Analogous to implicit motives, research distinguishes between explicit affiliation–intimacy motive, explicit power motive, and explicit achievement motive (McClelland et al. 1989).

Box 5.3 Assessment of Explicit Motives

Explicit motives are measured via self-report questionnaires like the Personality Research Form (PRF, Jackson 1984a, b). People usually complete the scales for achievement, affiliation, and dominance. Sometimes, the scale for aggression is also used as another key component of the power motive (e.g., Schultheiss et al. 2009). People are instructed to indicate how they would behave in general, but not in response to specific situational contexts. They decide whether or not the statements apply to themselves. For example, an item measuring power (dominance) is "I feel confident when directing the activities of others"; an item measuring affiliation is "I try to be in the company of friends as much as possible," and an item measuring achievement is "I will not be satisfied until I am the best in my field of work."

The implicit and explicit motive systems coexist within a person but are widely independent of each other (McClelland et al. 1989; Weinberger and McClelland 1990). They are triggered by different stimuli and influence different behavioral responses (McClelland et al. 1989; Schultheiss and Brunstein 1999). Despite the independence and differences, the two systems interact with one another in channeling a person's behavior over the lifetime (Winter et al. 1998).

As long as both motive systems are independent of each other, there are individuals with congruent implicit and explicit motives (high implicit/high explicit motives or low implicit/low explicit motives) and individuals with incongruent implicit and explicit motives (high implicit/low explicit motives or low implicit/high explicit motives). Individuals with high congruence are more likely to explicitly choose opportunities in line with their implicit motives, which energize their behavior and lead almost effortlessly to a positive, enjoyable experience.

However, for individuals with incongruent implicit and explicit motives, McClelland et al. (1989) stated that "whatever the reasons for discordance [incongruence] between implicit and explicit motives, it can certainly lead to trouble" (p. 700). For example, motive incongruence increases negative affect (Schüler et al. 2008) and unhealthy eating behavior (Job et al. 2010) as well as decreases emotional (Brunstein et al. 1998; Brunstein et al. 1999) and physiological well-being (Baumann et al. 2005).

Therefore, when individuals choose opportunities that are only in line with explicit, but not with implicit motives, they choose things that seem suitable for themselves and seem to be important and valuable. The problem is that attempting to act on opportunities recurrently without supporting implicit motives needs conscious effort and brings little or no enjoyable experience. Thus, flow will be prevented.

For example, a manager with a high explicit but a low implicit power motive works in a leading position without enjoying the opportunity of influencing others. This could result in physiological and emotional stress like getting migraine right up to stomach ulcer or burnout. Another example would be a student with a high implicit but a low explicit affiliation–intimacy motive. She prepares for an exam alone, but soon becomes bored and starts to distract herself by cleaning up her apartment, because she would much rather be with her classmates in a study group, where they could talk about the things they are learning.

The ability to select motive-corresponding action opportunities is termed motivational competence (Rheinberg 2002). This means "a person's ability to reconcile current and future situations with his or her activity preferences such that he or she can function effectively, without the need for permanent volitional control" (Rheinberg and Engeser 2010, p. 532; cf. Bruya 2010a). Motivational competence has five components (Box 5.4).

Box 5.4 Components of Motivational Competence (Rheinberg and Engeser 2010)

1. Congruence between one's implicit and explicit motives (indicating an accurate motivational self-concept)
2. The ability to evaluate different incentives in a situation
3. If there are no incentives in line with one's implicit motives, the ability to endow the situation with motive-corresponding incentives
4. In long-term projects, focusing not just on expected benefits but on taking pleasure in the activities themselves
5. Knowledge of internal and external conditions influencing one's motivational processes (metamotivational knowledge)

The flow hypothesis of motivational competence states that individuals high in motivational competence are more likely to experience flow (Rheinberg and Engeser 2010). When a person's life is mostly self-determined and the motivational self-concept is accurate, one can select action opportunities in line with one's implicit motives. Implicit motives support and energize motive-corresponding action opportunities. The person knows exactly what to do next; the situation becomes well structured and flow can arise. In the case that no motive-specific incentives are present, the person endows the action opportunities with incentives that correspond to his or her motives in order to elicit flow.

First evidence for the hypothesis was found by Clavadetscher (2003, reported in Rheinberg and Engeser 2010), who investigated members volunteering for an organization to help organize cultural events like concerts. The members were able to choose the helping activity by themselves (e.g., inviting well-known artists, administration, or running the bar in the concert break). He found that the better the correspondence between the implicit and explicit motives, the more flow was experienced while performing their chosen activity. Also, Schüler (2010) showed that individuals with congruent implicit and explicit achievement motive experienced more flow in sports with achievement-related incentives compared to sports without achievement-related incentives. Schattke (2011) examined indoor wall climbers who climbed routes with an increasing level of difficulty. He found that for individuals high in achievement motive congruence, flow increased from an easy to a challenging route but only when they experienced achievement motive incentives during climbing.

Kehr (2004b) had a similar idea to Rheinberg in his compensatory model of work motivation and volition. The model proposes that the "congruence of implicit motives, explicit motives, and perceived abilities is associated with flow experience" (p. 489). In doing so, the model also allows for partial congruence. This means that the motive-specific incentives of an action opportunity arouse the implicit motives of a person and may or may not activate the congruent explicit motives. However, when explicit motives are activated which compete with the implicit motives, attention is distracted from the activity, and flow will be prevented.

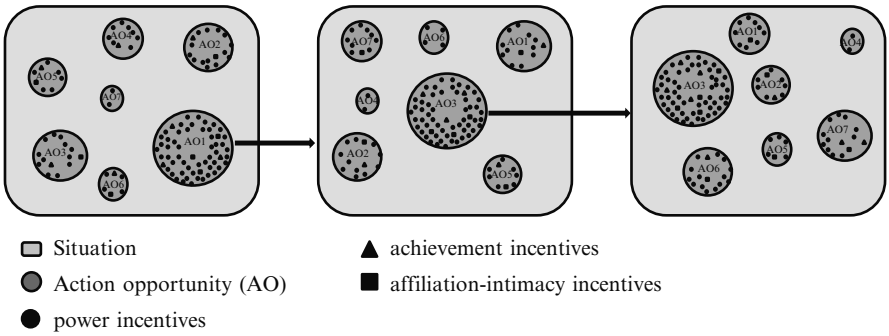

Fig. 5.2 The process of maintaining flow experience

For example, a woman with a high implicit affiliation–intimacy motive goes to a party and meets a very good friend there. Both start chatting extensively about their past experiences, about their boyfriends, etc. The person can experience flow while talking to her friend with or without knowing about her own motives (a high or a low explicit affiliation–intimacy motive). However, if the person believes herself to have a high implicit power motive, the party could also arouse her explicit power motive. Accordingly, she would prefer to walk around and talk to different people in order to extend her network rather than to be in a deep conversation with her very good friend. Hence, she cannot experience flow while talking to her friend because a conflicting explicit power motive is aroused. The person is distracted by task-irrelevant incentives that prevent flow experience. At the same time, even if she were to walk around and try to extend her network, she would probably not experience flow because the support of an implicit power motive is missing.

When a person chooses an action opportunity and acts upon it, the situation alters and other opportunities emerge. Again, the person responds to one opportunity and therefore changes the situation and so on (see Fig. 5.2). The implicit motives orient the attention and help to select the next motive-corresponding opportunity. Hence, the individual knows exactly which opportunity to attempt next and loses himself or herself in the series of actions which in turn elicit flow. Competing explicit motives activated through task-irrelevant incentives would interrupt the series of actions and therefore disturb flow experience.

Kehr (2004b) also integrated the skills back into a joint model with implicit and explicit motives. In contrast to Csikszentmihalyi (1975), the compensatory model proposes that "Perceived abilities surpassing task demands do not necessarily lead to boredom, or otherwise counteract flow … Low, compared to high, task demands only counteract flow if they prevent arousal of flow-concordant implicit motives or activate conflicting explicit motives" (Kehr 2004b, p. 489).

To review, flow as a motivational state emerges from a person × situation interaction. On the person's side, implicit and explicit motives as well as perceived abilities help to orient attention in situations und structure them. If one chooses an action opportunity in line with one's motives and the perceived skills are sufficient, one is more likely to experience flow because one knows exactly what to do next. Then, flow itself affects experience and behavior like well-being and performance (Fig. 5.3).

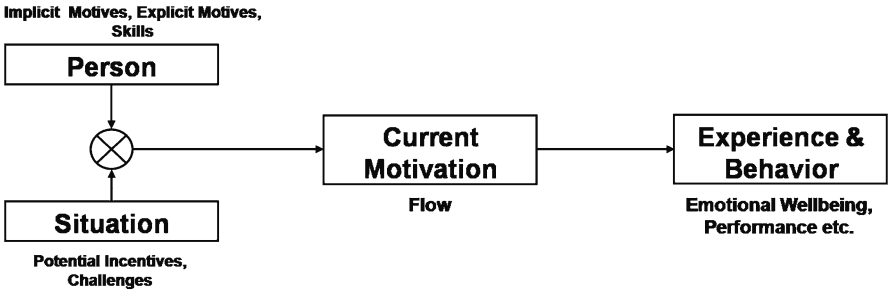

Fig. 5.3 Adapted basic model of "classical" motivational psychology (following Rheinberg 2006)

Factors Contributing to Flow in Social Situations

Affiliation-Intimacy and Its Incentives

As outlined above, implicit motives are primarily aroused by factors intrinsic to the process of performing an activity. Hence, the affiliation–intimacy motive can be aroused through incentives in social situations and therefore foster flow experience. In the PSE stories, the affiliation–intimacy motive is scored whenever a character expresses concern for establishing, maintaining, or restoring friendly relations with others or expresses sadness or other negative emotions about separation or disruption of a relationship (Pang and Schultheiss 2005). Individuals with a high affiliation–intimacy motive prefer situations that allow them to feel closely related to other people and to enjoy the presence of others (McClelland 1985a). Box 5.5 provides key characteristics of affiliative situations.

Research on the affiliation–intimacy motive distinguishes between affiliation and intimacy. The two are highly correlated but can be differentiated regarding the

Box 5.5 Key Characteristics of Affiliative Situations

1. Affiliative situations offer action opportunities to establish, maintain, intensify, or restore a relationship (e.g., spending friendly time together, parties, or just friendly small talk).
2. Affiliative situations provide social interactions with the expression of warm, friendly, or intimate feelings.
3. The outcome can be attributed to mutual affection of the interactants instead of instrumental gestures of kindness to achieve a different goal (e.g., sales situation).
4. The outcome of an interaction provides (sufficiently) clear feedback about the quality of the social relationship.

person with whom one has a relationship. Intimacy refers to close dyadic interactions like romantic relationships, whereas affiliation refers to any friendly and warm social contact. Therefore, the affiliation–intimacy motive is a "recurrent preference or readiness for experiences of close, warm, and communicative exchange with others—interpersonal interaction that is seen by the interactants as an end in itself, rather than a means to another end" (McAdams 1984, p. 45).

Individuals high in the affiliation–intimacy motive seek opportunities to enjoy interpersonal relationships. Once again, the incentives for capturing the implicit or explicit motive are somewhat different. Previous research (e.g., McAdams et al. 1984a, b). has found that people high in the implicit affiliation–intimacy motive showed more listening, smiling, eye contact, and laughter, which are likely to promote pleasant interpersonal interactions. In contrast, people high in the explicit affiliation–intimacy motive want to reinforce their self-view as sociable, competent in interactions with others and therefore place greater value on establishing positive interactions.

Craig et al. (1994) used the Rochester Interaction Record (Wheeler and Nezlek 1977) to examine differences in the implicit and explicit intimacy motive, which is a similar method to the ESM technique but without giving a signal to indicate the completion of the questionnaires. Participants are asked to complete an interaction record for every interaction that lasted 10 min or longer for 1 week. The authors showed that the explicit intimacy motive predicted the total number of interactions in a week, and the implicit intimacy motive the percentage of dyadic interactions. Furthermore, the implicit intimacy motive was associated with displaying higher levels of self-disclosure when interacting with close friends (because this is an interaction-intrinsic incentive). On the other hand, the explicit intimacy motive was only associated with greater self-disclosure in men and only when the situation explicitly called for such behavior because it was the nature of the interaction, such as being on a date.

To sum up, individuals high in the affiliation–intimacy motive seek opportunities for reciprocal dialog and interpersonal closeness. Likewise, Csikszentmihalyi (1975) discovered that in playing chess, an activity in which individuals often experience flow, players who found friendship and companionship important—which are opportunities containing affiliation–intimacy motive-specific incentives—belonged to more chess clubs. The camaraderie of other players was important to them, and playing chess provided a situation of social bonding. In Csikszentmihalyi's interviews, one player described that "Most of my social life is centered around chess players" and "I enjoy other chess players and the social life around chess which is unique" (1975, p. 68). Likewise, the main reasons for enjoying rock dancing, besides body movement and involvement with the music, were involvement with the partner and a feeling of togetherness (Csikszentmihalyi 1975).

Wong and Csikszentmihalyi (1991) examined the relationship of the explicit affiliation motive to related behaviors and quality of experiences in an ESM study. The outcome variables were derived from the Experience Sampling Form and included level of concentration, self-consciousness, control, feeling good about oneself, and wishing to be doing the activity. Results showed that women high in the

explicit affiliation motive felt happier, better about themselves, more involved, and more in control when in interaction with a friend compared to women low in the explicit affiliation motive. The experiences of men did not differ a great deal depending on whether they were high or low in the affiliation motive. Although all other variables from the Experience Sampling Form were reported, challenge and skills were not reported in the study, or were possibly not assessed. Hence, the balance of challenge and skills does not seem to be primarily relevant in affiliative situations, and therefore underlines our theoretical framework presented in this chapter.

The results of the aforementioned study also give rise to assume that whether a not a person reaches flow experience in social interactions may also depend on gender. Studies showed that women have higher levels of the implicit affiliation motive than men (Stewart and Chester 1982; McAdams et al. 1988; Schultheiss and Brunstein 2001; Pang and Schultheiss 2005) and also tend to describe themselves as more affiliative (Feingold 1994). This gender difference may reflect a possibly different socialization of women and men. Women are often expected to behave in a more communal and affiliative way than men (Bem 1974; Deaux and Lewis 1983). Hence, they have more opportunities to acquire such experiences. One could conclude that, in general, women may experience more flow in social situations than men. However, this would be an interesting aspect to examine in future studies.

Additionally, developing interpersonal relationships also requires skills. To get the intrinsic reward of flow experience from a social situation, sufficient social skills are required. Thus, women may have an advantage in experiencing flow in social situations because they have developed a stronger affiliation–intimacy motive and have better social skills to enjoy the situation and interact adequately with other people.

After being in a successful interaction with another person that has rewarded one with flow experience, an individual with a high affiliation–intimacy motive will seek such a social situation again because he or she wants to attain this state again. Therefore, he or she becomes more familiar with such situations and thus develops more social skills, resulting in the ability to actively structure the social interaction. Hence, the person knows how to respond without volitionally thinking about what to do next and can reach flow experience more easily.

Studies on Flow in Social Situations

Flow research has not focused on social situations exclusively, but has gathered data from such situations by chance in ESM studies (e.g., Csikszentmihalyi and LeFevre 1989). Good initial impetus for systematically analyzing flow in social situations was provided by Graham (2008), who examined couples in their daily lives using the ESM technique. Among other things, he questioned whether the level of flow experienced during an activity was positively associated with relationship quality. Therefore, he determined the time partners spend together and categorized their activities in nonfree time, including paid work, household work, child care, obtaining goods (e.g., shopping, doctor visits), personal needs (e.g., washing, eating, drinking), and

education (e.g., homework, attending classes), in contrast to free-time activities like volunteer work, movies, museums, sports, hobbies, reading, watching TV, conversation, cuddling, kissing, and sex. Results indicated that regardless of whether or not the activity included free-time components, flow during these activities was positively associated with relationship quality and how close a person felt to his or her partner. When both partners in a relationship focus their attention on the interaction and feel safe in the interaction, distraction is minimized and flow is a very likely experience.

Moreover, in social situations, flow can cross over from one person to another. Bakker (2005) showed that the higher the flow of music teachers had been, the higher the flow the students experienced. This effect of *emotional contagion* is explained as "The tendency to automatically mimic and synchronize facial expressions, vocalizations, postures and movements with those of another person and, consequently, to converge emotionally" (Hatfield et al. 1994, p. 5). The crossover effect may become even more important in situations where any more people are involved.

Flow in Groups

The question "Is doing it together better than doing it alone?" (Walker 2010, p. 1) guides flow research in a new direction. Walker (2010) determined whether flow in social companionships is more enjoyable than flow in situations without the presence of others. Students were asked to write down two situations in which they had recently experienced flow, one in which they had been alone and one in which they had been with others. Afterwards they rated how joyful the experience was for them. As a result, students reported more joy in interactive flow situations than if they were alone while experiencing flow. However, the study did not aim to examine whether people experienced more or less flow when they were alone or with others, nor it took possible moderators like the affiliation–intimacy motive into account. Therefore, the empirical question remains open.

Flow in groups is a very complex phenomenon because there are many interactions between numerous people. Besides factors of the person and the situation, other factors on the group level may become important to foster flow for example, size and structure of the group, relationship between group members, or trust.

In sports settings, there is some evidence on flow in team sports (Jackson 1995; Russel 2001). Here, the balance of challenge and skills is, as an achievement-motive-specific incentive, of course, important to experience flow. However, team sports also provide opportunities to be with friends, colleagues, and teammates and can therefore capture the affiliation motive. For individuals high in the affiliation motive, it is important to get to know the teammates very well in order to establish and maintain positive relationships. This in turn, may provide additional support to structure the sport situation, in order to elicit flow. For example, playing soccer is a complex situation for a team. It is not sufficient to have 11 great solo players; they also need to interact well with each other. The better a player knows the other team members, the better he is aware of how the others will react in specific situations and what

action opportunity they will choose. Therefore, he always knows what will happen next and which action opportunity to choose next depending on his or her teammates. As a result, flow can possibly occur.

Jackson (1995) interviewed elite-level athletes who competed as individual participants or as part of a team in international competitions. Athletes were asked about factors that help them to get into flow, factors preventing flow, and factors disrupting flow. For athletes in team sports, a positive team play and interaction, indicated through trust between players, a positive feeling on the team, unison movements, and focus among interacting teammates, were important to experience flow. In contrast, negative team interactions like negative talk or negative feelings within the team, as well as not feeling part of the team, not being trusted by the team, or not focused partner prevented and also disrupted flow. Also, the results of a study among college athletes showed that they appear to have similar experiences of flow states, regardless of whether they participate in individual (e.g., swimming, track, wrestling, triathlon) or team sports (e.g., football, baseball, volleyball, softball) (Russel 2001). Again, individual and team sports may provide different action opportunities with different motive-specific incentives. Therefore, both can elicit flow but because of the arousal of different motives.

Recapitulating, action opportunities which contain affiliation–intimacy motive-specific incentives can arouse the affiliation–intimacy motive. Individuals high in this motive orient their attention to those opportunities that in turn become more salient to the person. When such an action opportunity is chosen to act upon, flow is very likely to occur. Therefore, individuals high in the affiliation–intimacy motive should experience flow especially in situations that provide affiliation–intimacy motive-specific incentives.

Factors Contributing to Flow in Power Situations

Power and Its Incentives

The power motive is a recurrent concern for having impact on others (Winter 1973) in order to feel important and strong. Individuals high in the power motive have the desire to influence, control, or impress others and to be recognized for related behavior. Therefore, similar to individuals high in the affiliation–intimacy motive, they often need the (at least virtual) presence of another person upon whom they can have an impact. But in contrast to individuals with a high affiliation–intimacy motive who like social situations due to the opportunities to spend harmonious times with others, individuals with a high power motive prefer social situations because they can influence other people. For them, for example, it is more about networking and knowing many people. Box 5.6 provides key characteristics of power situations.

Box 5.6 Key Characteristics of Power Situations

1. Power situations offer action opportunities in which another person/the world at large is present upon whom/which one can have an impact or whom one can impress.
2. Power situations provide interactions in which a person can feel important, strong, and influential.
3. The outcome (successful influence) can be attributed to the individual's charisma and strength (e.g., rhetoric, influence strategies, forming alliances).
4. The outcome provides (sufficiently clear) feedback about being successful in influencing and/or impressing others.

Power situations provide a broad range of action opportunities with different power motive-specific incentives (Winter 1994). The first opportunities to exercise power are strong, forceful actions which have an impact on other people or the world at large, such as possibilities to accuse, attack, demand, chase, or threaten someone. The opportunity to resist the impact another person has on oneself also elicits the power motive. Every competitive situation—on a personal or on a team level—belongs to this category as well. Second, situations in which a person can control, regulate, or check upon other people provide action opportunities to arouse the power motive. Likewise, opportunities in which someone can persuade, convince, prove a point, or argue with others can activate the power motive. Fourth, each opportunity in which someone tries to impress others and shows concerns with fame, prestige, or reputation contains power motive-specific incentives. The final two power situations have a somewhat different connotation than the previous ones. They provide action opportunities to help, advise, or give support that is not explicitly solicited, for example, when a manager gives advice to one of her employees. Finally, any situation that provides an opportunity for a person to intentionally elicit a strong (positive or negative) emotional reaction to the action of another person is an incentive for the power motive. Eliciting emotions in others is a powerful socialized way of influencing other people (cf. Winter 1973; McClelland 1975).

The Personalized and Socialized Power Motive

The different power motive-specific incentives already point to two different aspects of the power motive: the personalized and the socialized power motive (McClelland 1970, 1975, 1985a; McClelland and Wilsnack 1972; Winter 1973; Winter and Stewart 1978). Both motives aim to influence others, but can be differentiated according to the outcomes with regard to the welfare of others.

Individuals high in the personalized power motive experience positive affect from making a purely self-interested impact on others. A high personalized power motive is positively associated with extreme risk taking (McClelland and

Watson 1973), sexual aggression (Winter 1973; Zurbriggen 2000), the acquisition of prestigious possessions (Winter 1973), assertiveness in friendships (McAdams et al. 1984a), increasing testosterone after dominating an opponent in a competitive game (Schultheiss et al. 1999), and conflict escalating decision making (Magee and Langner 2008), while it is negatively associated with making confessions during conflict resolution (Langner and Winter 2001).

Individuals high in the socialized power motive experience the same positive affect from having an impact that benefits other people. In contrast to the personalized power motive, a high socialized power motive is positively associated with carrying for others well-being (Magee and Langner 2008) and ratings of oneself as a responsible person (Winter and Stewart 1978). Thus, individuals high in the socialized power motive may choose action opportunities like teaching or parenting in order to experience flow. Looking at current research on flow, there is some evidence for both forms of power motive and their influence on flow experience.

Studies on Flow in Power Situations

Flow in Competitions

In his group of chess players, Csikszentmihalyi (1975) found different perceived reward structures based on the competitive level at which chess was played. He stated that players involved at a low competitive level enjoyed more autotelic elements of the game (the experience) whereas players involved at a high competitive level seemed to enjoy "exotelic aspects" (p. 60), like the competition itself and prestige. In this case, he may was premature to assume these to be exotelic aspects. In fact, competitions which are about prestige and beating someone in order to feel strong after a victory are task-inherent incentives that can elicit the implicit personalized power motive.

In the first study that examined directly the relationship between the implicit and explicit power motive and flow, Schiepe (2011) invited male students to the laboratory for a competition in which the contest outcome—victory or defeat—was experimentally varied. The competition contained power motive-specific incentives and was thus expected to arouse the power motive. Results showed that men with a high implicit and explicit power motive experienced more flow after winning the competition than men with a high implicit and explicit power motive after losing a competition. Also, winners with a high implicit and explicit power motive experienced more flow than winners with a low implicit, but high explicit power motive. Therefore, the congruence between implicit and explicit power motive indicating an accurate motivational self-concept led to a high flow experience. Neither the achievement motive congruence nor the affiliation motive congruence predicted flow. In sum, the results support the proposed theory of this chapter explaining how flow can be experienced in nonachievement situations. The competition aroused the implicit and explicit power motive. Hence, the motives were conducive to structuring the situation, which in turn fostered flow.

Additionally, one study analyzed the effect of playing against computer- vs. human-controlled opponents in an online game (Weibel et al. 2008). It was found that participants who believed that they were playing against a human user experienced more flow than participants who believed that they were playing against the computer. Here, the presence of another person may have been a stronger action opportunity to elicit the implicit power motive than merely playing against the computer resulting in higher flow experience for individuals playing against a human user.

Flow and Leadership

Early research on the implicit power motive indicated that a high implicit power motive is one helpful prerequisite for being a successful leader (Stewart and Chester 1982; Winter and Stewart 1977, 1978; Winter 1988; McClelland and Boyatzis 1982). The power motive structures situations in such a way that it makes action opportunities to have an impact on others salient. Therefore, leading others is a predestined job for individuals high in the power motive. However, a leader does not only structure situations for himself or herself; he or she also clarifies the rules and structures the situation for his or her followers. Especially, a leader who is high in the socialized power motive also provides his or her followers with action opportunities that meet their motives. Hence, they can act upon these opportunities successfully without being persuaded by the leader, and flow at the follower level is more likely to occur.

Current research particularly determines the effects of transformational leadership, which was found to have positive effects on the experiences and behaviors of followers (e.g., Bass 1997; Dubinsky et al. 1995; Tsai et al. 2009). Transformational leaders have a vision and inspire their followers to perform beyond their expectations by stimulating and transforming the followers' attitudes, beliefs, values, and needs (Bass 1985). Therefore, it shares some common characteristics with the socialized power motive.

Linsner (2009) examined the relationship between transformational leadership and work-related flow of the followers. The study indicated that transformational leaders who created a climate of contribution, recognition, and challenge had a positive influence on flow experience of the followers. Moreover, transformational leadership and flow experience together had a positive effect on work climate.

Boerner and von Streit (2006) showed that in an orchestra, the transformational leadership style of a maestro in interaction with flow experience of the musicians of the orchestra increased the cooperative climate of the orchestra (e.g., sticking together, no tensions between the instrument groups). When the maestro was high in transformational leadership and the orchestra players were high in flow, the cooperative climate was also high. When the maestro was high in transformational leadership but the orchestra players were low in flow, there was no increase in the cooperative climate.

Individuals high in the socialized power motive also tend to select a teaching profession for their career (Winter 1973; Winter and Stewart 1978). Hence, teaching

provides action opportunities eliciting the power motive and can thus foster flow experience. Froh et al. (1993) examined award-winning teachers and their most intrinsic rewarding situations. These teachers recalled their most joyful flow experiences in situations where they were vigorously engaging in classroom discussions and became completely absorbed in the discussion. Presumably, this was the result of structuring the discussion for themselves and for their students through their socialized power motive.

Summarizing, action opportunities in social situations can not only contain affiliation–intimacy motive-specific incentives but also personalized or socialized power motive-specific incentives. Thus, individuals high in personalized or socialized power motive can also experience flow in social situations when they choose action opportunities to act upon that arouse their power motive.

General Conclusion and Perspectives

The final conclusion drawn from this chapter is not to leave the key component of Csikszentmihalyi's flow theory—balance of challenge and skills—aside but to consider it as one possible motive-specific incentive that particularly arouses the achievement motive (cf. Chap. 9). Besides challenge and skills, there are other motive-specific incentives. They can arouse motives which in turn foster flow because they are conducive to structuring the situation. Luckily, a situation can contain many action opportunities with different motive-specific incentives and an individual can choose between them (according to their motives). Moreover, a person high in motivational competence is able to endow the situation with motive-specific incentives, which helps the person to frame the situation in such a way that it fits the person's own motives.

We hope that the broader theoretical framework offered by this chapter will make it easier to examine flow in situations where the balance of challenge and skills does not have priority. Hence, researchers do not have to try to fit their hypotheses and explain their findings in the light of balance and skills, but can determine flow in nonachievement situations, too. Very little research has been conducted in this area, possibly also due to the lack of a corresponding theory. The good thing is that many research questions still remain open.

First of all, the assumed connections between implicit motives and flow need to be confirmed empirically. First studies showed the proposed relationship between the implicit achievement motive (Schüler 2007; Engeser and Rheinberg 2008) as well as power motive congruence (Schiepe 2011) and flow experience. Even a relationship between the explicit affiliation motive and flow experience has been pointed out (Wong and Csikszentmihalyi 1991). Nevertheless, more studies need to be conducted to confirm the presented theory.

A further aspect to consider is that individuals can be high not just in one motive but also in two or more motives. Hence, the question arises of whether a clearly high characteristic in one motive or a special motive pattern is more conducive to fostering flow in the respective situation.

Additional research questions could deal with the processes of flow in groups in order to better understand the factors that foster and maintain flow in social situations. One main question that remains to be answered is whether flow in groups is merely the sum of flow experiences of the group members, because every member has aroused motives and individual flow experience crosses over from one to the other, or whether it is an collective phenomenon that is even greater than the sum of flow experiences and which has different required structures for the situation itself (e.g., Sawyer 2003). The flow of a group may also explain the great moments of teams when all members reach their highest potential and even unexpectedly beat a much stronger opposing team. Moreover, such a moment is a possible opportunity for the spectators to lose track of time and become totally absorbed while watching the game. Furthermore, research on leadership has just begun to recognize flow as a possibility to motivate employees.

In addition, the aspect that in flow the self and the action are merged might be described as a feeling of oneness, which seems to be important in nonachievement situations as well, but needs more theoretical and empirical research in order to be better understood (Siegel and Weinberger 1998; Weinberger et al. 2010; Schmid 2007).

Study Questions

- How did Csikszentmihalyi understand challenge and skills at the beginning of his research?

  He depicted challenge more broadly than the usual sense of the word challenge, as opportunities for actions and skills, as a person's perceived action capabilities.
- How can the incentive "balance of challenge and skills" be integrated into the theoretical framework presented here?

  The balance of challenge and skills is one possible motive-specific incentive which particularly elicits the achievement motive. Besides achievement motive-specific incentives, there are other incentives activating the affiliation–intimacy and power motive, which can also help to structure the situation. Therefore, the person knows exactly what to do next and thus flow experience is more likely to occur.
- What are implicit and explicit motives? Are they dependent on each other?

  Implicit motives are unconscious motivational needs that orient attention, and select and energize behavior toward specific classes of rewarding task-intrinsic incentives. In contrast, explicit motives are consciously accessible evaluations of a person's self-concept and reflect people's self-attributed view of their own implicit motives. Both motive systems coexist within an individual but are widely independent of each other. Research almost always points to a correlation close to zero between implicit and explicit motives.

- How are motives conducive to fostering flow experience?

  In a given situation, individuals have many action opportunities but cannot attempt all of them. They have to choose one. The more motive-specific incentives an opportunity contains, the more a person orients his or her attention to the opportunity. Therefore, the opportunity becomes more salient to the person. Hence, the motives are conducive to structuring the situation by making suitable action opportunities salient.
- What does the flow hypothesis of motivational competence state?

  The flow hypothesis of motivational competence states that individuals high in motivational competence are more likely to experience flow. When a person's life is mostly self-determined and, moreover, the implicit and explicit motive are congruent, one can select action opportunities in line with one's implicit motives. This will likely result in flow experience because the implicit motives support and energize motive-specific action opportunities and therefore help to structure the situation.
- Do implicit and explicit motives have to be congruent all of the time when one is experiencing flow?

  Kehr (2004b) assumes that implicit and explicit motives do not necessarily need to be congruent. The motive-specific incentives of an action opportunity arouse a person's implicit motives and may or may not activate the congruent explicit motives. However, only when explicit motives are activated which compete with the implicit motives flow will be prevented. Then, attention is distracted, and this hinders the experience of flow.
- What is the affiliation–intimacy motive? How does affiliation and intimacy differ from each other?

  The affiliation–intimacy motive is a recurrent concern for establishing, maintaining, or restoring friendly relations with others. Affiliation refers to any friendly and warm social contact, whereas intimacy refers especially to close dyadic interactions like romantic relationships.
- What are the key characteristics of affiliative situations?

  Affiliative situations offer action opportunities where another person is present with whom one can establish, maintain, intensify, or restore a relationship (e.g., spending friendly time together, parties, or just friendly small talk). They provide social interactions with the expression of warm, friendly, or intimate feelings, and their outcome (positive interaction) can be attributed to the individual's personality, effort, and skills (social competencies, e.g., empathy, active listening). This outcome provides (sufficiently) clear feedback about the quality of the social relationship.
- What are possible motive-specific incentives arousing the power motive?

  Motive-specific incentives for the power motive are inherent in each action opportunity that entails an impact on others or the world at large, for example, accusing, attacking, demanding, chasing, or threatening someone. Moreover, competitive action opportunities, concerns about fame, prestige, or reputation as well as opportunities to help, advise, or give support that is not explicitly

solicited and opportunities to intentionally elicit a strong (positive or negative) emotional reaction in others arouse the power motive.

- Can social situations offer action opportunities with power motive-specific incentives, too? If so, please explain the relationship between the power motive and social situations.

  Yes, action opportunities in social situations can also offer power motive-specific incentives. Both the affiliation–intimacy and the power motive are mostly dependent on the presence of another person. The presence of others is a key characteristic of social situations regardless of affiliative or power situations. Hence, social situation can be seen as a broader term for both types of situations, but the similar situation can be structured by motives differently. Additionally, a situation can contain different motive-specific incentives activating different motives and a person high in motivational competence is also able to endow the situation with motive-specific incentives and to reframe the situation in such a way that it fits one's own motives.

Chapter 6
A Conceptual Framework for the Integration of Flow Theory and Cognitive Evaluation Theory

Sami Abuhamdeh

Abstract Flow theory (Csikszentmihalyi, *Beyond boredom and anxiety: Experiencing flow in work and play*. Jossey-Bass, San Francisco, 1975) and cognitive evaluation theory (Deci and Ryan, *Intrinsic motivation and self-determination in human behaviour*. Plenum, New York, 1985) have each inspired a large body of research dedicated to understanding why we enjoy doing what we enjoy doing. Although both theories ostensibly address the same category of behavior—namely, intrinsically motivated behavior—there have been few serious efforts to reconcile these two theories. In this chapter, I attempt to clarify the relationship between them. Based on a review of relevant empirical findings, I suggest the two theories hold greatest explanatory potential for distinct behaviors, distinguished by their state-level motivational orientations. Furthermore, whereas CET appears to be most applicable to understanding the process of developing intrinsic motivation, flow theory appears the more useful framework for understanding variations in enjoyment once intrinsic motivation for an activity has been established.

Flow theory (Csikszentmihalyi 1975) and cognitive evaluation theory (CET) (Deci and Ryan 1985) have each inspired a large body of research dedicated to understanding why we enjoy doing what we enjoy doing. Despite what appear to be largely overlapping agendas, however, there have been few attempts at theoretical integration. This is especially surprising given both theories emphasize the role of competence-related processes. Flow theory proposes that intrinsically motivating experience is dependent on a balance of perceived challenges and perceived skills (cf. Chap. 2). Within CET, perceived competence is one of two key psychological constructs proposed to underlie enjoyment (the other being perceived autonomy) (Deci and Ryan 1985).

In this chapter, I attempt to clarify the relationship between these two theories. Because flow theory's concept of "optimal challenge" has most relevance for CET's

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perceived competence proposition, this chapter's primary focus will be on reconciling these two theoretical propositions. I begin by summarizing relevant empirical findings, highlighting those that are *not* consistent with the propositions, as they are especially useful in identifying the range of each theory's explanatory potential.

An assumption I make throughout this chapter is that flow theory is relevant for predicting not only flow but also enjoyment. Indeed, in most of the studies I refer to, the outcome variable was enjoyment rather than flow. This assumption is fully consistent with how the model was intended to be used since its inception (Csikszentmihalyi 1975). That is, although the model was developed by examining the conditions associated with optimal experience (flow), the intention was to create a model that could be applied toward a broader range of intrinsically motivated behavior.

Flow Theory

The Optimal Challenge Proposition

Flow theory was developed based on extensive interviews with rock climbers, chess players, athletes, and artists (Csikszentmihalyi 1975; cf. Chap. 1). These individuals described their most rewarding experiences while engaged in the activities they most enjoyed and the situational conditions associated with these experiences. Particularly prevalent among these conditions was the presence of significant challenge—challenge that pushed one's skills to their limit, but that were nevertheless not beyond one's perceived capacities. Csikszentmihalyi referred to such challenges as "optimal challenges." When such challenges were present, the rock climbers, chess players, and artists sometimes experienced a deeply rewarding state of mind, which Csikszentmihalyi termed "flow."

Later work on optimal challenges departed from this early focus on intrinsically motivated activities. Using the experience sampling method, researchers typically sampled a wide range of activities individuals engaged in during their day-to-day lives, including school-related activities and work-related activities. Results from this studies indicated that, whereas high perceived skills were consistently linked to enjoyment in these studies, high perceived challenges were not (e.g., Adlai-Gail 1994; Carli et al. 1988; Clarke and Haworth 1994; Haworth and Evans 1995). Indeed, zero-order correlations between challenge and enjoyment, from those studies that reported them, were either absent or negative (Chen et al. 2000; Hektner 1997; Moneta and Csikszentmihalyi 1996; Shernoff et al. 2003).

State-Level Moderators of the Link Between Challenge and Enjoyment

In assessing the implications of these findings, it is important to keep in mind that the studies they are derived from typically did not restrict their focus to goal-directed,

intrinsically motivated activities (as the original 1975 study had), but instead sampled a wide range of the everyday activities participants engaged in. This is important to consider for at least two reasons. First, many of these everyday activities, such as school-related activities and work-related activities, are not activities typically engaged in voluntarily for fun (i.e., intrinsically motivated), but out of obligation or necessity (e.g., Graef et al. 1983). In such contexts, individuals appear to most enjoy relatively low levels of challenge (Harter 1978; Koestner et al. 1987). Second, many of the activities we engage in during our day-to-day lives are not goal-directed, even those that are intrinsically motivated. Perceived challenge—a construct which implies the active pursuit of goals—would therefore seem to have less relevance for the enjoyment of such non-goal-directed activities.

In a recent ESM-based study of US college students, both state-level motivational orientation (intrinsic, nonintrinsic) and activity type (goal-directed, non-goal-directed) were assessed as potential moderators of the within-person relationship between challenge and enjoyment (Abuhamdeh and Csikszentmihalyi 2011a). As expected, the relationship was considerably stronger for activities that were intrinsically motivated than for those that were not. Furthermore, among these intrinsically motivated activities, challenge predicted enjoyment significantly more in the context of goal-directed than in the context of non-goal-directed activities.

A second study examined the challenge-enjoyment relationship in the context of a single intrinsically motivated, goal-directed activity—internet chess. (It is worth keeping in mind that chess was one of the "autotelic activities" that were examined in Csikszentmihalyi's initial work on optimal experience (1975) that served to inform flow theory.) Within this context, perceptions of challenge were strongly related to enjoyment ($r = 0.69$), even more so than state-level perceptions of competence. Furthermore, games against opponents with higher skill ratings were more enjoyable than games against opponents with lower skill ratings, even though the latter were associated with higher state-level perceptions of competence than the former.

Another potential moderator of the degree to which challenge is enjoyable—perceived outcome importance—was examined by Engeser and Rheinberg (2008). [Although the variable was referred to as "perceived [activity] importance" in the paper, I refer to it here as perceived *outcome* importance as this seems closer to how the authors conceptualized the construct, as is evident in the three items that were used in its operationalization (e.g., "I am worried about failing")]. Three different activities—playing Pac Man, studying statistics, and learning a foreign language—were examined. Flow-related experiences were most associated with a balance of challenges and skills only for the Pac Man game (which presumably was associated with lower outcome importance than the other two activities). For the other two activities, flow-related experiences were greatest when participants perceived their skills to be significantly greater than the challenges they faced. Furthermore, for each of the three activities, participants who attached relatively low importance to the outcome of what they were doing reported more flow-related experiences when there was a balance of challenges and skills than participants who attached more importance to outcome.

Conclusion

The optimal challenge proposition appears to best address the enjoyment of goal-directed activities characterized by a predominantly intrinsic motivational orientation. For this reason, the concept of optimal challenge appears most useful for predicting enjoyment in the context of goal-directed leisure activities such as sports and games. When concerns regarding performance outcomes are high (i.e., high extrinsic motivation), however, lower levels of challenge are typically more enjoyable (or perhaps less aversive), presumably because this implies a higher likelihood of attaining the extrinsic rewards that are sought (or avoiding the negative consequences of failure).

Cognitive Evaluation Theory

CET is a subtheory within self-determination theory (Deci and Ryan 1985) that aims to explain the conditions that elicit and sustain intrinsic motivation. According to CET, we enjoy activities to the extent that they satisfy the fundamental human needs of competence and autonomy.

The Perceived Competence Proposition

Perceived competence represents the degree to which an individual perceives him/herself to be competent at a given activity. Thus, the Perceived Competence Scale, "one of the most face valid of the instruments designed to assess constructs from Self Determination Theory" (Perceived Competence Scales, n.d., para. 2), assesses respondents perceived competence for an activity or domain. For example, a sample question from the Perceived Competence for Learning Scale (Williams and Deci 1996) reads: "I am capable of learning the material in this course." Perceived competence represents a domain-level cognitive assessment based on social-contextual information and should therefore be distinguished from state-level "feelings of efficacy" (White 1959) or "task-referential competence" (Elliot et al. 2002) that may accompany moment-to-moment behavior.

The "perceived competence proposition" is described as such: "Simply stated, we would expect a close relationship between perceived competence and intrinsic motivation such that the more competent a person perceives himself to be at some activity, the more intrinsically motivated he will be at that activity" (Deci and Ryan 1985, p. 58). Thus, if Ron believes he is a highly skilled tennis player, he should be more intrinsically motivated to play tennis than Paul, who believes he is a moderately skilled player.

Support for the perceived competence proposition comes from over three decades of empirical research. In laboratory-based studies, perceived competence has typically

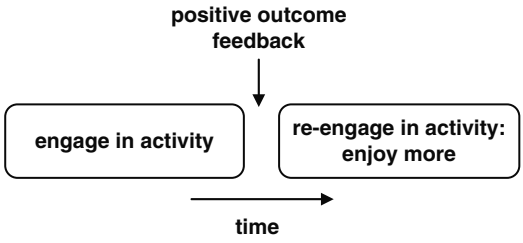

Fig. 6.1 The carryover effect between positive outcome feedback and subsequent enjoyment

been manipulated by varying the type of performance feedback participants receive while controlling for actual performance. Participants assigned positive verbal feedback (e.g., "you performed very well"), which increases participants' perceived competence, show more subsequent enjoyment of the task than participants assigned negative feedback or no feedback (e.g., Blanck et al. 1984; Deci 1971; Koestner et al. 1987). Additionally, in the context of competitive activities, participants who were told that they won the competitive activity they had just engaged in (and therefore received implicit positive performance feedback) subsequently enjoyed the activity significantly more the next time they engaged in it than participants who were told that they lost (Reeve et al. 1985, 1987; Reeve and Deci 1996; Tauer and Harackiewicz 1999; Vallerand et al. 1986; Vallerand and Reid 1984; Vansteenkiste and Deci 2003). The intervening period between competitive outcome and subsequent task engagement was as long as 3 weeks (Vallerand and Reid 1984). Several studies found that perceived competence mediates this "carryover effect" between outcome feedback and subsequent enjoyment (Fig. 6.1) (Reeve and Deci 1996; Vallerand and Reid 1984; Vansteenkiste and Deci 2003).[1]

State-Level Moderators of the Link Between Perceived Competence and Enjoyment

Results from other studies, however, suggest perceived competence does not always promote enjoyment. Elliot and Harackiewicz (1994) examined factors associated with the enjoyment of playing pinball. Participants were screened so that only experienced pinball players were included in the sample. Neither anticipated performance, nor midgame perceived competence, nor postgame perceived competence predicted enjoyment (in this study, like most studies which examine perceived competence as a predictor of enjoyment, actual performance was experimentally controlled). The authors suggested that while perceived competence may promote the *development* of intrinsic motivation for an activity, *maintaining*

[1] However, one study found that positive affect, rather than perceived competence, fully mediated the relationship (Tauer and Harackiewicz 1999).

intrinsic motivation for that activity is largely dependent on other factors. This null finding was replicated in a subsequent study which used a similar study design (Cury et al. 2002).

The condition under which perceived competence can account for intrinsic motivation was the specific focus of a pair of laboratory-based studies by Carol Sansone (1986). In study 1, task feedback (being provided answers to previously unknown questions) influenced enjoyment independent of perceived competence (perhaps by satisfying curiosity). In study 2, the positive relationship between perceived competence and enjoyment only held when competence had first been emphasized through the use of an ego-involvement manipulation: participants were told that doing well at the task was associated with greater intelligence and creativity. For participants who did not receive this ego-involvement manipulation, enjoyment was unrelated to perceived competence. A follow-up study which employed a similar design again found no relationship between perceived competence and enjoyment (Sansone 1989).

Conclusion

Although perceiving oneself as competent at a given activity appears to promote enjoyment when performance outcomes are of relatively high importance (i.e., high extrinsic motivation), when performance-related concerns are minimal or absent, perceived competence may have little or no effect on enjoyment.

Reconciling the Perceived Competence Proposition with the Optimal Challenge Proposition

What may be apparent at the point is the contrasting nature of the motivational orientations for which the two constructs appear to have greatest explanatory potential. Whereas optimal challenge appears to be most useful in understanding the enjoyment of intrinsically motivated activities (such as hobbies), in which performance outcomes are typically of relatively low concern, perceived competence appears most relevant to the enjoyment of activities in which performance outcomes are of relatively high importance. This makes sense when we consider that higher challenge decreases the likelihood of attaining a positive performance outcome, and higher perceived competence increases it. Thus, if a student desires a good grade on a math exam, then immediate experience will be greatest when perceived competence is high and challenges are low because of the implications for performance outcomes. In contrast, when the prime motivation is to simply have fun, optimal challenge becomes more relevant, and perceived competence less. A tennis hobbyist who considers himself to be an “average” tennis player (i.e.,

medium perceived competence) should have just as much fun playing a game of tennis as a tennis hobbyist who considers himself to be a "very good" tennis player (i.e., high perceived competence) if, in both cases (and controlling for other factors), optimal challenges are present.

Because outcome-related concerns for a given activity often decrease over time as an individual gains experience and acquires skills in an activity, the explanatory potential of the two constructs is likely to vary accordingly. Consider the following example. Elif is a student in a geometry class. On the first day of class, she is asked by the teacher to solve a relatively easy problem on the board. She nervously writes what she thinks may be the correct solution (due to her inexperience, she receives very little feedback from the task itself). At this point, how useful are the two constructs in predicting the enjoyment Elif experiences while attempting the solution on the board? The optimal challenge construct would not appear to be of much help here. Both laboratory-based and field-based studies have shown that when extrinsic motivation for an activity is high, "optimal challenges" do not tend to optimize experience (Abuhamdeh 2008; Engeser and Rheinberg 2008; Harter 1978). Rather, in these situations, we tend to prefer relatively easy tasks. In contrast, the perceived competence construct is more relevant—the more competent Elif believes she is at geometry, the more confidence she will have that her solution is correct, and the more enjoyable (or less aversive) the process will be. Furthermore, we should expect the performance outcome—whether her solution is right or wrong—to have a significant impact on her subsequent motivation for and enjoyment of geometry. If her solution is correct, the teacher will congratulate her, providing her with positive performance feedback. This positive performance feedback should increase her perceived competence in geometry, and this increase in perceived competence should make her more likely to enjoy herself the next time she attempts to solve a geometry problem (i.e., a carryover effect).

Let us assume that Elif's solution was correct and that she goes on to develop a keen interest in geometry—she now freely chooses to work on geometry problems outside of class, during her free time, purely for the fun of it. In other words, Elif is now intrinsically motivated to engage in geometry (interest researchers may say she has established *individual interest* for geometry) (e.g., Krapp et al. 1992). How useful are the two constructs now for predicting the variations in enjoyment she experiences from one episode of engagement to another?

Let us first consider perceived competence. At this point, would it be possible to predict the enjoyment Elif experiences while engaged in a given geometry problem based on the performance outcome of her previous episode of engagement (i.e., a perceived competence carryover effect)? This would seem unlikely. At this point, she would be well acquainted with geometry and would have already established a sense of her own competence at it. Any single outcome would be unlikely to have much of an impact on this assessment. Furthermore, intrinsically motivated, enjoyable activities provide participants with a stream of real, meaningful performance feedback *during* the course of engagement. Elif would now have the experience needed to

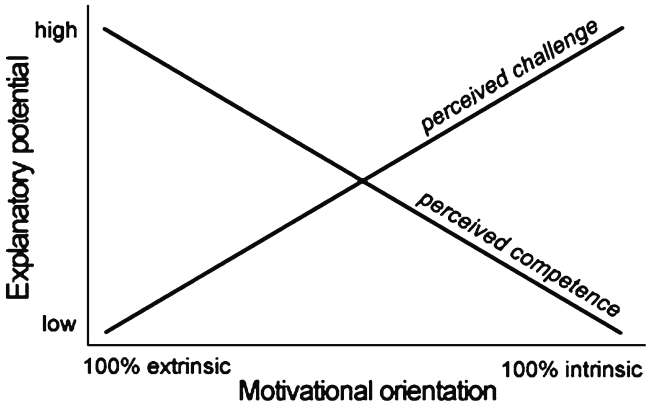

Fig. 6.2 The importance of perceived challenge and perceived competence for enjoyment as a function of motivational orientation

accurately interpret this feedback, and it is this feedback that would guide her behavior and experience, not feedback from a previous problem she attempted to solve.[2]

In contrast to perceived competence, optimal challenge does appear useful in predicting variations in enjoyment from one episode of engagement to the next once intrinsic motivation for an activity has been established. If an activity is too easy, boredom will ensue. If an activity is too difficult, boredom again (unless there is significant performance pressure, in which case anxiety will be more a more likely response). A balance between activity demands and perceived capacities offers the best potential for enjoyment and may even lead to flow.

Of course, to speak of intrinsic motivation as having been "established" or "not established" implies a binary that is unlikely to exist. More realistic is to conceive of a continuum, with one end representing high extrinsic motivation and low intrinsic motivation (e.g., taking a college placement exam) and the other end representing high intrinsic motivation and low extrinsic motivation (e.g., playing a familiar video game against a computer opponent). Across this continuum, the importance of perceived competence for enjoyment and the importance of challenge for enjoyment would be inversely related, as shown in Fig. 6.2.

CET and Optimal Challenge

For those who are unfamiliar with CET, it may come as a surprise that CET, like flow theory, emphasizes optimal challenge as an important condition for enjoyment (and therefore intrinsic motivation). This does not contradict CET's assertion

[2] This is not to suggest that if Elif's perceived competence for geometry steadily decreased over time, this would not have negative repercussions for her intrinsic motivation. Rather, it is to say that perceived competence loses its ability to predict the enjoyment of single episodes of engagement—a math problem, a tennis match, etc.—when a motivational orientation is primarily intrinsic.

that intrinsic motivation is rooted in the needs for competence and autonomy because, according to CET, "it is success at optimally challenging tasks that allows people to feel a true sense of competence" (Deci and Ryan 2000, p. 260). "When children are working with optimally challenging activities, perceived competence will tend to come naturally, for they will be having the experiences of success following concerted effort that lead to the perceptions of competence" (Deci and Ryan 1985, p. 124).

This conceptualization of optimal challenge is difficult to evaluate, as there seems to be an assumption that success experiences always accompany optimally challenging activities. Optimally challenging activities, however, are relatively difficult activities, and relatively difficult activities sometimes end in failure. A chess player involved in a very close game of chess, for example, faces the significant possibility of defeat, and thereby receiving negative outcome feedback.

However, it is possible to consider a different though related possibility—that the enjoyment of optimal challenge can be accounted for by state-level perceptions of competence that accompany the process of engagement itself. There is some evidence to suggest that the pursuit of optimal challenge is associated with heightened performance (e.g., Jackson et al. 2001; Schüler 2007), and feeling good about one's performance while engaged in an intrinsically motivated activity is positively related to enjoying that episode of engagement (e.g., Delle Fave et al. 2003; Jones et al. 2003). Furthermore, interview-based findings indicate that the pursuit of optimal challenge is typically associated with feelings of control (Csikszentmihalyi 1975).

Still, the general proposition that the enjoyment of optimal challenge can be reduced to information-based perceptions of competence seems unlikely. In a study of the enjoyment of internet chess games (Abuhamdeh and Csikszentmihalyi 2011b), experienced chess players most enjoyed games in which they performed only slightly better than equally rated opponents—outperforming these opponents by a wider margin was not as enjoyable. It seems unlikely that outperforming an equally rated opponent by a small margin would provide more positive competence information (both during and at the conclusion of the game) than outperforming the same opponent by a wider margin, so it is unclear how CET would account for this difference in enjoyment. Below, I suggest a couple alternative possibilities.

Other Reasons Why Optimal Challenges Are Enjoyable

Optimal Challenges Maximize Attentional Involvement

From its inception, the flow model (1975) stressed the role of attention. According to the model, when challenges are balanced by skills, attention is channeled from stimuli unrelated to the task at hand (e.g., self-focus, monitoring time, etc.) to the task itself. This heightened attentional involvement allows the person to enjoy the experience of being fully engaged in an intrinsically rewarding activity. Interviews and case studies of artists, surgeons, athletes, and others have found that when

these individuals describe their most enjoyable moments, they frequently mention high concentration and an intense involvement in whatever they happen to be doing (Csikszentmihalyi 1975; Jackson and Csikszentmihalyi 1999). Several laboratory-based studies have provided empirical support for a positive relationship between attentional involvement (referred to as "task involvement" or "task absorption" in these studies[1]) and enjoyment (Deppe and Harackiewicz 1996; Elliot and Harackiewicz 1994; Harackiewicz and Elliot 1998).

The possibility that attentional involvement mediates the relationship between a balance of challenges and skills and enjoyment was examined in a recent experience sampling study of US college students (Abuhamdeh and Csikszentmihalyi 2011a). Multilevel, within-person analyses indicated that (1) as expected, there was a greater balance of challenges and skills associated with greater enjoyment, and (2) this positive relationship was fully mediated by attentional involvement. That is, when attentional involvement was statistically controlled, the relationship between challenge/skill balance and enjoyment was no longer significant. Due to the observational nature of the data, however, it was not possible to rule out spurious relationships, nor could conclusions regarding causality be made. Indeed, it seems possible, even probable, that reciprocal causality exists in the relationship between attentional involvement and enjoyment, with attentional involvement being both a cause and consequence of enjoyment.

Optimal Challenges Maximize Suspense

In the context of intrinsically motivated activities, part of the enjoyment of optimal challenges may come from the *suspense* of not knowing what the ultimate outcome will be. Optimal challenges maximize outcome uncertainty, and outcome uncertainty adds significance and drama to one's immediate actions and promotes further involvement in the activity. When outcome uncertainty is low—as when a chess player outperforms his or her opponent by a wide margin—so too is the degree of suspense.

The possibility that optimal challenge may be linked to suspense in the context of a goal-directed activity, and that this heightened suspense may, in turn, increase enjoyment, was recently examined in a study which had participants play four games of "Speed Slice" on the Wii video game console (Abuhamdeh 2011). In order to minimize performance-related concerns, participants were told they were playing against the computer (although in reality their opponent was an out-of-view research assistant) and were left to play alone in a private area, unobserved. Additionally, participants were told previous research indicated that game performance was unrelated to both mental and physical ability. During each game, play was paused, and participants completed a short survey which measured various subjective states including suspense and enjoyment. Additionally, the game score at that time was recorded. Multilevel, within-person results indicated that, as expected, very

close, "optimally challenging" games were associated with greater enjoyment than lopsided games (even those in which participants outperformed their opponents by a wide margin). More importantly, suspense mediated this positive relationship, accounting for almost half of the variance, even after controlling for perceived competence. This finding lends support to the notion that the enjoyment of optimal challenge cannot be completely accounted for by competence-related effects.

CET's Perceived Autonomy Proposition

In addition to a need for competence, CET proposes humans also have a *need for autonomy*—a need to experience the initiation and regulation of behavior as self-determined (Ryan and Deci 2000). CET's perceived autonomy proposition states that events that increase a person's perceived autonomy while performing a certain behavior will increase intrinsic motivation for that behavior, whereas events that decrease perceived autonomy will decrease intrinsic motivation (Deci and Ryan 1985). This proposition has been well supported empirically. Participants given a choice about which puzzles to work on, for example, subsequently enjoyed the puzzles to a greater extent than participants who were not given this choice (Zuckerman et al. 1978)—in other words, a perceived autonomy carryover effect. Other studies have shown that extrinsic rewards can undermine subsequent enjoyment (e.g., Deci 1971), presumably because such rewards are experienced as controlling and therefore reduce one's sense of autonomy and freedom.

The concept of autonomy is not explicitly represented in flow theory, as Deci and Ryan (2000) have pointed out:

> Perhaps the most important [difference between CET and flow theory] is that flow theory does not have a formal concept of autonomy, instead basing intrinsic motivation only in optimal challenge (which, as a concept, is relevant primarily to competence rather than autonomy). SDT, on the other hand, has always maintained that even optimal challenges will not engender intrinsic motivation or flow unless people experience themselves as autonomous in carrying them out—that is, unless the behaviors have an I-PLOC [internal perceived locus of causality]. Although Csikszentmihalyi has at times referred to the idea of autonomy, it has not been represented as a formal element in the theory (p. 261).

Deci and Ryan go on to suggest that expanding flow theory so that it accounts for the need for autonomy (as well as the need for competence and the need for relatedness) would significantly increase the range of behaviors capable of being addressed by the theory.

Given the huge number of positive motivational outcomes the concept of autonomy has been linked to within the STD literature (for a review, see Ryan and Deci 2006), it is worth considering possible reasons for the absence of a concept of autonomy in flow theory. The original intention of the theory was to account for enjoyment in the context of "autotelic" (i.e., intrinsically motivated) activities (Csikszentmihalyi 1975). When the chess players, athletes, etc., who were interviewed were asked to describe their "optimal experiences," heightened perceptions of autonomy or freedom

were *not* commonly reported as distinguishing features of these experiences. That is, they did not distinguish optimal experiences from more mundane (but still relatively enjoyable) experiences while engaged in these activities.

This makes sense when one considers the nature of autotelic activities. These activities are associated with preponderantly intrinsic motivational orientations (i.e., located on the far right of the *x*-axis in Fig. 6.2). In the context of such activities, variations in enjoyment would seem to have little to do with perceptions of autonomy because perceptions of autonomy are no longer a significant issue. If a chess enthusiast plays two consecutive games of internet chess within a single sitting and enjoys the second game significantly more than the first, how likely is it that perceptions of autonomy would have much to do with the difference in enjoyment? In the context of intrinsically motivated activities, fluctuations in enjoyment appear to be influenced primarily by factors other than perceived autonomy and perceived competence, such as perceptions of challenge and feelings of efficacy (White 1959). The question of whether flow theory may profit by incorporating the concept of autonomy, therefore, depends on the intended scope of the theory.

Conclusion

Albert Bandura (1986) observed that while moderate levels of self-efficacy (i.e., perceived competence) seems necessary for interest in an activity to develop, additional self-efficacy does not appear to promote additional interest. He therefore proposed the existence of a "threshold" beyond which additional self-efficacy has no effect on interest.[3] Building on this, Elliot and Harackiewicz (1994) distinguished between the *development* of intrinsic motivation for an activity for which intrinsic motivation has yet to be established, and the *maintenance* of intrinsic motivation for an activity once intrinsic motivation for an activity has been established. Although this distinction was originally made an account for perceived competence null findings (perceived competence did not predict enjoyment for an intrinsically motivated activity, Elliot and Harackiewicz 1994), the general distinction also appears useful for identifying the motivational contexts in which optimal challenges promote enjoyment. Whereas both perceived competence and perceived autonomy appear to have greatest explanatory potential when extrinsic motivation is high and intrinsic motivation is low, optimal challenge appears most relevant for the enjoyment of activities high in intrinsic motivation and low in extrinsic motivation, activities which Csikszentmihalyi referred to as "autotelic" (Csikszentmihalyi 1975). Referring back to the example of Elif the Geometry 1 student, CET may aid in understanding why Elif *develops* intrinsic motivation for

[3] Like most higher level psychological variables, variations in state-level motivational orientations are likely to be continuous rather than discrete. For this reason, the existence of an actual "threshold" seems unlikely.

geometry, whereas flow theory appears more useful for understanding why Elif *continues to enjoy* geometry once she has established intrinsic motivation for it.

Study Questions

- In Csikszentmihalyi's initial work on optimal experience (1975), challenge was a key condition for the enjoyment of autotelic activities such as chess, rock climbing, and dance. Later findings from studies which used the experience sampling method to examine the enjoyment of challenge across a wide range of everyday activities suggest that in many of these studies, challenge was unrelated to enjoyment. What is one possible reason for this discrepancy in findings, according to the author?

  One possible reason is that many of the activities sampled in studies which used the experience sampling method were often not intrinsically motivated. A second possible reason is that many of the activities were not goal-directed.
- According to CET, what two fundamental needs underlie intrinsically motivated behavior?

  The need for competence and the need for autonomy.
- Describe a real-life scenario in which, according to the author, a perceived competence carryover effect is likely to occur.

  A perceived competence carryover effect is likely to occur in the context of an unfamiliar activity associated with significant outcome importance, especially if the activity provides minimal performance feedback to the participant during the process of engagement. Imagine, for example, a blindfolded boy playing the children's game Pin the Tail on the Donkey for the first time, in front of his peers. If he receives positive outcome feedback, his perceived competence at the game should increase, and this should have a positive effect on enjoyment the next time he plays the game.
- Zach is playing his favorite video game, Smash Brothers, for the 896th time. According to the author, which of the two theories (flow theory or CET) is more likely to be useful in this situation for predicting how much Zach will enjoy the game?
  Flow theory.

  (a) According to CET, why are optimal challenges enjoyable?
  (b) Describe another possible reason why optimal challenges are enjoyable.

  a. According to CET, optimal challenges are enjoyable because they maximize perceptions of competence.
  b. Optimal challenges may promote attentional involvement, and this would promote enjoyment. Optimal challenges may also heighten suspense, which has been linked to enjoyment.

Chapter 7
The Dark Side of the Moon

Julia Schüler

Abstract When talking about flow, most people probably think of a highly desirable state associated with a broad variety of positive outcomes in terms of positive motivation, well-being, and performance. In contrast, this chapter suggests that the characteristics of flow also have the potential to be evil. First, we will explain how flow can lead to addiction when exercising, playing games, and using the Internet. Then we will consider how flow is linked to impaired risk perception and risky behavior. As a third negative facet of flow, we will outline how it can also be experienced in antisocial contexts and during combat. This chapter ends with some broader comments on the dark and bright sides of flow, including flow as a universal experience, the implications for practical interventions, ethical questions related to flow, and future research questions.

The Dark Side of the Moon

"The Dark Side of the Moon" is the title of an album by the progressive rock group Pink Floyd, which is frequently ranked as one of the greatest rock albums of all time and also the title of a book by the Swiss author Martin Suter. At their heart, both these masterpieces say that everything has a dark side which is often not visible at first sight. In this chapter, we will discuss to what extent this might be true of flow.

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The Hitherto Neglected Dark Side of Flow

In the literature, flow is conceptualized as an optimal motivational state characterized by a positive quality of experience and associated with high performance (Csikszentmihalyi 1990; cf. Chaps. 1 and 3). So far, empirical analyses of flow have mainly focused on the bright sides of flow, revealing flow to be a predictor of performance in the workplace (Eisenberger, et al. 2005), in academic learning settings (Engeser, et al. 2005), and in sports (Jackson et al. 2001). Flow has also been shown to predict persistence in activities (Csikszentmihalyi 1993) & creativity (Perry 1999). In addition, the repeated experience of flow has positive effects on mood, for example, during one's working day (Csikszentmihalyi and LeFevre 1989) and in an academic learning setting (Schüler 2007). To summarize, in the literature flow comes across as being a highly desirable state that is worth promoting by creating flow-facilitating environments in a broad variety of life domains.

Interestingly, hardly any studies have addressed Csikszentmihalyi's claim that "Flow experience, like everything else, is not *good* in an absolute sense" (Csikszentmihalyi 1990, p. 70). Csikszentmihalyi and Rathunde (1993, p. 91) answer their rhetorical question whether flow is always a good thing with the clear statement that "Like other forms of energy, from fire to nuclear fission, it [flow] can be used for both positive and destructive ends." Csikszentmihalyi is thereby suggesting that the bright side of flow is accompanied by a dark side. This can already be concluded from a critical look at the extended definition of flow as a state "in which people are so involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it" (Csikszentmihalyi 1990, p. 4). Is flow associated with a reckless disregard for other important interests and needs of oneself and of others? Does flow have costs?

This chapter will to some extent give an affirmative answer to these questions. Under certain circumstances, flow is associated with neglecting other domains of one's life and the interests of other persons. Costs can be time costs, for example, spending days and nights working on an interesting project; financial costs such as financing expensive leisure time activities; costs to one's physical health; and even costs to one's psychological growth, when important other goals (that do not produce flow and that require self-control) are disregarded. Before elaborating on these possible costs in more detail, the dark and bright sides of each flow component will be described.

The Characteristics of Flow and Their Potential to Be Good or Bad

Flow is a multifaceted phenomenon mainly characterized by "[…] a subjective state that people report when they are completely involved in something to the point of forgetting time, fatigue, and everything else but the activity itself" (Csikszentmihalyi and Rathunde 1993, p. 59). The deep involvement in a task is usually described as a positive feeling. However, it is also associated with a loss of self-awareness, which

means not thinking about the compatibility between one's current activity and one's future goals and personal values. For example, spending hour after hour playing computer games might cause time conflicts with one's future educational goals (revising in order to pass an exam) and one's personal goals (fostering social relationships) and might be incompatible with one's high regard for engaging in cultural activities and being an active person. Thus, flow might produce short-term and long-term goal and psychological conflicts.

Other characteristics of flow can also be interpreted in a less "bright" way. Thus, the strong concentration on the task at hand means a narrowed focus of attention that makes it impossible to process information which is unrelated to the task, but nevertheless important. For example, individuals who spend night after night playing computer games might neglect social cues about the inappropriateness of their behavior.

Individuals experiencing flow feel a sense of high control over their actions. This feeling of control, which is accompanied by an absence of anxiety, might be unrealistic and lead to an underestimation of one's psychological and physical vulnerability.

During flow, individuals often report a distortion of time. Time often seems to pass quickly. This can be interpreted as the absence of boredom (in which time seems to stand still), but could also have negative effects on activities which require a precise sense of time. In addition, flow can wreak havoc on useful time schedules (being home from work at 6, finishing a project on time in order to allocate resources to the following project, stopping playing computer games at midnight). Table 7.1 sums up the potentially dark sides of flow characteristics.

In the following, the few existing studies about flow's dark sides which have been published in the scientific psychological literature so far will be summed up (addiction, risk-taking, and fighting in combat). Please note that the empirical basis for flow as a predictor of negative outcomes is still weak, and theoretical and practical implications must therefore be interpreted with caution.

Flow and Addiction

The International Classification of Diseases (ICD 10, World Health Organization 1994) defines addiction (F1x.2 dependence syndrome) as a cluster of phenomena in which "the use of a substance takes on a much higher priority for a given individual than other behaviors that once had greater value."

Box 7.1 Defining Features of Dependence

- Strong desire or sense of compulsion to take the substance
- Evidence of tolerance
- Persisting with substance use despite clear evidence of overtly harmful consequences

Table 7.1 The dark sides of flow characteristics

Flow characteristics	The dark sides of flow characteristics
Loss of self-reflection	Neglecting further goals and values (of others)
Exclusive concentration on the task at hand	Narrowed focus of attention excluding additional information
High control, absence of anxiety	Overestimation of one's abilities, unrealistic optimism
Distortion of time	Neglecting temporal information although it is relevant

Although these criteria (see Box 7.1) were developed for psychoactive substance use and describe the symptoms of mentally ill persons, some criteria are also applicable to the experience of flow (cf. Grant et al. 2010).

Individuals report a strong desire to experience flow again (Csikszentmihalyi and Rathunde 1993) and prioritize it at the cost of other behaviors. Because the experience of flow is more likely at a balance between the challenge of a task and the skills of a person (Nakamura and Csikszentmihalyi 2002; cf. Chap. 2), the situational challenges have to be continuously adapted to the improving skills of a person. Thus, individuals show evidence of tolerance, such that increased "doses" of the flow-producing behavior are required in order to achieve effects originally produced by lower "doses" of behavior. For example, higher mountains have to be climbed due to increased physical fitness, and more ambitious job projects have to be generated due to increased knowledge and competence. Finally, individuals persist in activities although they know the possible harmful consequences (even for their lives) (see below).

Reward as a Mechanism by Which Flow Leads to Addiction

As in addictive behavior, individuals desire to experience flow over and over again. According to the principle of operant conditioning, the positive quality of the flow experience functions as a reward which enhances the probability that the activity will be performed again. The bright side of this rewarding process is that individuals enhance their skills and competences and achieve higher performance over time because they are constantly adapting the difficulty of the task to their skills.

The dark side is that being rewarded is sometimes a powerful motivating force at the expense of conscious control. In Csikszentmihalyi's (1990, p. 62) words, "When a person becomes so dependent on the ability to control an enjoyable activity that he cannot pay attention to anything else, then he loses the ultimate control: the freedom to determine the contents of consciousness. Thus, enjoyable activities that produce flow have a potentially negative aspect." Examples of such enjoyable, flow-producing activities which have attracted interest in previous research are summed up in the following paragraphs: exercising, playing computer games, and using the Word Wide Web.

Flow and Exercise Addiction

The rewarding quality of flow has been described by teenage skateboarders as an intense subjective experience accompanied by heightened concentration, peak performance, and transcendence (Seifert and Heddersen 2010). A study by Partington et al. (2009, p. 176) confirms the rewarding quality of flow in a sample of big wave surfers and in addition analyzes its positive and negative consequences.

The authors interviewed the world's top big wave surfers and found that most of them experienced flow. They report, for example, the exclusive focus on the activity itself ("There is nothing else in your mind. There is nothing else that matters"), the distortion of time ("For a moment in time, time stands still"), and a high sense of control ("You are able to control the most uncontrollable because everything becomes slow motion and that's when you know you are surfing the best") (citations from Partington et al. 2009, p. 176). The surfers describe the rewarding quality of flow as a peak experience, comparable to euphoria, as a great joy in performing perfectly which enhances self-esteem, which is accompanied by feelings of personal fulfillment.

However, simultaneously, they actually use the term "addiction" when describing their experiences. Additional features are reported that would qualify as a diagnosis of exercise dependence according to Hausenblaus and Downs (2002), such as tolerance (increase the speed of surfing to achieve the positive feeling of flow), withdrawal symptoms (depression, feeling depleted when not able to surf), conflicts with social life (surfing conflicts with the interests of the life partner), and continuation despite injuries (e.g., prolonging healing times) (see Box 7.2 for examples from Partington et al. 2009).

According to Jacobs (1989), addiction goes along with dissociative symptoms, such as blurred reality, trance-like state, out-of-body feeling, and positively altered self-perception. Exploring the potential link between flow and addiction, Wanner et al. (2006) investigated the relationship between flow and dissociation in exercisers and in recreational and pathological gamblers. They argue that the pathological

Box 7.2 Citations Supporting Exercise Dependence of Big Wave Surfers

Addiction	"Once you get familiar with that feeling, it's an addiction" (p. 176)
Tolerance	"Nothing is ever enough," "After each turn, you want to accelerate faster in to the next turn" (p. 176)
Withdrawal	"There is psychologically after all that is done, there is a depression almost" (p. 179)
Social conflicts	"My husband wants to have babies. I kinda don't cause I want to keep surfing you know?" (p. 179)
Continuation	"I have heard that a separated rib is more annoying than a broken rib … It went on for over 6 months. I tried to pad it, put on wetsuits" (p. 179)

phenomenon of dissociation and flow has similar characteristics and thus might conceptually overlap. For example, the distorted sense of time, the merging of action and awareness, and the loss of self-reflection characterize both flow and dissociation. The authors assessed dissociative symptoms, flow experience, exercise and gambling behavior, and emotional well-being of their participants. The results revealed that exercisers and addicted and nonaddicted gamblers experience flow, which in turn was related to emotional well-being. And as expected, some components of flow—self-consciousness, the merging of action and awareness, and the distorted sense of time—showed communalities with dissociation. Thus, the study further supports an overlap between flow and addiction.

Flow and Online Game Addiction and Internet Addiction

Recent studies show that flow can be experienced not only in natural environments but also in online environments (e.g., Chen 2006). The World Wide Web is characterized by features such as controllability, immediate feedback, and ease of use, which make the experience of flow highly probable. Furthermore, flow has been found to be related to positive affect, exploratory behavior, and attitudes toward Web sites and has been successfully used to explain online shopping behavior and Web use (Webster et al. 1993).

Again, besides the positive consequences of flow for Internet use, there are also negative consequences. The association between flow and problematic or even addictive behavior has been analyzed empirically for the domains of online gaming and Internet use. For example, Thatcher et al. (2008) assessed, among other things, flow experience and problematic Internet use of more than one thousand Internet users. Problematic Internet use was defined as the "use of the Internet that creates psychological, social, school, and/or work difficulties in a person's life" (Beard and Wolf 2001, p. 378) and includes symptoms such as needing to spend more and more time online, loss of control regarding the time spent online, and withdrawal symptoms. Typical Internet activities are general Web browsing, e-mailing, news Web sites, telnet, and blogging. Thatcher et al. (2008) reported results which support the flow–addiction link: the stronger the participants experience of flow, the higher their problematic Internet use.

This study result is supported by Kim and Davis (2009) who also found a positive association between flow, as measured using Webster et al.'s (1993) flow in human–computer interaction scale (e.g., "When using the Internet, I am totally absorbed in what I am doing"), and problematic Internet use, assessed using items such as "I've tried and failed to cut down the amount of time spent online" and "My job performance and/or productivity suffers because of the Internet" (Caplan 2002). In addition, Kim and Davis (2009) identified the participants' perceived importance of Internet activity as being a mediator of this relationship. Thus, flow predicted the importance of seven positive Internet activities ("shopping/auctioning," "joining the same interest group") which in turn led to high scores on the problematic Internet use scale.

Researchers into the phenomenon of online and cyber-game addiction argue that cyberspace behavior is associated with flow because while in the flow state, the

consumer experiences a sense of happiness, an exploratory desire, and the absence of time pressure. In accordance with the above-mentioned mechanisms which link flow to addiction, Chou and Ting (2003) found that the positive quality of flow promotes the tendency to repeat the activity of cyber-gaming, which in turn can lead to addictive behavior.

Thus, one part of the dark side of flow is that it includes the possibility of making individuals addicted to certain activities. In dealing with addiction, clinical psychologists have established different principles and therapeutic techniques to deal with the problem, such as behavior therapy (operant conditioning) and cognitive behavior therapy (self-control techniques), which might also work in the treatment of flow addiction. However, in contrast to other forms of addiction, which need a specific substance (alcohol, cocaine), flow can be experienced through nearly any activity (Csikszentmihalyi 1990). In order to prevent individuals from becoming addicted to a certain flow-producing and health-endangering activity (big wave surfing despite injuries), the experience of flow can be spread over a broader range of more moderate sporting activities (starting a new sport) and/or intellectual activities (learning a foreign language). However, the question remains whether the sum of several low-intensity flow activities will be able to balance an extraordinary, high-level flow experience.

Flow and Risk-Taking

Csikszentmihalyi's (1975) work on flow started with the question what motivates individuals to perform activities such as playing musical instruments, climbing rocks, or playing chess without receiving a visible reward in the form of money or recognition, and even expending high costs in terms of effort and time. The following question goes one step further and asks: What are the reasons for individuals deliberately seeking risks to their health and even their life? Why does one and the same individual wear a seat belt when driving a car and take safety rules at the workplace very seriously, while engaging in skydiving, rock climbing, or white-water kayaking during his or her leisure hours?

The answer is the same as the answer to Csikszentmihalyi's initial question: Individuals perform these activities for their own sake, simply for the pleasure associated with the activity itself and regardless of the (negative) consequences. In the following, we will provide support for the assumption that one of these negative consequences can be risky behavior.

The Mechanisms that Link Flow with Low Risk Perception and High Risk-Taking

The mechanisms which link flow with risk lie on the one hand in the conditions for flow, on the other hand in the features of flow, and lastly in the consequences of flow. An important condition for flow is the balance between the skills of a person

and the challenges of a situation (Csikszentmihalyi 1990; cf. Chap. 2). Thus, individuals seek challenging situations in which the probabilities of succeeding or failing are approximately equal. This can be dangerous in terms of injuries in high-risk sports or in terms of financial loss in gambling.

In addition, some features of flow, such as the loss of self-reflection, which prevents worrying about danger, and the restriction of perception to a limited field of activity, which prevents the perception of signs of danger, combined with a high sense of control can be highly problematic when performing high-risk sports such as riding a motorcycle, rock climbing, or kayaking.

Another explanation for the link between flow and risk lies in the consequences of flow. The experience of flow can be so rewarding that individuals are willing to hazard the negative consequences of flow and even risk endangering their life as expressed by the following citation: The pleasure of the flow experience "outweighs the risk you know. And maybe that's not saying much for my regard for, for my life, for my health, but, but I guess I am willing to take the chance of, you know, of any pain or suffering it might cause over the benefits of the rush" (citation from Partington et al. 2009, p. 179).

Studies Dealing with Flow and Risk Perception and Risk-Taking

Only a few quantitative and qualitative studies have analyzed the link between flow experience and risk perception and risk behavior. For example, Sato (1988) used direct observations, semistructured interviews, and questionnaires to explain the behavior of Japanese juvenile motorcycle gangs. These "bosozoku" groups consist of mainly young men who engage in illegal high-risk races. The speed of these races is up to twice the speed limit on city roads (up to 100 km/h). The translation of "bosozoku" is "violent-driving tribe" and thus describes the risk of hurting or killing oneself or others in an accident very well.

The readiness to expose oneself to physical danger is underlined by the fact that the riders rarely use protective gear such as helmets and boots. Interestingly, the author did not identify negative reasons (e.g., overcoming frustration or feelings of inferiority) for participating in such races, but enjoyable, flow-like experiences. For example, participants describe the centering of attention on a limited range of stimuli (the race, the noise, and the atmosphere), the feeling of competence and control, and the merging of their awareness with the activity of driving. The goal of these races is clear (winning, being faster than others), and they provide immediate and clear feedback (noise of the motoring, exact time).

It could be argued that "bosozoku" motorcycle gangs represent a lifestyle or youth movement of juveniles rather than being the consequence of the flow experience. However, Rheinberg's (1991) study with adults shows that there is no fool like an old fool. He interviewed motorcyclists and asked them to describe their experiences when riding their bikes. They often report flow components such as a feeling of control ("In this condition I feel absolutely safe," p. 358) and the loss of self-reflection ("I am so gone that I feel that I don't exist," p. 357).

Interestingly, most motorcyclists mentioned the positive aspects of flow, but scarcely anybody realized that this joyful merging with the activity can be dangerous. Consequently, participants "act at times completely contrary to their commendable safety standards" (Rheinberg 1991, p. 361). In accordance with these findings, Rheinberg (1991) revealed that the more intense the motorcyclists experience of flow, the less afraid they are when riding a motorcycle. In addition, flow was directly related to risk-taking. The greater the experience of flow, the more the motorcyclists agreed with items representing a dangerous driving style, such as a preference for high speed on highways and a higher number of accidents.

Schüler and Pfenninger (2011) have examined the relationship between flow and risk in white-water kayaking, which is a risky sport that involves the danger of being seriously hurt or even losing one's life through drowning. They hypothesize that flow leads to an underestimation of risk in kayaking, which they operationalized by comparing an objective risk rating by experts with the participants' perceived subjective risk when kayaking. As expected, the experience of flow, which was assessed while kayakers were still sitting in their kayaks, led to an underestimation of the risk of capsizing or hurting oneself while kayaking.

The results remained stable even when the authors controlled for sensation seeking, which shares some of the characteristics of the flow experience (e.g., quest for exceptional experiences). A study by Schüler (2012) finds that the flow experience of climbers is related to excessive feelings of self-efficacy which in turn leads to distorted risk perception and risky behavior in climbers.

To summarize, a few studies have already confirmed the association between flow experience and risk-taking (e.g., Rheinberg 1991; Sato 1988; Schüler and Pfenninger 2011). However, the above-mentioned mechanisms which link flow to risk are theoretical assumptions rather than empirically tested facts. Future studies should aim to analyze these mechanisms empirically. For example, the degree of self-reflection and the limited field of perception could be measured—or even better: experimentally induced (e.g., enhancing self-reflection using a mirror, giving tasks to focus on environmental characteristics in order to broaden the field of perception). Also, one could try to sever the association between flow and its affective reward, for example, by asking participants to think about something sad when they feel that they are about to achieve a state of flow.

Combat Flow

Csikszentmihalyi and Rathunde (1993) mention that one danger inherent in flow is that it can be experienced in antisocial contexts. When people lack the experience of flow in other life domains, they will seek flow in destructive activities such as aggressive behavior, violence, and crime. An extreme form of antipersonnel flow is losing oneself in the action of killing. Harari (2008) has summarized the positive experiences while killing other persons in war. Soldiers report losing reflective awareness and thereby any worries and thoughts about morality and human values.

They report full concentration on the task at hand (which in this case is killing) and a distortion of time in which only the present counts, without wasting much thought on the past and the future.

In addition, the soldiers report positive experiences during combat, such as a heightened sense of being alive. As a result of the above-mentioned characteristics, they disregard the danger to their life and maximize their mental and physical abilities (Harari 2008, p. 255). Harari (2008, p. 256) cites Leo Tolstoy's description of an artillery battery commander as follows: The commander "did not experience the slightest qualm of fear, and the idea that he might be killed or badly wounded never entered his head. On the contrary, he grew more and more elated. Though he forgot nothing, thought of everything, did everything the best of officers could have done in his position, he was in a state akin to feverish delirium or intoxication."

The Mechanism that Makes People Enjoy Killing

One mechanism which links flow to combat is again its rewarding quality. Like other activities which are rewarded by flow (see above), combat fighting too can be experienced as joyful and can be addictive. In Box 7.3, an interviewed veteran is cited (Caputo 1977; cited in Harari 2008, p. 255).

That flow can also be experienced while fighting in war supports Csikszentmihalyi's assumption that flow can be experienced in every activity as long as important conditions for flow are met. In the act of killing too, the rewarding quality of flow facilitates the maintenance of the rewarded activity.

Like flow in other activities, combat flow also has its positive sides, for example, when an individual enters into a life-or-death struggle, he or she is pretty much going to have "no mind" anyway, and flow enables high concentration and efficacy which might save one's own life. However, the negative sides are that it overrides self-reflection including morality and even humanity (e.g., killing without necessity, just for the sake of killing) and that one can become addicted to combat flow.

Box 7.3 Urge to Experience Flow in Combat

"I felt a drunken elation. I had never experienced anything like it before. […] Within a year I began growing nostalgic for the war. I could protest against the war as loudly as the most convinced activists, but I could not deny the grip the war had on me, nor the fact that it had been an experience as fascinating as it was repulsive, as exhilarating as it was sad […]. It was something like the elevated state of awareness induced by drugs. And it could be just as addictive […]."

Broader Comments on the Dark and Bright Side of the Moon

Flow as a Universal Experience

The studies reported above suggest that the "optimal experience" of flow does not necessarily mean that the consequences of flow are always positive. While experiencing flow, individuals can become addicted to the euphoric feelings associated with flow, underestimate their personal risk of being injured, and be willing to hurt or even kill other people. Thus, the term "optimal" refers to the inner state of perfect physical and mental functioning, but not to the desirability of its outcome. Flow experience is not just a hedonic feeling that enhances an individual's quality of life; it is also an optimal functional state that can lead to peak performance in sports or music and can be a matter of life and death in life-threatening situations. From an evolutionary point of view, flow has a high adaptive value.

The assumption of flow as an evolutionary-based experience is supported by its universality, which is expressed in at least two senses. First, flow experience is relatively similar across a broad variety of activities which do not have much in common. Thus, the heart of flow is the same for individuals engaging in sport, in arts, in leisure time activities, and in scientific activities, as well as for soldiers. Second, the flow experience is relatively similar across different individuals. It is the same for individuals across different cultures and classes, for men and women, and for individuals of different ages (Nakamura and Csikszentmihalyi 2002). This leads Csikszentmihalyi and Csikszentmihalyi (1988a) to the conclusion that there might be an evolutionary predisposition to become deeply involved in activities and to do things for their own sake.

This would be in agreement with other theoretical considerations, for example, with Deci and Ryan (1985, 2000) self-determination theory (SDT) (cf. Chap. 6). SDT assumes that intrinsic motivation is evolution-based and that performing activities just for the pleasure of doing them is associated with subjective well-being and personal growth. However, SDT assumes that intrinsically rewarding activities are in principle not directed against other persons, but are performed in harmony with the interests of other people or even for the benefit of others. Antisocial behavior is the result of restricting environments thwarting important basic psychological needs rather than one form of expression of intrinsic motivation. In contrast, flow theory does not explicitly exclude the possibility that the positive experience of flow can be associated with "negative" (e.g., antisocial) behaviors.

According to flow theory, not even basic need-satisfying environments (e.g., environments providing feelings of autonomy) are needed in order to experience flow, as long as some basic conditions (challenge–skill balance, clear goals, immediate feedback) are fulfilled. Flow can even be experienced in dangerous and need-frustrating situations such as in combat (Harari 2008) and in concentration camps (Csikszentmihalyi 1990). "Even an experience involving extreme levels of deprivation, discomfort, and danger turns out to become highly attractive once people *enter*

flow" (Harari 2008, p. 255). To summarize, flow is a universal competence-enhancing and sometimes even life-saving experience with a high adaptive value in evolution.

Implications for Practical Interventions

The negative consequences of flow put a new complexion on practical interventions which aim to facilitate flow. On the one hand, flow-enhancing strategies contribute to the cognitive and physical efficiency, motivation, and happiness of individuals. On the other hand, flow-enhancing strategies can yield negative outcomes, as outlined in this chapter. It is the responsibility of researchers and practitioners to consider this problem by means of theoretical, practical, and particularly moral considerations. For example, flow-enhancing interventions could be matched to the characteristics of specific populations or situations. A person who is beginning a desired activity, such as exercising physically, or who is learning a new language needs an immediate reward in terms of flow experience.

According to the reward mechanism outlined above, this should lead to long-term adherence to the desired activity and a progress in performance. In contrast, individuals who are already experiencing flow while performing an activity, such as elite big wave surfers, passionate kayakers, and experienced computer programmers, do not need flow-enhancing strategies but might benefit from the knowledge of strategies to reduce the experience of flow which they can apply in situations that endanger their psychological well-being or health. The former group of people needs to lose themselves in an activity, whereas the latter group needs self-reflection in order to separate themselves from the activity at the right moment.

Ethical Questions Related to Flow

The potential negative consequences of flow may have raised ethical questions among some readers. Two ethical questions are briefly addressed in the following. First, the subjective positive experience of flow is a hedonic feeling which, however, often interferes with other (higher-order) human goals and values. To name but a few examples, individuals addicted to flow in computer gaming might experience a psychological goal conflict when their families, their job performance, and their friends suffer because of their addiction. The soldier cited above reported a conflict between his political antiwar belief and the joy associated with participating in combat. The risky behavior as a consequence of flow even contradicts the human goal of physical integrity. Thus, losing oneself completely in the moment can be a source of serious psychological conflict and might clash with the interests of other individuals. As already remarked by Aristotle (see also Csikszentmihalyi and Rathunde 1993), the feeling of excellence of action (as a defining characteristic of flow) might be the highest form of happiness, but nevertheless is not the highest human good. Excelling

in actions can be harmful to the self or to others. The fact that individuals derive and enjoy intrinsic rewards from flow activities does not justify their action morally.

A second ethical problem is that the flow experience of individuals can be abused. Sometimes, institutions are less interested in people reflecting about what they are doing, and flow induction can theoretically be used to exploit individuals for military, political, or religious purposes. For example, one strategy for enhancing flow is to have many drills for soldiers. Practicing extensively how to react in certain kinds of situations and consolidating behaviors through repetition helps the right movements to become automatic. The movements come too quickly to think about them. Automatic behavior which circumvents conscious thoughts in turn promotes the experience of flow (Dietrich 2004).

Thus, flow enhancement through drill again has two sides because on the one hand, it helps to save the soldier's own life, but on the other hand supports the killing of other people. Practicing extensively is also the way to access flow in other activities, such as making music or exercising, which have no or less negative consequences for other people, however. This means that it depends on the sort of flow activity (killing versus making music) whether a flow-enhancing strategy is good or bad in a moral sense.

Future Research Questions

As already mentioned, the findings on the negative consequences of flow are based on a very small number of studies. Moreover, these studies are limited in their study designs. Thus, our understanding of the negative consequences of flow is mainly based on qualitative interviews and correlative field studies. Experiments, which are the ideal way to analyze the dependence of consequences on certain conditions, might reveal more precise or even different insights in the relationship between flow and its outcomes. Further research is needed to overcome methodological problems and to answer further research questions. For example, the research question whether some components of flow are associated more with positive rather than with negative consequences, whereas others are connected more strongly with negative rather than positive effects is still unanswered.

Furthermore, it would be interesting to know whether certain personality traits, such as openness to experience (Costa and McCrae 1992), action orientation (Kuhl and Beckmann 1994), and sensation seeking (Zuckerman 2006), boost the negative effects of flow, whereas other variables such as state orientation (Kuhl and Beckmann 1994) or self-control competencies can buffer its negative effects. Furthermore, most research into the consequences of flow is based on participants' self-reports of flow. Identifying and using physiological, for example, neuropsychological, correlates of flow could help to objectivize the measurement of flow (which is an important research aim in itself; see Chap. 8) and may help us to analyze the positive and negative consequences more precisely. One of the most important aims of future

research is to figure out how to control flow in terms of evoking it when it is useful and abandoning it when it is harmful.

The final conclusion drawn from this chapter is not to demonize the experience of flow but to bear in mind that the dark sides of flow also need theoretical, empirical, and practical attention. The recommendations for researchers and practitioners about how to deal with flow are expressed well by Csikszentmihalyi's (1990, p. 70) statement that the challenge entails "learning to distinguish the useful and the harmful forms of flow, and then making the most of the former while placing limits on the latter."

Study Questions

- List the main characteristics of flow. From the perspective of the devil's advocate: What are their dark sides? Do you see any additional dark sides beyond those already mentioned?
  - Loss of self-reflection: ignoring compatibility between flow-producing activity and one's own goals and values and the goals and interests of others
  - Strong concentration: narrowed focus of attention which might exclude potentially self-relevant information
  - High sense of control: overestimation of one's abilities, unrealistic optimism
  - Distortion of time: neglecting temporal information although it is relevant and neglecting important time schedules
  - Please add further "dark sides":

    _____
    _____
    _____

- How does the principle of operant conditioning explain persistence in behavior? How can it be related to the experience of flow?
  - Principle of operant conditioning: Behavior which is rewarded is more likely to be performed again in the future than behavior that is not rewarded (or even punished).
  - Operant conditioning and flow: The positive experience quality of flow functions as an intern reward of the flow-producing activity. Thus, the activity is performed again in order to experience flow again.
- What are the main features of dependence? How can they be applied to flow?
  - Main features of dependence: strong desire or sense of compulsion to take the substance, evidence of tolerance, persisting with substance use despite clear evidence of overtly harmful consequences.
  - Application to flow (see also Box 7.1):

  - Strong desire or sense of compulsion to take the substance: strong desire to experience flow again
  - Evidence of tolerance: increased "doses" of the flow-producing behavior are required in order to experience flow
  - Persisting with substance use despite clear evidence of overtly harmful consequences: persisting with flow-producing activities despite harmful consequences (e.g., for health; continuation with big wave surfer despite broken ribs)

- What mechanisms link flow to risk? How do they work?
  - Challenge–skill balance: Individuals seek challenging situations in which the probabilities of succeeding or failing are approximately equal (dangerous in high-risk sport)
  - Loss of self-reflection: prevents thinking about danger
  - Restriction of perception to a limited field of activity: prevents the perception of signs of danger
  - High sense of control: overestimation of one's skills, underestimation of the situation kayaking
  - Rewarding quality of flow: Individuals are willing to hazard the negative consequences of flow, even high risks
- What studies on flow and risk exist? Design a future study addressing one of the several research questions that still remain open.
  - Studies on flow and risk: Sato (1988): Participants of "bosozoku" groups experience flow when engaging in high-risk races; Rheinberg (1991): Motorcyclists experiencing flow report dangerous driving style; Schüler and Pfenninger (2011): Flow leads to an underestimation of risk in white-water kayaking.
  - Your study on flow and risk:

    _____
    _____
  - _____
- Give examples of flow in antisocial contexts.
- Aggressive behavior, violence, crime, losing oneself in the action of killing
- Can you think of any further ethical questions that are related to flow?
- Please note your answer:
- _____
- _____
- _____

Chapter 8
Psychophysiological Correlates of Flow-Experience

Corinna Peifer

Abstract Flow—the pleasant state of absorption of a person with an activity—has rarely been investigated from a physiological perspective. However, interest in such studies is growing fast. Only recently, researchers started to apply psychophysiological measures to study flow-experiences. In order to contribute to this ongoing research, this chapter aims to report and integrate existing theories and findings concerning the physiology of flow-experience and to stimulate further investigation.

The first part of this chapter will give an overview about existing literature explicitly dealing with the psychophysiology of flow. A theoretical psychophysiological framework is then developed on the basis of prominent stress theories. The third part discusses physiological correlates of flow, integrating existing literature on flow and related concepts such as attention and cognitive control. The chapter ends with an integrative definition of flow-experience, practical implications, and an outlook on future research perspectives.

Introduction: Benefits of a Psychophysiological Perspective to Study Flow

Traditionally, psychophysiology focuses on the expression of psychological phenomena in bodily processes. Studying flow with psychophysiological methods can eventually help us to better understand the concept: Until today, the most common instruments to study flow-experience are questionnaires and interviews that are retrospective by nature. But, a key characteristic of flow is that it appears during an activity, when a person is fully absorbed in the task and self-referential thoughts are completely inhibited. The important conflict here is that as soon as

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participants are asked for their experience, they enter into self-reflection and leave the flow state. Therefore, the most common way to assess flow by self-report instruments is *right after* the activity. Psychophysiology can provide physiological flow indicators that are assessed *during* the activity without interrupting the participant.

However, since flow is a subjective experience, physiological measures cannot substitute self-report measures. The benefit lies in the additional information and the simultaneous assessment that will open new research possibilities.

Such possibilities include assessing microprocesses during flow, like length, depth, and stability of flow episodes regarding conducive and obstructive conditions, as well as effects of different kinds of distractors. Also controversial issues such as the experience of happiness *during* flow can be addressed with corresponding physiological research methods. By finding physiological correlates, psychophysiology can contribute to the debate which flow characteristics constitute flow-experience and which are antecedences or consequences of flow.

A further advantage of assessing flow physiologically is the ability to compare it to related concepts such as stress, attention, or meditation and to benefit from those branches of research. This could help to fully understand the functions and consequences of flow and to conclude practical implications, e.g., how to reach a state of flow, how to switch from stress to flow, and how to prevent potential negative consequences.

Part 1: Existing Literature on the Psychophysiology of Flow-Experience

Until today, only few and often theoretical papers address the psychophysiology of flow-experience; nevertheless, interest is recently growing. The next section aims to provide a comprehensive and chronological overview on the existing literature.

After Csikszentmihalyi had introduced the concept of flow in 1975, Hamilton et al. (1984) were (to our best knowledge) the first who experimentally investigated physiological aspects of flow-experience. With their *Intrinsic Enjoyment Scale* they assessed the probability to experience flow in daily activities as a personality trait (cf. *autotelic personality*, Csikszentmihalyi 1990; cf. Chap. 9). In subjects who scored high on the Intrinsic Enjoyment Scale (in opposite to low scorers), they found that increased attention even led to decreased effort measured via electroencephalography (EEG; Evoked Potentials). They concluded that individuals differ in their ability and needed effort to control attention. Referring to the findings of Hamilton et al. (1984), Csikszentmihalyi (1990) drew the conclusion that individuals with an autotelic personality have the ability to shut down mental activity in all information channels that are irrelevant for task fulfillment.

Also referring to Hamilton et al. (1984), Goleman (1995) described the neurophysiology of flow-experience as a subjective state of effortlessness. He suggested that flow is connected to a decrease in cortical activation, where a minimum of mental energy leads to maximum efficiency in highly practiced activities. Activation and inhibition of neural circuitry are fully adapted to momentary activity demands during flow-experience.

The next author focusing on the physiology of flow was Marr (2001). He called for a synthetic theory, including cognitive, behavioral, and neurophysiological explanations for the flow phenomenon (see Box 8.1). Referring to Goleman (1995), Marr discussed a reduction of brain metabolism to be involved in flow-experience. Further, he proposed the neurotransmitter dopamine as a possible neurophysiological correlate of flow.

Box 8.1 Call for a Biobehavioral Theory of Flow

"A bio-behavioral theory of flow explains the latency, duration, and intensity of flow, as well as flow's effect on cognitive efficiency and creativity. In addition, the theory is parsimonious, testable, and integrates the seemingly independent subject matters of phenomenology, learning theory, and cognitive neuropsychology. Most importantly, a bio-behavioral theory demonstrates that the flow experience cannot be understood through an appeal to phenomenological, cognitive, neurological, or behavioral variables alone, but only through an integration of the respective metaphors that are engaged by these explanatory schemes." (Marr 2001, p. 6)

Again on a theoretical basis, Dietrich (2004) provided a neurophysiological theory of flow-experience. In line with above-mentioned approaches (Csikszentmihalyi 1990; Goleman 1995; Hamilton et al. 1984; Marr 2001), he suggested that flow results from a downregulation of prefrontal activity in the brain (*Hypofrontality*, Dietrich 2003): During flow, well-trained activities are performed without interference of a conscious control system, which makes the process very fast and efficient (see Box 8.2).

Box 8.2 A Neurocognitive Explanation of Flow

"(…) the flow-state as a period during which a highly practiced skill that is represented in the implicit system`s knowledge base is implemented without interference from the explicit system." (Dietrich 2004; p. 746)

Two years later, Kivikangas (2006) implemented a second experimental study addressing the psychophysiology of flow-experience. Kivikangas concentrated on facial electromyographic (EMG) activity indicating emotional valence and electrodermal activity (EDA) indicating arousal. A science fiction ego-shooter computer game was used to induce flow-experience. As the main result Kivikangas found flow

to be negatively associated with activity in the corrugator supercilii (CS, "frowning muscle"; see Fig. 8.5), suggesting that flow is linked to increased positive valence and decreased negative valence. He found no effects of zygomaticus major (ZM, "smiling muscle"; see Fig. 8.5) and orbicularis oculi (OO, "eyelid muscle"; see Fig. 8.5), nor of EDA.

Recently, researchers in the tradition of human–computer interaction show increasing interest in a psychophysiological investigation of flow (e.g., Nacke and Lindley 2009; Prinzel et al. 2000; Rani et al. 2005; for an overview, see Fairclough 2009). Their common objective is to find physiological indicators to develop real-time adaptive systems that optimize gaming experience and/or efficiency of the human–computer interaction. By measuring physiological parameters of the user, they aim to distinguish task engagement from boredom or frustration. In contrast to Kivikangas (2006), Nacke and Lindley (2009) found increased activity of ZM and OO (indicating positive valence) and an increase of EDA (indicating high arousal) to be associated with an experimental flow condition. They concluded that a combination of both measures is promising for further research on adaptive systems.

In our own recent research, we linked flow to the hormonal stress-mediator cortisol. Since Lazarus et al. (1980) and Csikszentmihalyi (1990) described flow in the context of stress coping, we aimed to investigate how stress and flow are related from a physiological point of view. Using a complex demanding computer game to induce flow, we found evidence for a positive relation of the stress-hormone cortisol and flow-experience (Peifer et al. 2010). Furthermore, in another experiment, we orally applied synthetic cortisol in a dose simulating the cortisol reaction to a strong stressor. Here, we found a decrease in flow-experience due to the cortisol manipulation compared to a placebo condition. It was proposed that these findings reflect an inverted-u function of flow and physiological arousal (Peifer et al. 2011).

De Manzano and colleagues (De Manzano et al. 2010) investigated physiological aspects of flow-experience in professional piano players performing a musical piece of their own choice. In line with Nacke and Lindley (2009), they found high flow values being associated with activation of ZM and sympathetic activation. Further, they found an association with deep breathing. Contrary to Kivikangas' (2006) findings, De Manzano et al. (2010) found no relation of CS activity and flow. They argued that sympathetic activation is indicating mental effort as necessary for high attention (e.g., Berntson et al. 1993; Porges and Byrne 1992) and draw the conclusion that flow is "a state of effortless attention, which arises through an interaction between positive affect and high attention" (p. 301; see also Box 8.3).

Box 8.3 A Physiological Definition of Flow-Experience

"(…) flow is experienced during task performance as a result of an interaction between emotional and attentional systems, that is, both cognitive and physiological processes, enabled by a certain level of expertise." (De Manzano et al. 2010, p. 309)

Also in 2010, Brian Bruya edited a book on flow-experience, approaching it from a cognitive perspective (Bruya (2010a). Bruya (2010b) discussed existing theories of attention and action and questioned the common assumption that required effort increases with task demands (e.g., Grier et al. 2003; Kahneman 1973): Here, he referred to flow as a state of *effortless attention*, which allows "a person to meet an increase in demand with a sustained level of efficacy but without an increase in felt effort—even, at the best of times, with a decrease" (Bruya 2010b). Next, he questioned whether the subjective experience of effortlessness comes along with an objective decrease in effort which can be measurable with psychophysiological indicators. Contributors of the volume described their theories on effortless attention and related physiological findings mainly from a cognitive perspective.

Keller et al. (2011b) experimentally investigated flow using the PC games "Who wants to be a Millionaire" and "Tetris." They report that skills-demands compatibility is associated with elevated cortisol levels and reduced heart rate variability, indicating a stressful state of increased workload. In consequence, they question the current, exclusively positive, picture of the flow phenomenon.

Summary of Part 1: Status Quo of the Psychophysiology of Flow-Experience

From the provided overview of existing literature, one can summarize that there is few but growing research in the area of psychophysiology of flow-experience. A common theoretical basis regarding the neurophysiology of flow is the down-regulation of task-irrelevant processes (Csikszentmihalyi 1990; Dietrich 2003; Goleman 1995; Hamilton et al. 1984; Marr 2001). Still, the only empirical study investigating this theoretical approach was conducted by Hamilton et al. (1984), and further studies on this issue are urgently required.

More than two decades later, Kivikangas was next to empirically investigate the psychophysiology of flow. He applied physiological measures indicating arousal (EDA) and affective valence (EMG), which were also used by Nacke and Lindley (2009) and by De Manzano et al. (2010). Also cardiovascular measures (heart rate variability; De Manzano et al. 2010; Keller et al. 2011b) and cortisol as a hormonal measure (Keller et al. 2011b; Peifer et al. 2010, 2011) have been linked to flow-experience. Only a theoretical link exists for a relation of flow and the neurotransmitter dopamine (Marr 2001).

The increasing number of published experimental data in the last 2 years (De Manzano et al. 2010; Keller et al. 2011b; Nacke and Lindley 2009; Peifer et al. 2010, 2011) underlines a clear growth of research interest. Still, further studies should be conducted to be able to draw a clear picture on the physiology of flow-experience.

Part 2: The Psychophysiology of Flow-Experience: A Theoretical Framework

In contrast to the few research on the psychophysiology of flow, there is a broad knowledge about the physiological processes during stress. By linking the two concepts, hypotheses on the psychophysiology of flow can be derived. Therefore, two popular stress concepts will be introduced and parallels to the concept of flow will be outlined. This will result in an integrative definition of flow-experience.

Flow in the Transactional Stress Model

Until today, only a few authors paid attention to the relation of stress and flow-experience, among them are Lazarus et al. (1980), Donner and Csikszentmihalyi (1990), Csikszentmihalyi (1990, 1993), Ohse (1997), and Weimar (2005). All of them referred to Lazarus' transactional stress model, since it has important theoretical characteristics in common with flow theory. A comprehensive overview on theoretical models of flow-experience has been given in Chap. 1. To compare flow and stress, it is here referred to the flow-channel model (Csikszentmihalyi 1975), which defines flow as an optimal challenge–skill balance (Fig. 8.1). Lazarus' concept of stress can be integrated into this model: According to Lazarus, stress is caused if situational demands exceed the resources of an individual. *Anxiety* according to Csikszentmihalyi results if activity demands exceed the skills and resources of an individual—so the conceptualizations of anxiety (Csikszentmihalyi 1975) and stress (Lazarus and Folkman 1984) seem equivalent, when stress is interpreted as threat or harm. Therefore, *stress* was added to the flow-channel model next to anxiety (see Fig. 8.1). Flow is experienced below anxiety (or stress respectively) and above boredom, in the small channel of an optimal *challenge–skill balance* (Csikszentmihalyi 1975).

Rheinberg (2008) criticizes that Csikszentmihalyi does not distinguish between *challenge* and *demand*. He points out that challenge is already the result of a comparison between the demands of a situation and the individual's coping resources (cf. Chap. 3). An optimal demand–skill balance (instead of challenge–skill balance) would therefore lead to a cognitive appraisal of challenge, which supports flow-experience. In consequence, the provided Fig. 8.1 was adapted according to Rheinberg (2008).

The resulting relation of demands and skills is consistent with Lazarus' transactional stress model, wherein he defines challenge as a result of "difficult demands that we feel confident about overcoming by effectively mobilizing and deploying our coping resources" (Lazarus 1993, p. 5). According to Lazarus, challenge is a positive form of stress that is experienced as "exhilarating" (p. 5) and goes along with increased performance. In situations appraised as challenging, the process of coping itself can be pleasurable (Lazarus et al. 1980). The concept of challenge in the sense of Lazarus

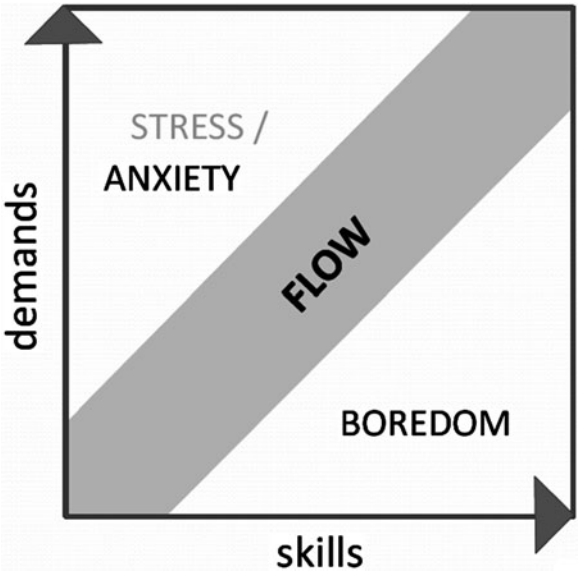

Fig. 8.1 Stress in the flow-channel model. Adapted from Csikszentmihalyi (1975) and Rheinberg et al. (2008)

therefore closely resembles the concept of challenge–skill balance as a prerequisite of flow-experience in the sense of Csikszentmihalyi (1975).

According to Lazarus et al. (1980), stress is the result of a transactional process between a person and the environment. They outline the important role of cognition in the evaluation of a potential stressor: In a primary appraisal, a person evaluates a certain event regarding its subjective relevance according to personal goals and needs, and further, whether it can be seen as a threat, loss, or challenge. During the secondary appraisal the person evaluates available coping resources. These two appraisals can consistently be renewed during a reappraisal. A subjective experience of stress results, if an event is appraised as personally relevant and the demands of the situation exceed the coping resources of the person (see Fig. 8.2).

Referring to Lazarus (Lazarus and Folkman 1984), Csikszentmihalyi (1990, 1993) states that stress can be transformed into flow-experience through reappraisal of a negative situation into a pleasant challenge. Here, flow appears as a cognitive strategy to cope with stress (Weimar 2005; see Fig. 8.3).

In his more recent work, Lazarus integrates his stress research into a *cognitive–motivational–relational theory of emotions* (e.g., Lazarus 1993), where he discusses the different functions of emotions. One function of positive emotions is to act as *sustainers* in the coping process (Lazarus et al. 1980). Here, Lazarus refers to flow-experience as an emotion that helps to sustain coping efforts.

> What has recently been referred to as 'flow' (see Csikszentmihalyi 1976; Furlong 1976) appears to be an extremely pleasurable, sustaining emotion that arises when one is totally immersed in an activity and is utilizing one's resources at peak efficiency. Examples of flow

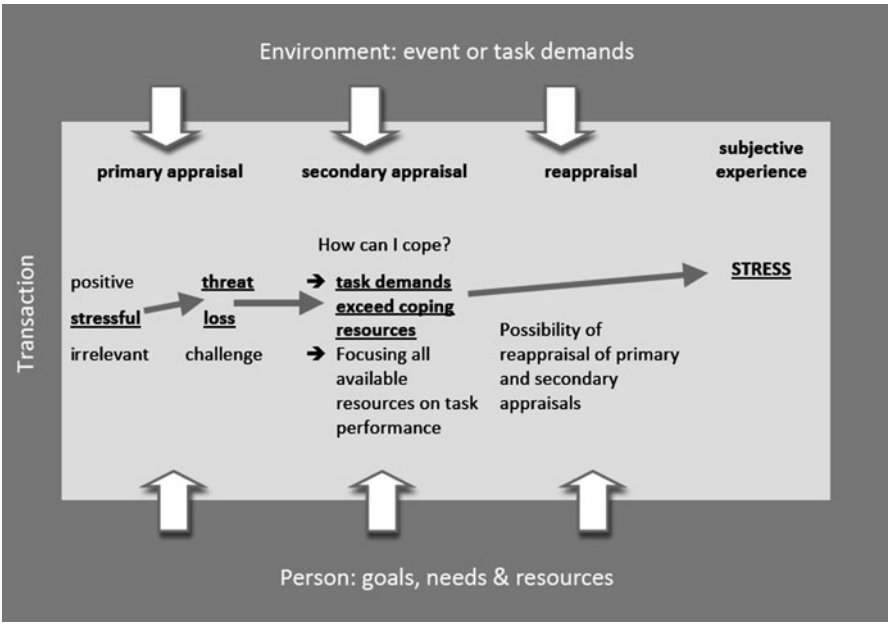

Fig. 8.2 Stress in the transactional model (Lazarus and Folkman 1984)

> are the basketball player who is 'hot' and the inspired performance of a musician, actor, or speaker. The person in flow 'finds, among other things, his concentration vastly increased and his feedback from the activity greatly enhanced' (Furlong 1976, p. 35). Although the experience of flow is characterized by a feeling of effortlessness, it occurs at times when great coping effort is usually required and during these times serves as a powerful sustainer of coping. (Lazarus et al. 1980, p. 209)

As an intermediate summary on the theoretical integration of the concepts flow and stress, it can be concluded that flow is a positively valenced state that is relevant for the stress-coping process to sustain the coping effort at peak efficiency in situations that have been appraised as challenging.

Flow and the General Adaptation Syndrome

Selye (1983), "father of the stress field," also described a positive form of stress. He defined stress as an organism's unspecific reaction to any kind of external demand. In his *general adaptation syndrome* (GAS), he distinguished among three phases of the stress reaction: an *alarm reaction*, a *stage of resistance,* and a *stage of exhaustion*. The function of the alarm reaction is to activate bodily resources in order to adapt to the stressful situation. This is not necessarily uncomfortable or unhealthy; it can even be experienced as pleasant and increase performance. Only a high intensity and/or the sustained endurance of a stressor leads to the harmful

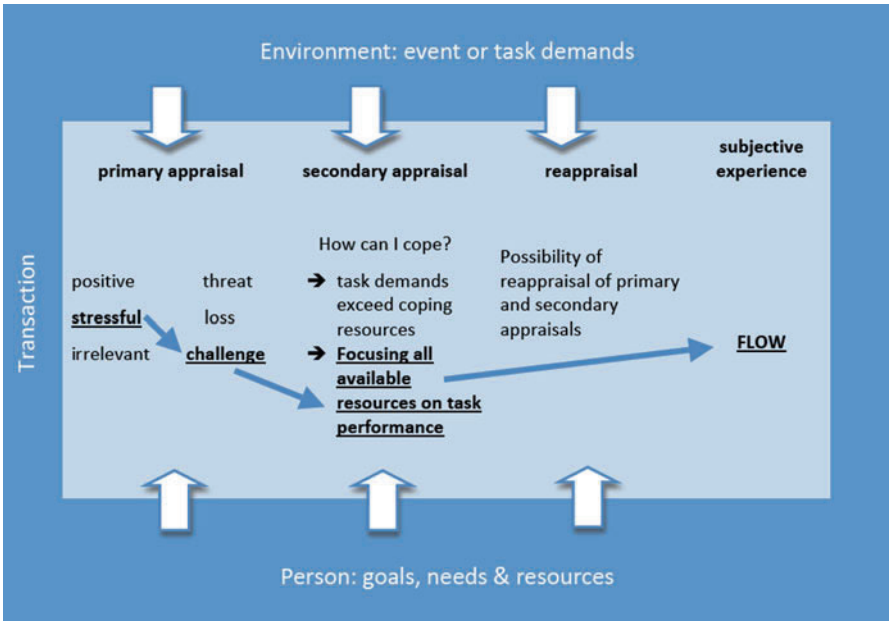

Fig. 8.3 Integration of flow theory (Csikszentmihalyi 1990, 1993) in the transactional model (Lazarus and Folkman 1984)

stages of resistance and exhaustion. To distinguish healthy from unhealthy forms of stress, Selye (1983) used the terms *distress* (Latin: dis = bad; associated with negative emotions) and *eustress* (Greek: eu = good, associated with positive emotions). Selye (1983) described eustress as "pleasant stress of fulfillment" (p. 20), a description that already reminds of flow-experience. Like flow, eustress is a pleasant and desirable state caused by challenging demands combined with high control and subjective importance, characterized by positive arousal and increased productivity (Edwards and Cooper 1988; Csikszentmihalyi 1975; Selye 1983).

Flow and eustress show strong similarities, so one can assume that both share the *same* core concept with just different labels and research traditions. Therefore, findings and theoretical implications from eustress are transferred to assumptions regarding flow.

In a review and theoretical framework on "the impacts of positive psychological states on physical health," Edwards and Cooper (1988) draw a detailed picture on the relation of stress, coping, and eustress. They proposed three ways to experience eustress, all related to coping activities: "the stress and coping process may generate eustress through direct appraisal of the environment as exceeding desires, engaging in inherently enjoyable coping activities, or successfully executing coping strategies" (p. 1,448). This statement provides further support that flow-experience plays an active and protective role in the stress-coping process. From a physiological perspective, *eustress* is defined as a highly functional state of physiological arousal (Gangster and Schaubroeck 1991; Sales 1969).

A Working Definition of Flow-Experience

The following proposed working definition (Box 8.4) of flow aims to sum up the theoretical approaches from Lazarus, Selye, and Csikszentmihalyi and the reported empirical findings, integrating a affective, cognitive, physiological and behavioral component:

Box 8.4 Working Definition of Flow- Experience

Flow is a positively valenced state (affective component), resulting from an activity that has been appraised as an optimal challenge (cognitive component), characterized by optimized physiological activation (physiological component) for full concentration on coping with environmental/task demands (behavioral component).

Part 3: What Means "Optimized Physiological Activation"?

At first sight, the physiological component of the proposed working definition seems rather unspecific. What is meant by "optimized physiological activation"? Since there are plenty of possible flow activities with different physiological demands (e.g., climbing vs. computer game playing), it becomes clear that the physiology of "optimal functioning" naturally differs between activities. Still, one can identify a common ground for physiological activation at maximum efficiency: the full concentration of all body functions to the given activity and the downregulation of all functions that are irrelevant for task fulfillment.

Here, the component of optimal challenge is a necessary prerequisite to enter in flow: Only if demands and skills are in a perfect balance, all self-related thoughts can be switched off to dedicate all resources to task fulfillment. In line with this, Wulf (2007a, b) could show that performance increased when attention was given to an external focus compared to an internal focus. Consequently, self-reflection has to be absent during flow, a state of optimal functioning. This is how it comes to the phenomenon known as "merging of action and awareness" (Csikszentmihalyi 1975).

The absence of self-reflection has another advantage: Subjective effort can only be experienced, if the person does some kind of introspection. That is how it comes to the often-described feeling of effortlessness (Csikszentmihalyi 1975, 1997, 1999; Bruya 2010b) that automatically sustains focused attention. Still, effortless attention does not necessarily imply that there is no effort, but it means that a person does not *feel* the effort. Respectively, Bruya (2010b) defines the term *effortless* as follows:

> description of attention or action that (1) is not experienced as effortful or (2) involves exertion and, due to the autotelicity of experience, subjective effort is lower than in normal conditions, with effectiveness maintained at a normal or elevated level. (p. 5)

Effortlessness as a subjective experience can be measured with questionnaires. Whether or not this subjective experience is accompanied by a decrease in objective effort can be measured with the help of psychophysiological indicators.

In the following, existing findings for flow-related physiological concepts are reported. Further, physiological research methods that seem promising regarding the investigation of the flow phenomenon will be introduced. Since physiological processes are highly complex, no claim of completeness is made here.

Optimal Functioning in the Brain

What happens in the brain during flow? As already introduced in part 1 of this chapter, existing theories and findings regarding this question mainly agree on the assumption that flow is accompanied by a decrease in cortical activity (Csikszentmihalyi 1990; Dietrich 2004; Goleman 1995; Hamilton et al. 1984; Marr 2001). During flow, a minimum of mental energy leads to maximum efficiency in highly practiced activities. Activation and inhibition of neural circuitry are fully adapted to momentary activity demands during flow-experience. However, the only empirical evidence is provided by Hamilton et al. (1984) who found subjects scoring high on the *Intrinsic Enjoyment Scale* (assessing autotelic personality) to show decreased effort in an attention condition compared to baseline.

Dietrich (2004) provided a theoretical approach addressing the brain processes during flow. For his *hypofrontality hypothesis* on altered states of consciousness (Dietrich 2003; *hypofrontality* refers to a downregulation of activity in the prefrontal cortex), he used the distinction of explicit and implicit information-processing systems (Ashby and Casale 2002; Dienes and Perner 1999; Schacter and Bruckner 1998). The explicit system is tied to conscious awareness and contains higher order knowledge representations. This system is rather slow, but flexible. The implicit system on the other hand is unavailable to consciousness and contains skills and experiences that cannot be verbalized, but can be observed during task performance. Therefore, this system is very fast and highly efficient in its very specific context (Dietrich 2003, 2004; Dietrich and Stoll 2010). Dietrich (2004) concluded that the flow state would be "a period during which a highly practiced skill that is represented in the implicit system's knowledge base is implemented without interference from the explicit system" (p. 746) and further: "Given that the explicit system is subserved by prefrontal regions, it follows from this proposal that a flow-experience must occur during a state of transient hypofrontality that can bring about the inhibition of the explicit system" (p. 757). However, Dietrich (2004) did not reduce flow to task performance on an implicit level. As a crucial prerequisite for flow, he outlined a balance of personal skills and challenges of the task: If the implicit system is used to its full ability (and not beyond), no resources need to be dedicated to the explicit system. The only process of the explicit system that he explicitly excluded from being downregulated during flow is executive attention, since it is essential to focus on a certain activity and to selectively inhibit other cognitive prefrontal processes.

An interesting line of research that can shed some more light to the physiology of flow-experience is investigating default networks in the brain. It was consistently found that blood flow in regional brain activity, like in the medial prefrontal cortex (mPFC), decreased in a passive, relaxing state compared to a task-focused state (Goldberg et al. 2006; Gusnard et al. 2001; Raichle et al. 2001; Shulman et al. 1997). Shulman et al. (1997) proposed that the increased activity during a passive state reflects processes like monitoring or exploring the external environment, the body, or the subjective emotional state. Gusnard et al. (2001) argued that the mPFC contributes to self-referential mental activity or introspection. To explain the phenomenon of decreasing prefrontal activity during task engagement, Goldberg et al. (2006) proposed a global resource allocation network that disengages task-irrelevant cortical processes, such as self-related cortical representations. Since flow is a highly focused state of task engagement, these findings provide additional evidence that activity in particular brain regions decreases during flow-experiences.

Another line of research that may help to understand the physiology of flow in the brain is that of meditation. Meditational practice has often been linked to flow-experience (Csikszentmihalyi 1990; Goleman 1995; Posner et al. 2010), since their common target state is one of full attentional control. Both phenomena are characterized by a deep concentration on a certain focus. Once entered in a meditative state, practitioners report feelings of effortless attention similar to flow. However, meditation is usually practiced in a resting position whereas flow arises during an activity that might require a higher degree of physiological activation. Meditation has a longer research tradition with an early interest in its physiology from the 1950s (e.g. Das and Gastaut 1955; Bagchi and Wenger 1958). Yet, existing studies show inconsistent results. In some studies, *increased* activity in frontal lobes was found during meditation (Herzog et al. 1990; Lazar et al. 2000; Newberg et al. 2001), which would speak against a state of hypofrontality during effortless attention. If it is argued that flow and meditation are similar attentional states, how can these conflicting results be explained? As shown by Brefczynski-Lewis et al. (2007) in an fMRI study, very experienced meditation practitioners need much less effort to sustain the attention focus during meditation compared to less experienced practitioners. Since successful meditational practice often requires years of practice, the often-found increase in frontal activity could refer to lacking attentional control characterized by drifting thoughts and processes of self-reflection when novices try to meditate. Still, more research with an explicit focus on flow-experiences during task performance needs to be conducted to clarify this issue.

Other common attributes of flow and meditation are the loss of the senses of time, space, and self-awareness (Baijal and Srinivasan 2010; Csikszentmihalyi 1975) in opposite to a relaxing (“*default*”) state of mind on one side, and stress on the other. Goldberg et al. (2006) found neurophysiological evidence for the phenomenon of losing the self in the act, that is, a suppression of self-related brain areas during a highly demanding sensory processing task compared with an introspective task. Gusnard et al. (2001) found evidence that the dorsomedial PFC is associated with self-related emotional processing. Since self-related emotions are excluded in the definition of flow, the dorsomedial PFC would be expected to be inactive during flow-experience. The senses for space and time are neurophysiologically associated

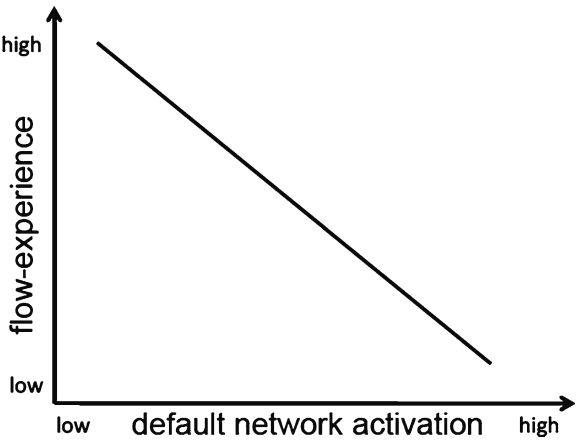

Fig. 8.4 The relation of flow-experience and default network activation in the brain

with the superior parietal lobe (Lynch 1980; Joseph 1996); therefore, they are expected to be inhibited during flow. Austin (2010) suggested that the thalamus plays a key role in effortless attention as experienced during meditation or flow. In the *thalamic gateway* hypothesis, he argued that the thalamus serves as a filter selecting which events become aware and which are shielded from awareness. Further, he explained that a deactivation of thalamic nuclei inhibits self-referential pathways in order to enter a state characterized by selflessness, effortlessness, and fearlessness as typical for flow.

Aggregating the existing theories and findings on the physiology of flow in the brain, it seems that flow results from a downregulation of task-irrelevant processes, which leads to decreased activity in default networks due to focused attention (see Fig. 8.4). Still, literature provides contradicting results that need to be clarified in studies explicitly addressing flow-experience.

Possible Contributions of the Neurotransmitter Dopamine

As suggested by Marr (2001), there might be a relation of dopamine and flow-experience. Flow is a highly intrinsically rewarding state, and dopamine is considered to be an essential element in the brain reward system. The mesolimbic dopamine system belongs to the so-called *pleasure centers* that have first been described by Olds and Milner in 1954. They had implanted an electrode into the septum of a rat's brain, and the rat could stimulate itself by pressing a button. The self-stimulation was so rewarding that the rat did continue regardless of hunger or thirst. The mesolimbic dopamine system is regulating reward-related motivational, emotional, and cognitive processes (Davis et al. 2009). Engagement in rewarding activities creates positive memories, and, therefore, these activities even gain salience for a subject. This process can be seen as an upward spiral of positive reinforcement that increases a subject's motivation toward the rewarding activity. Using a PET scan method (11C-labeled raclopride), Koepp et al. (1998) investigated human participants playing a rewarding

video game. They found an endogenous dopamine increase particularly in the (ventral) striatum that was positively correlated with the performance level.

Other indicators supporting a relation of dopamine and flow-experience are the effects of dopamine agonists, such as cocaine, that strongly resemble some attributes of flow-experience: a rewarding feeling of high energy and alertness, accompanied by an improvement of concentration (and therefore performance), a carefree trust in one's own abilities with a feeling of perfect control over the activity, while forgetting about basic human needs such as hunger or sleep.

Since the flow state is rewarding and appetitive, humans thrive to experience it more often and are more likely to engage in flow-eliciting activities. That is why highly flow-conducive activities carry at the same time a high risk for addiction. Examples are playing video games or internet surfing. Therefore, the relation of flow and addiction recently came into focus of research (for more details, see Chap. 7). One risk factor for addiction disorders seems to be hypodopaminergic functioning of the brain reward system so that dopamine-enhancing substances or activities are used to counterbalance the lack of dopamine in the system (Davis et al. 2009). Given that flow leads to a dopamine increase, low basal dopaminergic activity would contribute to an autotelic personality (see Chap. 9), which implies an active seeking and mastering of difficulties in order to experience the rewarding state of flow.

Future research on the relation of flow and dopamine should now follow theoretical considerations. Here, pharmacological studies seem promising, such as the administration of L-dopa in an experimental setting. Also imaginable is the use of neuroimaging methods, e.g., fMRI or PET scan with C-labeled raclopride RAC to measure changes in extracellular dopamine levels during flow-experience (see Koepp et al. 1998).

Electromyography

Electromyography measures action potentials discharged during facial muscle activity (Fridlund and Cacippo 1986). The "frowning muscle" *corrugator supercilii* (CS), the "smiling muscle" *zygomaticus major* (ZM), and *orbicularis oculi* (OO), the muscle that closes the eyelid (involved in genuine smiling), are often used as physiological indicators of emotional valence (see Larsen et al. 2008; see Fig. 8.5).

Whereas positive affect increases activity in ZM and OO, CS activity is increased by negative affect and inhibited by positive affect compared to baseline activity. CS activity has also been linked to mental effort (Van Boxtel and Jessurun 1993). Since flow-experience is considered to be a positive state, researchers have started to use EMG measures to investigate flow (Kivikangas 2006; De Manzano et al. 2010; Nacke and Lindley 2009; please note Box 8.5 on the role of emotions during flow-experiences). Starting from *enjoyment* as a key characteristic of flow, Kivikangas (2006) and De Manzano et al. (2010) expected to find increased ZM activity and decreased CS activity during flow-experience. Kivikangas (2006) here found partial support as he reported low CS activity being related to high flow, but no association with ZM and OO activity during video game playing.

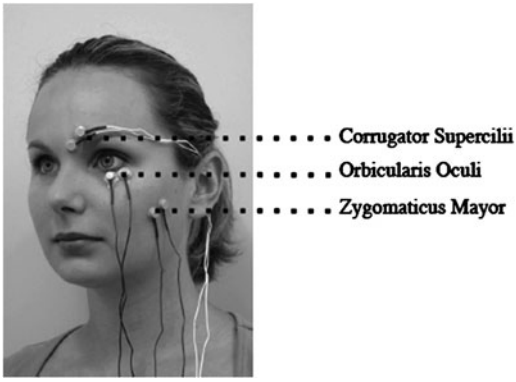

Fig. 8.5 Positions of EMG electrodes to measure corrugator supercilii, orbicularis oculi, and zygomaticus major

Box 8.5 The Role of Emotions During the Flow State

Literature provides contradicting statements whether flow is a positive emotional state or if emotions are absent during flow. It is proposed here to rather speak of a positively valenced state, than of an emotion. To experience emotions, self-referential thoughts are needed, which are naturally absent during flow (cf. Chap. 1).

Taking CS activity as an indicator for mental effort, these results could also be interpreted as evidence for an objective decrease of effort during subjective effortlessness in flow. In contrast, Nacke and Lindley (2009) found an association of the experimental flow condition with increased activity of ZM and OO but no association with CS. Also De Manzano et al. (2010) found a positive relation of flow with ZM activity, but no relation with CS activity in their study with professional piano players.

Since only few studies exist that investigated facial muscle activity in relation to flow, it is too early to draw conclusions. The conflicting results might be triggered by the different methodological factors of the experiments. Whereas participants played an ego-shooter game in Kivikangas' (2006) and Nacke and Lindley's (2009) experiments, in the experiment of De Manzano et al. (2010), participants played their favorite piece of music on the piano. Whereas Kivikangas used student volunteers, Nacke and Lindley had recruited male hardcore gamers and De Manzano et al. had professional piano players as participants. Further studies are necessary to clarify the conflicting results and to identify a flow-typical pattern if it exists.

Cortisol

The close relation of the concepts flow and stress, as introduced in part 2 of this chapter, suggests a connection of the stress-hormone cortisol to flow-experience. Cortisol is

a body-own hormone belonging to the group of glucocorticoids and is secreted by the adrenal glands as an end product of the hypothalamus–pituitary–adrenal (HPA) axis. Cortisol can be measured in blood or in saliva. Contrary to the ANS, this endocrine system reacts rather slow so that a cortisol change after a stressful event is only measurable in saliva 10–30 min after stimulus onset, depending on its intensity. Cortisol secretion follows a diurnal rhythmic and peaks within the first 30 min after awakening (cortisol awakening response; Fries et al. 2008). Cortisol is involved in general bodily functions like in metabolism and the immune system. Whereas every cell in the organism contains cortisol receptors, some brain areas are particularly rich of these receptors, e.g., the hippocampus, the hypothalamus, or the PFC.

In addition, cortisol is involved in the regulation of stress-related processes. It is increasingly secreted in stressful situations, and, therefore, cortisol is often called "*stress-hormone*" (for an overview on cortisol and its functions, see Ulrich-Lai and Herman 2009). However, existing studies suggest that cortisol is involved in the coping process by mediating the stress response (Oitzl et al. 2010; Putman and Roelofs 2011). Through its enhancing effect on blood glucose levels, additional energy resources are provided (Sapolski et al. 2000) preparing the individual for increased energy demands (Benedict et al. 2009). Lovallo and Thomas (2000) explain the physiology of cortisol secretion referring to the transactional stress model of Lazarus and Folkman (1984). According to their explanation, an individual undergoes an appraisal process, evaluating a given stressor by its threat potential (first appraisal) and the person's resources to cope with it (second appraisal; compare Fig. 8.2). If the appraisal process results in a global threat evaluation, this may in turn elicit a cortisol response in order to aid situational coping mechanisms. This explanation can be linked to the approach of Baumann (Baumann and Scheffer 2010; cf. Chap. 9), who hypothesizes that flow results from *seeing difficulty* and *mastering difficulty*: Integrating both approaches, it is proposed that seeing difficulties results in a cortisol increase preparing the individual for the stressful situation and providing additional resources for mastering. In line with this, it was found that cortisol helps to maintain normal cognitive functioning and memory formation during stress (Lovallo and Thomas 2000). Gailliot et al. (2007) found a lack of blood glucose to be associated with lower attention control in a Stroop task, while the administration of glucose could maintain performance. Since cortisol acts as an energy supplier by providing glucose to the body, it can help to maintain mental effort.

Putman and Roelofs (2011) argue that cortisol facilitates approach-related behavior and shields task performance from irrelevant emotions. Cortisol increases selective attention to stress-relevant stimuli, so that individuals use given information more efficiently and watch the important detail rather than the complete picture (De Kloet et al. 1999; Schwabe et al. 2007). This shift of attention deep into the task, that is, protected from irrelevant distractors and accompanied by a most efficient way of performing, is a key aspect of flow-experience.

In one of our recent studies, we found empirical evidence for this association between cortisol and flow-experience: A significant positive correlation of $r = 0.40$ between cortisol and flow-experience was observed in a complex video game (Peifer et al. 2010). Also Keller et al. (2011b) found elevated cortisol levels in participants playing an optimally challenging level of the video game *Tetris*. Rose and colleagues

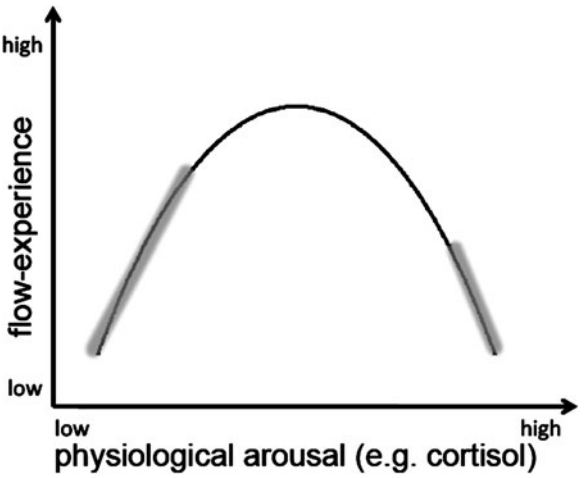

Fig. 8.6 Inverted-u function of physiological arousal and flow-experience

(Rose et al. 1982) found high cortisol reactivity in response to workload to be related with an experience of challenge and engagement. Also, this went along with more job satisfaction, higher competence ratings from peers, and less illness.

However, literature provides evidence for negative effects of enduring and / or high cortisol levels such as cognitive impairment (e.g., Lundberg 2005; McEwen and Seeman 1999). In line with this, we found in a recent study that flow decreases after the oral administration of cortisol, simulating a cortisol response to a strong stressor (Peifer et al. 2011).

Integrating these findings, it is proposed that the relation of cortisol and flow-experience follows an inverted-u-shaped function (compare Yerkes and Dodson 1908; see Fig. 8.6): As long as cortisol values are in a normal day-to-day range, a positive relation between cortisol and flow is expected. When cortisol is further increased, as in consequence of a strong and enduring stressor, a negative relation of cortisol and flow would result. However, this proposal still needs to be tested in future studies: So far, we only have evidence for the two ends of the curve as marked in Fig. 8.6.

Still, it is unclear whether an increase in cortisol is always involved in flow-experience: Does flow cause an increase in cortisol as suggested by Keller et al. (2011b)? Or do increased cortisol values in flow situations indicate that flow here results from a stress-coping process? This mechanism is visualized in Fig. 8.7: Through the described effects of cortisol on selective attention and blood glucose levels, additional coping capabilities are available, and a stressful state can be transformed into flow-experience as symbolized by the arrow from stress to flow. Is it possible to experience flow without increased cortisol levels? Yet, there are no studies to answer these last questions.

If cortisol would indeed always be involved in flow-experience, that would lead to the question whether flow has exclusively beneficial effects on health (Keller et al. (2011b)). Enduring high cortisol levels, as in very stressful life phases, lead to

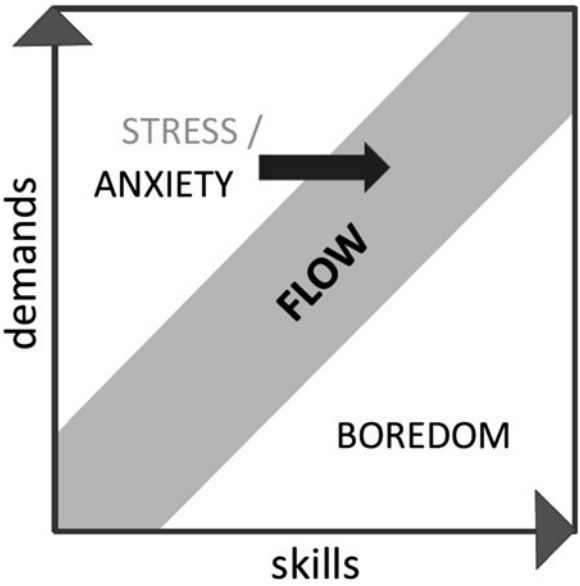

Fig. 8.7 From stress to flow through enhanced energy resources

an adaptation of the body: The body downregulates the overflowing cortisol resulting in hypocortisolism with decreased cortisol reactivity. It was found that low cortisol reactivity is associated with inadequate coping styles, such as passive coping and avoidance behavior (Heim et al. 2000). Further, there is evidence for health impairment due to high and enduring cortisol levels, such as cardiovascular disease, type 2 diabetes, and reduced immune functions (Lundberg 2005; McEwen and Seeman 1999). This leads to the following conclusion: Despite the pleasant and rewarding nature of flow, literature suggests that it is still a state of heightened physiological arousal that needs to be counterbalanced by phases of relaxation.

Cardiovascular Measures

Cardiovascular psychophysiology focuses on the interaction of psychological phenomena and cardiac activity (Brownley et al. 2000). The heart is controlled by the sinus node to beat 60–80 times per minute, and the number of beats per minute (bpm) is the measure for *heart rate* (HR). To adapt the cardiac performance to environmental demands, the heart is further influenced by the autonomous nervous system (ANS): The sympathetic part increases heart rate and stroke volume, and the parasympathetic part has the opposite effect (Porges 1995). During a resting state, parasympathetic influence is dominating, and, therefore, heart rate is low (Uijtdehaage and Thayer 2000). Low heart rate is usually accompanied by high heart rate variability (HRV), which represents the variability in the length of the interbeat intervals. High values represent a high ability to adapt to environmental demands (Porges

Table 8.1 Overview on physiological indicators concerning cardiovascular measures

Physiological term	Meaning
Heart rate (HR)	Number of heart beats per minute
Heart period (HP)	Inverse of HR
Stroke volume (SV)	Amount of blood pumped in one heart beat
Interbeat interval (IBI)	Time interval between two heart beats
Heart rate variability (HRV)	Variability of the length of inter beat intervals
Autonomous nervous system (ANS)	Branch of the nervous system that performs involuntary functions, influences cardiac activity due to environmental demands, consists of a sympathic and a parasympathetic nervous system
Sympathetic nervous system	Increases HR and SV
Parasympathetic nervous system	Decreases HR and SV, active during a resting state
Low-frequency band (LF)	Spectral component of the HRV, indicator for sympathetic activity or sympathetic and vagal activity, depending on the source
High-frequency band (HF)	Spectral component of the HRV, indicator for vagal activity
LF/HF ratio (LF/HF)	Quotient of LF and HF, reflecting sympathetic modulation or sympathico-vagal balance, depending on the sources

1995; Lehrer 2003). HRV is an important and sensitive cardiovascular measure that allows a differentiation of central sympathetic and parasympathetic influence. The differentiation can be realized by decomposing different frequencies within a time series of interbeat intervals (task force). Here, common measures are for instance the low-frequency band (LF; 0.14–0.15 Hz), the high-frequency band (HF; 0.15–0.4 Hz), and the quotient LF/HF as an indicator for sympathico-vagal balance. For an overview on the described indicators, see Table 8.1.

Regarding flow, an interesting aspect of HRV is that it can be used as an indicator for mental effort: In general, it is found that higher mental effort is associated with lower HRV (mainly in the HF band; Beh 1990; Hansen et al. 2003; Mulder et al. 1985; Redondo and Del Valle-Inclán 1992; Thayer et al. 2009). Therefore, HRV is a measure that can contribute to the debate of whether the reported effortlessness during flow is a subjective experience (Bruya 2010b). If objective effort would also be reduced during flow, one should find an increase in HRV. However, the opposite was found in a recent study conducted by Keller et al. (2011b). They investigated participants performing a knowledge task under experimentally induced skills-demands-compatibility condition, which was found to be associated with flow values compared to a boredom and an overload condition. In the compatibility condition, they observed a lower HRV in this condition compared to the boredom condition and on a trend level significance even compared to the overload condition. Keller et al. (2011b) attributed this finding to the high task involvement during flow and interpreted it as a sign of mental strain. In line with this were findings from De Manzano et al. (2010), who investigated piano players performing a favorite piece of music. They found an activation of the sympathetic branch of the ANS, represented through increased LF/HF ratio and increased heart rate, to be associated

with flow. The findings of Keller et al. (2011b) and De Manzano et al. (2010) support the view that the effortlessness during flow is a subjective experience that dissociates from the actual physiological costs, at least on the level of cardiovascular activity. Presumably, the feeling of the actual effort that accompanies flow is inhibited. It is possible that processes of the brain (CNS) and the ANS differ in that point and that a downregulation of default network activity might come along with an activation of the ANS, since a certain degree of alertness is necessary to focus on task performance. However, as proposed for cortisol, it is more likely that the relation of flow and cardiovascular activation follows an inverted-u function rather than a linear one. Very low and very high cardiovascular activation indicate a state of relaxation or a state of stress respectively. The optimal activation to experience flow should be located in between and might differ individually. Further studies on the cardiovascular processes during flow are required to test the proposed relationship.

Electrodermal Activity

EDA is an indicator for general arousal or attention (e.g., Boucsein 1992) and is a reliable measure for sympathetic activation (Dawson et al. 2007). It is defined by the skin's power to conduct (or resist) electricity, which predominantly depends on skin moisture and is increased through sweating. EDA is usually measured via two electrodes placed on the hand palm or on foot soles. Other terms used for EDA are galvanic skin response (GSR), skin conductance (SC), or skin resistance, whereas conductance and resistance are two sides of the same coin (for an overview on physiological terms concerning electrodermal activity see Table 8.2). One can distinguish between tonic and phasic EDA, whereas *tonic* refers to a long-term skin conductance level (SCL), indicating vigilance, sustained attention, and heightened arousal over time (Kilpatrick 1972). *Phasic* EDA reflects an event-related skin conductance response.

Flow-experience cannot be seen as a discrete situation that is triggered by specific stimuli or peak experiences, but it is characterized by an automaticity in action and a smooth activity flow enduring over a longer time period. Therefore, tonic SCL is a promising measure to investigate flow as chosen by Kivikangas (2006).

Phasic SCL might be of interest to observe the reaction toward sudden obstacles appearing during task performance. Again, a decrease in effort during flow as discussed by Bruya (2010b) should be reflected by lower values in SC compared to stress conditions. However, as already discussed for cardiovascular measures, a downregulation of irrelevant brain processes may come along with sympathetic activation as reflected by an increase in EDA. Supporting that view, it has consistently been found that EDA is generally elevated during task performance, information processing, and cognition (Dawson et al. 2007; Hugdahl 1995; Lacey et al. 1963; Siddle et al. 1996). Since flow-experience takes place during task performance, it is proposed here that SCL is generally elevated in flow situations compared to relaxation states. This is exactly what Nacke and Lindley (2009) found in their study with experienced players in an ego-shooter game: an association of increased EDA with the experimental flow condition. However, Kivikangas (2006)

Table 8.2 Overview on physiological indicators concerning EDA

Physiological term	Meaning
Electrodermal activity (EDA)	Ability of the skin to conduct or resist electrical current; mainly depending on skin moisture
Galvanic skin response (GSR)	Synonym for EDA
Skin conductance (SC)	Ability of the skin to conduct electrical current—reciprocal of SR
Skin resistance (SR)	Ability of the skin to resist electrical current—reciprocal of SC
Tonic EDA	Long-term skin conductance level (SCL); indicator for vigilance, sustained attention, and heightened arousal over time
Phasic EDA	Event-related skin conductance response; measured with skin conductance response (SCR)

did not find an association of EDA and flow-experience. This zero correlation might refer to a curvilinear relationship of flow and EDA: The increase in SCL depends on the demands of the task in relation to the skills of the person. With increasing task demands and resulting effort, SCL should further rise so that SCL is higher in stress compared to flow situations, which can again be visualized in an inverted-u function. Further studies are required to clarify the so far inconsistent results.

Another interesting aspect of the EDA is that relatively stable individual differences in SCR can be identified by their degree of *electrodermal lability* (Dawson et al. 2007). Whereas *stabiles* quickly habituate to certain stimuli and show a low rate of spontaneous SCRs in general, *labiles* habituate slower and show a higher rate of spontaneous SCRs. It was found that labiles have a higher ability to sustain focused and to prevent performance decrements. Katkin (1975) concludes that electrodermal lability, as a personality trait, seems to reflect central processes that are involved in attention and information processing. A higher ability to focus on tasks could possibly be linked to autotelic personality. It would be very promising to investigate this relation in future studies.

Conclusion

As conclusion of this chapter, the proposed integrative definition of flow-experience is further specified (Box 8.6), directions for future research are summed up, and practical implications are provided.

An Integrative Definition of Flow-Experience

The following proposed definition (Box 8.6) aims to integrate the reported theoretical approaches and empirical findings regarding flow-experience and explicitly includes not only the physiological but also cognitive, affective, and behavioral components.

Box 8.6 An Integrative Definition of Flow-Experience

Flow is a positively valenced state (affective component), resulting from an activity that has been appraised as an optimal challenge (cognitive component), characterized by optimized physiological activation (physiological component) for full concentration on coping with environmental/task demands (behavioral component).

Optimized physiological activation during flow refers to:

1. A decreased activation in default networks of the brain (Fig. 8.8)
2. Moderate peripheral arousal following a u-shaped function of activation (Fig. 8.9)

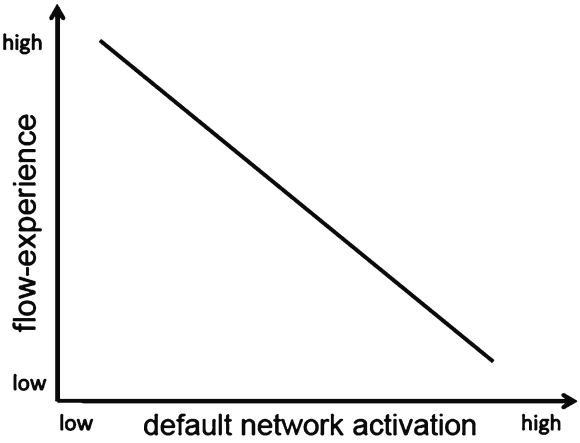

Fig. 8.8 Flow in the brain

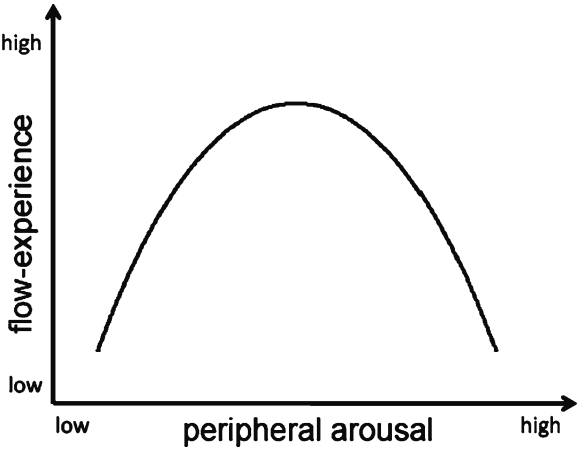

Fig. 8.9 Flow and arousal

Practical Implications

How can the described physiological mechanisms underlying the experience of flow be translated into action recommendations to reach flow states more often?

(1) Brain Processes
It has been proposed that brain processes during flow-experience are characterized by a decrease of default networks in the cortex. To reach such a decrease can be practiced through mental training, such as attention training (e.g., Rueda et al. 2005a, b) or meditation (Tang et al. 2007; for an overview, see Posner et al. 2010). Posner et al. (2010) suggested that meditation practice can enhance an individual's ability to reach a flow state and call for further investigation of this possible relation.

(2) General Arousal Indicators
Starting from a state of stress, a downregulation of the physiological arousal is required, which can be reached through the application of relaxation techniques. These techniques can be practiced in order to achieve faster and more efficient results. Starting from a passive state of low physiological arousal, an increase of arousal is required in order to reach a flow state. Here, gentle physiological activity can help to increase sympathetic activation.

Directions for Future Research

In this chapter, a framework for the psychophysiology of flow was proposed by linking popular stress concepts to flow theory. Until today, only few researchers have examined flow from a physiological perspective. Particularly for brain processes, mainly theoretical approaches exist; empirical studies are lacking (except for a very early study of Hamilton et al., 1984). Electrophysiological (EEG) or imaging techniques (fMRI, PET scan) should be used to shed more light on the hypofrontality hypothesis (Dietrich 2004; Dietrich and Stoll 2010). Also, neural correlates of self, time, and space seem to be promising variables in the investigation of flow-experience. In addition, the role of dopamine was discussed in literature, but never investigated. Therefore, pharmacological studies seem very interesting to clarify the role of dopamine to reach and sustain flow. Further, results on facial EMG measures indicating emotional arousal are still inconsistent and need future clarification. Regarding general arousal indicators of the ANS (e.g., ECG and EDA) and the stress-hormone cortisol, a u-shaped function of flow and arousal was proposed. However, existing studies cannot yet fully test this approach. Another difficulty here is the huge variability of possible flow-inducing activities that require different activation levels for "optimal functioning," depending on the certain demands of the activity. Altogether, there is a strong potential in the psychophysiological investigation of flow-experience, and hopefully, this chapter contributes to further stimulate the research progress.

Study Questions

- Describe theoretical approaches regarding the psychophysiology of flow-experience.

  (a) Based on results of Hamilton and colleagues (1984), it was hypothesized that flow is connected to a decrease in cortical activation, where a minimum of mental energy leads to maximum efficiency in highly practiced activities. Activation and inhibition of neural circuitry are fully adapted to momentary activity demands during flow-experience, and task-irrelevant processes are downregulated (Csikszentmihalyi 1990; Goleman 1995; Hamilton et al., 1984; Marr 2001).
  (b) The approach of Dietrich (2004) goes in a similar direction. He suggested that flow results from a downregulation of prefrontal activity in the brain (*Hypofrontality*; Dietrich 2003): During flow, well-trained activities are performed by the implicit system without interference from the explicit system, which makes the process very fast and efficient.
  (c) Austin (2010) suggested that the thalamus plays a key role in effortless attention as experienced during meditation or flow. In the thalamic gateway hypothesis, he argued that the thalamus serves as a filter selecting which events become aware and which are shielded from awareness. Further, he explained that a deactivation of thalamic nuclei inhibits self-referential pathways in order to enter a state characterized by selflessness, effortlessness, and fearlessness as typical for flow.
  (d) Marr (2001) discussed the neurotransmitter dopamine as a possible neurophysiological correlate of flow-experience. The mesolimbic dopamine system is regulating reward-related motivational, emotional, and cognitive processes (Davis et al. 2009). Flow is a highly intrinsically rewarding state, and engagement in rewarding activities creates positive memories, and, therefore, these activities even gain salience for a subject. This process can be seen as an upward spiral of positive reinforcement that increases a subject's motivation toward the rewarding activity. However, this approach has never been tested yet.
  (e) Based on research of Kivikangas (2006) and their own study, De Manzano et al. (2010) concluded that the physiology of flow consists of sympathetic activation and positive affect.
  (f) In this chapter, prior theoretical and experimental papers and our own research results led to the proposal of a particular physiological pattern typical for flow-experience, that is:

    - A decreased activation in default networks of the brain (Fig. 8.7).
    - Moderate peripheral arousal following a u-shaped function of activation (Fig. 8.8).

  → For more detailed information, please go back to *Part 1: Existing Literature on the Psychophysiology of Flow-Experience* and to *Part 3: What Means "Optimized Physiological Activation"?*

- Please explain the term *effortless attention* in the context of flow-experience and describe related findings.

A feeling of effortless attention has often been described in the context of flow-experience (Csikszentmihalyi 1975, 1997, 1999; Bruya 2010b). According to Bruya (2010b), it is a

> description of attention or action that (1) is not experienced as effortful or (2) involves exertion and, due to the autotelicity of experience, subjective effort is lower than in normal conditions, with effectiveness maintained at a normal or elevated level. (p. 5)

Effortlessness as a subjective experience can be measured with questionnaires. Whether or not this subjective experience is accompanied by a decrease in objective effort can be measured with psychophysiological indicators. Related findings are reported in the following:

(a) In an EEG study, Hamilton and colleagues (1984) found that individuals scoring high on the intrinsic enjoyment scale are better able to control and sustain their attention with less effort compared to controls.
(b) In research concerning default networks in the brain, it was consistently found that blood flow in regional brain activity, like in the medial prefrontal cortex (mPFC), decreased in a passive, relaxing state compared to a task-focused state (Goldberg et al. 2006; Gusnard et al. 2001; Raichle et al. 2001; Shulman et al. 1997).
(c) Brefczynski-Lewis and colleagues (Brefczynski-Lewis et al. 2007) could show in an fMRI study that very experienced meditation practitioners need much less effort to sustain the attention focus during meditation compared to less experienced practitioners.
(d) As shown by De Manzano et al., Keller et al. (EKG, cortisol), and Peifer et al. (cortisol), an increased sympathetic and endocrine activation compared to a state of relaxation is linked with flow.

Based on these results, it seems that flow is linked to decreased default network activity in the brain and moderate peripheral arousal.

- How are stress and flow related? Compare Lazarus' transactional model with Csikszentmihalyi's flow theory.

Lazarus' transactional stress model has important theoretical characteristics in common with flow theory:

(a) The conceptualizations of anxiety according to Csikszentmihalyi (1975) and stress according to Lazarus and Folkman (1984) seem equivalent, as they result if situational demands exceed the resources of an individual. Flow is experienced below anxiety (or stress respectively) and above boredom, in the small channel of an optimal challenge–skill balance (Csikszentmihalyi 1975).
(b) The concept of challenge in the sense of Lazarus closely resembles the concept of challenge–skill balance as a prerequisite of flow-experience in the sense of Csikszentmihalyi (1975). Lazarus stated that in situations appraised as a challenge, the process of coping itself can be pleasurable (Lazarus et al. 1980).

(c) Flow and stress are the result of an appraisal process. Referring to Lazarus (Lazarus and Folkman 1984), Csikszentmihalyi (1990, 1993) states that stress can be transformed into flow-experience through reappraisal of a negative situation into a pleasant challenge. Here, flow appears as a cognitive strategy to cope with stress (Weimar 2005; see Fig. 8.3); Lazarus refers to flow-experience as an emotion that helps to sustain coping efforts.

→ For more detailed information, please go back to paragraph *Flow in the Transactional Stress Model*

- Can physiological measures substitute self-report measures to investigate flow-experience?

Flow is a subjective experience, and therefore, physiological measures cannot completely substitute self-report measures, but they can help to better understand the concept. Whereas self-report measures, such as questionnaires and interviews, are retrospective by nature, the advantage of physiological measures is that they can be measured online and the person in flow does not need to be interrupted.

→ For more detailed information please go back to paragraph *Introduction: Benefits of a Psychophysiological Perspective to Study Flow*

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Chapter 9
Autotelic Personality

Nicola Baumann

Abstract This chapter reflects the search for more stable causes of flow experiences such as "flow personality" or "autotelic personality." Although flow research is primarily concerned with flow as a motivational state, Csikszentmihalyi has introduced the concept of an autotelic personality, that is, a disposition to actively seek challenges and flow experiences. This chapter starts with an overview of Csikszentmihalyi's conceptual ideas and phenomenological descriptions of autotelic personalities. Unfortunately, the rich concept was not complemented by an adequate operationalization. The chapter continues with a review of personality dispositions which can be conceived of as boundary conditions for flow experience. They reflect differences either in the *need* (achievement motive) or in the *ability* (self-regulation) to experience flow. The concept of an autotelic personality should encompass both aspects simultaneously. Next, the achievement flow motive (*n*AchFlow) is introduced which integrates need and ability aspects. As such, *n*AchFlow will be proposed as a way to operationalize an autotelic personality. Finally, the chapter offers a functional analysis of flow in achievement contexts within the framework of personality systems interaction (PSI) theory and gives an outlook.

Csikszentmihalyi's Concept of an Autotelic Personality

General Idea

Flow is a state of intrinsic motivation in which a person is fully immersed in what he or she is doing for the sake of the activity itself (Csikszentmihalyi 1975/2000, 1990). It is characterized by a merging of action and awareness, sense

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Box 9.1 Csikszentmihalyi's Definition of Autotelic Personality

"'Autotelic' is a word composed of two Greek roots: *auto* (self), and *telos* (goal). An autotelic activity is one we do for its own sake because to experience it is the main goal. […] Applied to personality, autotelic denotes an individual who generally does things for their own sake, rather than in order to achieve some later external goal" (Csikszentmihalyi 1997, p. 117).

"The mark of the autotelic personality is the ability to manage a rewarding balance between the 'play' of challenge finding and the 'work' of skill building" (Csikszentmihalyi et al. 1993, p. 80).

of control, high concentration, loss of self-consciousness, and transformation of time (Csiks-zentmihalyi 1975/2000, 1990; Csikszentmihalyi and Larson 1987; Csikszentmihalyi and LeFevre 1989; Nakamura and Csikszentmihalyi 2002). Although flow research has so far been primarily concerned with flow as a motivational state, Csikszentmihalyi and colleagues also suggested the idea of an autotelic personality: Autotelic personalities tend to position themselves in situations which enable frequent experiences of flow states (Csikszentmihalyi et al. 1993; Nakamura and Csikszentmihalyi 2002). They have a greater capacity to initiate, sustain, and enjoy such optimal experiences.

Csikszentmihalyi's concept of an autotelic personality is derived from his flow model. According to his original model (Csikszentmihalyi 1975/2000), flow is experienced when an actor perceives a balance between the challenge of an activity and his or her own skills. In the revised model, Csikszentmihalyi and Csikszentmihalyi (1988b) proposed that flow is experienced when both challenges and skills are high. Most flow research to date has started from these assumptions and operationally defined flow as experiences of balance (or high/high combinations; cf. Chap. 2). Only recently have researchers begun to measure and experimentally manipulate challenges and skills separately and to test their relation to flow experience (Engeser and Rheinberg 2008; Rheinberg et al. 2003; Keller and Bless 2008; Keller and Blomann 2008; cf. Chap. 3). Csikszentmihalyi's definition of an autotelic personality was guided by the same balance assumption: Autotelic personalities have a greater ability to manage the intricate balance between the play of challenge finding and the work of skill building (see Box 9.1; Csikszentmihalyi et al. 1993).

According to Csikszentmihalyi, challenge finding and skill building are supported by different, sometimes even opposing traits or processes which are simultaneously present in autotelic personalities: pure curiosity and the need to achieve, enjoyment and persistence, openness to novelty and narrow concentration, integration and differentiation, and independence and cooperation (Csikszentmihalyi et al. 1993; Nakamura and Csikszentmihalyi 2002). For example, the pleasure and fun associated with flow may be highly desirable. Nevertheless, flow activities also require concentration and a willingness to learn about the limits of one's skills. Where non-autotelic individuals may see only difficulty, the deep sense of interest aids autotelic

individuals to recognize opportunities to build their skills. They open their attention to new information (the play of challenge finding) and focus it on those units of information just far enough ahead of current skills to be manageable (the work of skill building).

The autotelic personality is a conjunction of receptive (e.g., openness) and active qualities (e.g., engagement and persistence). The openness to detect and become interested in new challenges is receptive yet not entirely passive. It also involves active engagement and persistence in highly challenging activities. However, the engagement is not a mean to a specific goal. Csikszentmihalyi (1997) summarized these qualities as a capacity for "*disinterested interest*." The term "disinterested" emphasizes a focus on task-inherent as opposed to purpose-related incentives as well as an orientation toward mastery as opposed to performance. Nakamura and Csikszentmihalyi (2002) describe similar core characteristics of autotelic personalities (i.e., curiosity and interest in life, persistence, and low self-centeredness) as metaskills. However, the relationship of such skills or traits with the frequency or intensity of flow experiences has rarely been tested.

Csikszentmihalyi et al. (1993) proposed that these complementary (receptive and active) qualities in tandem produce a powerful autotelic combination. The simultaneous presence of complementary or even opposing traits fosters a dynamic, dialectical tension which is conducive to "optimal" personality development and the evolvement of complex individuals. Therefore, autotelic individuals should have a clear advantage in realizing the development of their talents to the fullest extent (Csikszentmihalyi 1996; Csikszentmihalyi et al. 1993). The dialectical principle and the complexity inherent in autotelic experiences are often stimulated not only through the traits of a person but also through the environment: Autotelic personalities tend to have family and school environments which simultaneously provide challenge and support, independence and cooperation, flexibility and cohesion, and integration and differentiation.

Previous Measurement Approaches

Whereas the description of autotelic personalities and their developmental contexts is very rich and integrates general principles of self-growth from different theories, the operationalization of the construct is rather poor. There are two different approaches toward measurement. In the first approach, autotelic personalities are identified through frequency and intensity of characteristic experiences. Csikszentmihalyi (1997) assessed the frequency of high-demand, high-skill situations over longer periods of paging with the experience sampling method—a technique developed for the purpose of obtaining self-reports of thoughts and feelings at random intervals during ongoing activities (cf. Chap. 2). Individuals whose frequency of high-demand, high-skill experiences is in the upper quartile of the distribution (autotelic) are compared to those in the lower quartile (non-autotelic) in other outcomes of experience and behavior (Csikszentmihalyi 1997). Findings indicate, for example, that autotelic

individuals are not necessarily happier but are more often involved in complex activities which, in turn, make them feel better about themselves and increase their self-esteem (cf. Csikszentmihalyi 1997). This measure of autotelic personality is problematic because high-demand, high-skill situations do not necessarily elicit flow (e.g., Engeser and Rheinberg 2008).

Additionally, Csikszentmihalyi and colleagues developed a flow questionnaire that assesses the frequency (0 = "*not at all*" and 1 = "*few times a year*" to 7 = *"few times a day*") of three flow characteristics (Asakawa 2010; Csikszentmihalyi 1975/2000, 1982; Csikszentmihalyi et al. 1993; cf. Chap. 2). More recently, Jackson and colleagues (Jackson and Eklund 2002; Jackson et al. 2008) developed a dispositional flow scale which assesses the frequency with which individuals experience the full range of typical flow characteristics (loss of self-consciousness, transformation of time, sense of control, concentration on a task, etc.) within specified activities in general (cf. Chap. 2). The scale is validated not only in physical activity settings but also in other performance-related domains (Jackson and Eklund 2004b; Wang et al. 2009). Nevertheless, mere frequency (as well as intensity) measures do not contribute to an understanding of the underlying causes of flow experience as has been the case for the conceptionalizations above.

In the second approach, autotelic personalities are determined through their expected outcome of full talent development. Csikszentmihalyi et al. (1993), for example, derived autotelic personality patterns from traits that distinguish talented from average individuals: Autotelic (i.e., talented) personalities have traits conducive to concentration (e.g., achievement, endurance) as well as openness to experience (e.g., sentience, understanding). The traits were assessed with the personality research form (PRF; Jackson 1984a). However, little is known about the role of such personality factors with respect to flow experience. More importantly, the measure is confounded with the outcome (i.e., talent development) which it was originally designed to explain (Csikszentmihalyi et al. 1993).

Taken together, the search for stable causes behind flow experience is appealing and has interested flow researchers from early on. However, the concept of an autotelic personality is awaiting a clear operationalization that is not confounded with its to-be-explained outcomes. Before offering such an operationalization, the existing literature on the relationships between personality traits and flow experience is reviewed in more detail. This review is designed to provide more insights into functional underpinnings of a flow personality.

Personality Traits as Boundary Conditions of Flow

By introducing the concept of an autotelic personality, flow theory has acknowledged that some people are more likely to experience flow than others (Csikszentmihalyi 1975/2000, 1990). Nevertheless, flow researchers have only recently begun to empirically test the relationship between personality traits and flow experience. The recent findings clearly support the assumption that flow

experiences are systematically related to individual differences, for example, in the achievement motive (Eisenberger et al. 2005; Engeser and Rheinberg 2008; Schüler 2007) and in self-regulatory competencies (Keller and Bless 2008; Keller and Blomann 2008).

Achievement Motive

Among the many traits proposed to be conducive to autotelic experiences, the achievement motive is a strong candidate for several reasons. First, Moneta and Csikszentmihalyi (1996) proposed that "the flow model may be more applicable to social contexts and activities where achievement plays a dominant role" (p. 393). Second, a consistent finding in motivation research is that the achievement motive moderates whether people perceive a challenge–skill balance (i.e., medium task difficulty) as positive or negative. According to Atkinson's (1957) risk-taking model, only individuals high in hope for success prefer medium task difficulty (balance), whereas individuals high in fear of failure even try to avoid such balanced situations. The moderating role of the achievement motive has been empirically supported by findings from Eisenberger et al. (2005), Engeser and Rheinberg (2008), as well as Schüler (2007): Individuals high in hope for success and low in fear of failure do not only experience more flow, they especially experience more flow when they perceive a challenge–skill balance (medium task difficulty).

The findings support the assumption that a high need for achievement (*n*Ach) in its hope of success component is an important prerequisite for flow. In the studies cited above, hope for success was assessed with projective or semiprojective motive measures which tap into implicit (operant) motives. In contrast, questionnaire measures of achievement assess explicit goals orientations or self-attributed needs for achievement (*san*Ach). Congruence between these two distinct systems has been associated with self-determination and well-being (Brunstein et al. 1998; Thrash and Elliot 2002), whereas incongruence has been identified as a hidden stressor associated with volitional depletion and psychosomatic symptoms (Baumann et al. 2005; Kehr 2004a). Recent findings show that incongruence also has a negative impact on flow experience (Rheinberg 2008), especially when the potential conflict between *n*Ach and *san*Ach is aroused by achievement incentives (Schüler 2010). Taken together, the findings suggest that flow experience does not only depend on a strong need for achievement but also on its approach-oriented and self-determined implementation.

Self-Regulation

The important role of self-regulation in flow can not only be indirectly inferred from goal–motive congruence. In studies by Keller and Bless (2008) as well as Keller and Blomann (2008), the role of self-regulation has been directly tested by assessing

individual differences in self-regulation competencies such as action orientation (Kuhl 1994a, b) and internal locus of control (Rotter 1966).

The volatility-persistence component of action orientation reflects the ability to stay immersed in an ongoing activity (Kuhl 1994a, b). Whereas state-oriented individuals get quickly tired of interesting activities, take breaks, or work on other things in between (volatility), action-oriented individuals get fully immersed into interesting activities and persist for a long time with high concentration (persistence). Keller and Bless (2008) found this disposition to moderate the impact of challenge–skill balance on flow experience: Action- compared to state-oriented participants experienced significantly more flow when the task difficulty was dynamically adjusted to participants' skill levels. This finding is especially noteworthy because challenges and skills were equally matched for state- and action-oriented participants, and therefore skill levels per se could not explain the differences. Nevertheless, only action-oriented participants showed increased flow experience under balanced compared to unbalanced conditions.

Similar findings were observed for an internal locus of control (Keller and Blomann 2008). Individuals with an internal locus of control believe that outcomes are generally contingent upon the work and effort put into them and not so much on powerful others or chance (Lefcourt 1991; Levenson 1981; Rotter 1966). Internal locus of control moderated the impact of a dynamically adjusted challenge–skill balance on flow experience (Keller and Blomann 2008): Only individuals high in internal locus of control experienced higher flow under balanced compared to unbalanced task conditions (i.e., boredom or overload). In contrast, individuals low in internal locus of control had low levels of flow across all conditions. The findings confirm the assumption that flow does not arise for everybody as a result of optimal task conditions. Conceivably, it requires self-regulatory abilities to detect and utilize optimal task conditions even when they are externally provided. In flow theory, skills have been typically described as person factors and challenges as environmental factors. However, the findings by Keller and colleagues suggest that the perception and regulation of task demands may be a person factor as well.

To summarize, the self-regulation findings suggest that autotelic personalities have a high ability to detect and utilize a challenge–skill balance when they encounter it (i.e., *ability* for flow). This is a necessary but not a sufficient prerequisite for frequent and intense flow experiences. In addition, the achievement motive findings suggest that autotelic personalities also have a strong motivation to actively seek and produce flow experiences (i.e., *need* for flow). Thus, a measure of an autotelic personality should integrate both need and ability aspects: the need to seek difficulty (challenge) and the ability to master it.

The Achievement Flow Motive Behind Flow Experience

Baumann and Scheffer (2010) proposed a stable motive disposition behind frequent and intense flow experiences in achievement contexts: the *achievement flow motive* (*n*AchFlow). It is the amalgam of the aroused need to master challenging tasks

(seeking or seeing difficulty) and its mastery–approach implementation (mastering difficulty). The latter part of the definition reminds of Elliot's 2×2 conceptual framework of goal striving which combines mastery versus performance goals with approach versus avoidance orientations (Elliot and McGregor 2001). In contrast to Elliot, however, *n*AchFlow is not directly assessed via self-report but with operant measures which are based on apperception.

The general idea is that in the process of apperception (e.g., when inventing stories to ambiguous pictures), people do not only give need-related interpretations of perceptual input which can be coded as need content (affiliation, achievement, power). In addition, they provide implementation-related information on how they satisfy their needs (e.g., mastery-approach-oriented in case of flow). The implementation component can be inferred from the mood of the protagonist and affective tone of the story. The assumption is based on research indicating that moods and affective processes are critical indicators for enactment-related determinants like mastery-approach or mastery-avoidance, especially with regard to behavioral facilitation or inhibition (Baumann and Kuhl 2002; Gray 1987; Kazén and Kuhl 2005; Kuhl 2000; Kuhl and Kazén 1999). As such, *n*AchFlow allows to operationalize the autotelic personality because it integrates ability and need aspects of flow.

*N*AchFlow is conceived of as the intrinsic component of the achievement motive. The core aspect of the general achievement motive is to deal actively with an internal or external standard of excellence by changing an object toward a quality standard, improving it with respect to certain criteria, learning something, or meeting a requirement (Kuhl and Scheffer 1999; McClelland et al. 1953). The intrinsic component of the achievement motive is characterized by mastery- and approach-oriented strivings to meet internal standards of excellence (i.e., difficulty). These strivings are experienced as curiosity and interest in learning something.

Operant Measurement

*N*AchFlow can be assessed with the operant motive test (OMT; Kuhl and Scheffer 1999; Kuhl et al. 2003) which is a refined version of projective techniques like the thematic apperception test (TAT; Murray 1943; cf. Schultheiss and Brunstein 2010) and other picture story exercises. Participants are asked to write stories in response to ambiguous pictures which are coded for need- and implementation-related information. Sample pictures are presented in Fig. 9.1 and samples responses for coding *n*AchFlow are given in Box 9.2.

The OMT differentiates four hope components (approach behaviors) for each motive on the basis of crossing two affective sources of motivation (positive vs. negative affect) with self-determined versus incentive-focused forms of motivation (see Table 9.1). For the achievement motive, the two components driven by positive affect/approach motivation can be described as (1) self-determined *flow* (*n*AchFlow) and (2) incentive-focused, *standards of excellence.* The two components driven by negative affect/avoidance motivation are (3) self-determined *coping with failure*

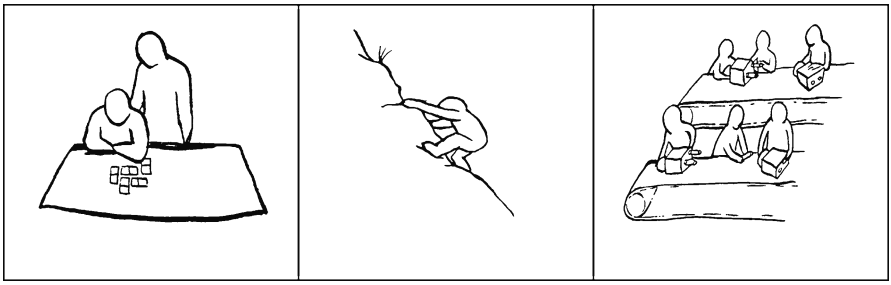

Fig. 9.1 Three sample pictures of the operant motive test (OMT)

Table 9.1 Four hope components of the achievement motive in the OMT

	Affective source of motivation	
	Positive affect	Negative affect
Self-determined	1. *Flow* – Being immersed in a task – Interest, curiosity, fun – Learning something new	3. *Coping with failure* – Perception of threat associated with active coping – Learning from failure – Disengagement
Incentive-focused	2. *Standards of excellence* – Inner standards – Doing something well – Being proud	4. *Pressure to achieve* – Social standards – Being the best – Relief after success – Meeting requirements

and (4) incentive-focused *pressure to achieve*. For example, a story in which the protagonist feels relief after success indicates latent negative affect as a source of motivation for approach behavior (i.e., active avoidance). In contrast, positive affect as a source of motivation would trigger feelings of pride instead of relief (see Box 9.3 for further details of the coding procedure). For the assessment of *n*AchFlow, only flow (component 1) is relevant.

Box 9.2 The Operant Motive Test: A Measure of Autotelic Personality

In the OMT, participants are presented with 15 pictures like the ones depicted in Fig. 9.1. Participants are asked to choose a main character, invent a story, and give their spontaneous associations to the following four questions:

1. What is important for the person in this situation and what is the person doing?
2. How does the person feel?
3. Why does the person feel this way?
4. How does the story end?

(continued)

Box 9.2 (continued)

The first question is likely to elicit need descriptors (i.e., affiliation, achievement, power). The second and third questions are likely to elicit implementation descriptors (e.g., mastery-approach, positive affect). The fourth question is often not considered for coding the OMT because it elicits happy endings out of the blue. Only if responses are coherently connected to and an integral part of the whole story, they can be used to define the implementation strategy. Typical answers for coding the achievement flow motive are as follows:

Left picture in Fig. 9.1 (sitting person):

1. The fun of the game. The person is concentrated on the puzzle.
2. Concentrated, elated.
3. The person likes to solve difficult puzzles.
4. The puzzle is solved.

Middle picture in Fig. 9.1:

1. High concentration is important. The person is totally involved in climbing the steep mountain and focuses on holds.
2. Invigorated, focused, and happy.
3. Because the person is confident to master this challenge.
4. The person reaches the top.

Right picture in Fig. 9.1 (person in the upper right):

1. Learning how to assemble the box; she is trying to do it on her own.
2. Curious, absorbed in her work.
3. The person wants to know what the thing is when assembled.
4. She assembles it on her own and finds out it is a jack-in-the-box.

Only if participants show both types of answers, that is, indicate a need to get involved in challenging tasks and an implementation sequence characterized by positive affective and self-determination (i.e., mastery–approach), the score on achievement flow motive is given.

In addition to achievement, the OMT differentiates four hope components for affiliation (*intimacy, sociability, coping with rejection, affiliation/familiarity*) and power (*guidance, status, self-assertion, direction/inhibited power*). Although the intrinsic components of affiliation (*intimacy*) and power (*guidance*) may indicate tendencies to seek and experience flow in social domains, they have different functional underpinnings compared to flow in the achievement domain (e.g., less difficulty orientation). This assumption will be elaborated in the final section of this chapter.

Finally, there is a classical fear component indicating a passive instead of an active avoidance for each motive (*fear of failure, dependence, subordination/powerlessness*).

Box 9.3 The Four Steps of the OMT Coding Procedure

1. The OMT coding procedure starts by checking whether one of the three basic motives is present. If no need becomes obvious in the picture story, a "zero" is coded.
2. If a motive is present, the coding procedure continues by checking whether approach behavior (hope) or avoidance behavior (fear/passive avoidance) is present (components 1–4 vs. 5, respectively). Passive avoidance can be inferred from explicitly reported negative affect which is not counter-regulated.
3. If an approach behavior is apparent, the next step is to code whether more internal, self-regulatory processes or more external triggers (e.g., incentives present in the situation) are involved in the motive-specific approach tendencies (components 1 and 3 vs. 2 and 4, respectively). For example, when a person in the story is confronted with a threat to need satisfaction, participation of the self is coded if he or she generates a creative solution.
4. The final step in the assessment is to code whether approach behavior is based on positive or negative affect (components 1 and 2 vs. 3 and 4). The affective source of motivation does not have to be explicitly reported in the story. Latent negative affect (active avoidance) which is not associated with self-determination (component 4), for example, can be inferred from rather "tight" or rigid forms of behavior even if negative affect is not directly mentioned (e.g., "she wants to be close to the other person"; "he just wants to beat his competitor").

In many cases, it may be easier to perform step 4 prior to step 3. See Kuhl and Scheffer (1999) for an elaborated coding manual.

Descriptives and Stability

Scale Range

In the OMT, no correction for length of story is necessary because only one of the 15 categories (3 motives × 5 components) or a zero is coded per picture story. Thus, achievement flow motive scores could theoretically range from 0 to 15.

Distribution

Empirically, the distribution of OMT scores is rather screwed. Most people do not show a score on achievement flow motive at all (about 65–80%). Only a quarter of a sample shows scores of one (10–30%), two (5–10%), three (0–5%), or four (0–5%). The sensitivity of the OMT could be increased by adding pictures that

strongly stimulate the achievement flow motive and removing those designed to assess other motive categories. To this point, it has to be left open if the flow motive is not distributed proportionally in the population indeed.

Stability

Flow research has paid only little attention to stable dispositions behind flow experience. Frequency and intensity measures of flow such as the experience sampling method (Csikszentmihalyi 1975/2000, 1997) as well as the dispositional flow scale (Jackson and Eklund 2002) have rarely been assessed repeatedly over longer test intervals. Thus, little is known about the stability of an inclination toward flow. Other personality traits which influence the need and ability to experience flow have only recently become the focus of attention.

Taken together, there is little empirical research on stable causes of flow. Investigating the stability of *n*AchFlow would therefore be an important contribution to flow research. Preliminary evidence by Baumann and Scheffer (2011) indicates that *n*AchFlow has a significant stability over a period of 2 years, $r_{\text{Kendall's Tau}}(27)=0.50$, $p<0.007$. This finding is an encouraging starting point when considering the length of the retest interval. However, it would be desirable to replicate the stability of *n*AchFlow in larger samples which do not only consist of psychology undergraduates.

Validity

The assumption that *n*AchFlow offers a way to operationalize the autotelic personality was supported by its significant relationship with flow experiences using the experience sampling method. In a sample of 40 business students, there was a significant correlation between *n*AchFlow and flow experience across various tasks during an outdoor assessment center ($r=0.37$, $p<0.05$; Baumann and Scheffer 2010). The finding was replicated in a sample of 33 army officers ($r=0.37$, $p<0.01$; Baumann and Scheffer 2011). Neither the other OMT components of the achievement motive (see Table 9.1) nor a TAT measure of *n*Ach was significantly correlated with flow experience. Furthermore, *n*AchFlow remained significant when controlling for the other achievement variables. Thus, *n*AchFlow is more than just *n*Ach (seeking difficulty). It also comprises the ability to implement achievement needs in a self-regulated and affectively positive way (mastering difficulty).

The findings link *n*AchFlow with past flow research which emphasizes frequent and intense flow experiences as a core element of an autotelic personality. However, in contrast to past flow research, *n*AchFlow is correlated but not confounded with the to-be-predicted outcome of frequent flow experience. Remember that the OMT assesses the *need* and *ability* to seek flow in the achievement domain and not the actual experience. In Csikszentmihalyi's concept of autotelic personality, need characteristics may have been implied. However, they have not been assessed.

Like other implicit motives, *n*AchFlow is based on extended cognitive–emotional networks of possible actions (derived from autobiographical memory) that can be performed to satisfy needs in a context-sensitive way across a variety of situations (Baumann et al. 2010; Heckhausen 1991; Kuhl 2001; McClelland 1980; Winter 1996). Because of the extended nature of the underlying networks, they are not (or only partially) consciously accessible. Therefore, the need to seek flow has to be assessed by apperception instead of self-report. Questionnaires assessing intrinsic interest in achievement may already tap into self-concepts of the need to experience flow. However, such explicit measures are conceptually distinct from implicit motives and rarely correlate with implicit measures (McClelland et al. 1989; Spangler 1992).

Taken together, the available findings support the assumption that *n*AchFlow offers a way to operationalize an autotelic personality. Before looking at first empirical findings on trait configurations and behavioral outcomes associated with *n*AchFlow, the functional basis of flow in achievement contexts will be analyzed within the framework of personality systems interaction (PSI) theory (Kuhl 2000, 2001).

A Functional Approach to Achievement Flow[1]

PSI Theory

In a nutshell, PSI theory (Kuhl 2000, 2001; Kuhl and Koole 2004, 2008, 2012) describes personality as the typical interaction between cognitive and affective systems: Positive and negative affects modulate the interactions among two high- and two low-level cognitive systems. The first modulation assumption explains how changes from low to high positive affect foster volitional efficiency: a smooth transition of intentions (*intention memory*) into action (*intuitive behavior control*).

The second modulation assumption explains how changes from high to low negative affect foster self-growth: an integration of new, unexpected, or even threatening experiences which are often represented as isolated "objects" (*object recognition*) into an extended, holistic, experiential network system (*extension memory*).

Within the framework of PSI theory, achievement flow can be described as a smooth transition of intentions into action through positive affect. In the following paragraphs, the terms intention, action, and positive affect will be elaborated. The general idea is depicted in Fig. 9.2.

[1]Consistent with flow theory, we do not propose different types of flow. The label *achievement flow* is simply used to indicate that our analysis is restricted to flow experiences in achievement contexts.

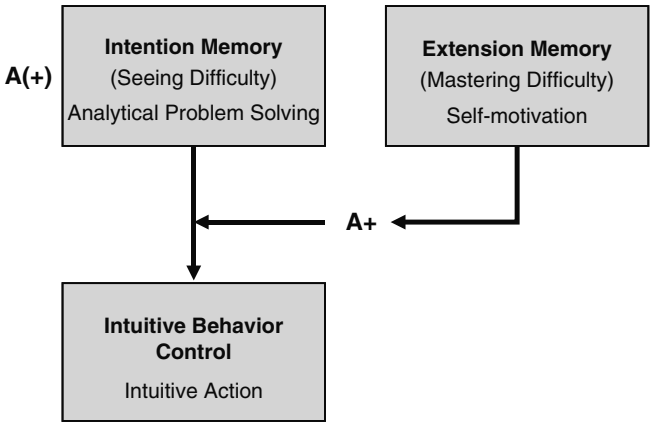

Fig. 9.2 Functional explication of achievement flow within the framework of personality systems interaction (PSI) theory. A+= positive affect, A(+)=reduced positive affect

Achievement Flow Involves Intentions

One does not form an intention unless there is some difficulty associated with performing an activity. Without any difficulty, one would simply go ahead and do it. Because flow activities are difficult and challenging (Atkinson 1957; Csikszentmihalyi 1990; Kuhl 1978; Rheinberg and Vollmeyer 2003), they activate an intention memory system (seeing difficulty). According to PSI theory, *intention memory* is a network of central executive functions involving active maintenance of an intention in working memory and inhibition of premature initiation of action in order to mentally simulate possible solutions to a problem (Goschke and Kuhl 1993; Jostmann and Koole 2006; Kazén and Kuhl 2005; Kuhl and Kazén 1999). It is supported by planning, analytical-sequential (left-hemispheric) information processing, as well as convergent thinking and problem-solving. The confrontation with difficulty (which is characteristic of achievement-related contexts) is typically associated with an initial dampening of positive affect (see Fig. 9.2). Vice versa, dampened positive affect (listlessness, frustration) activates intention memory and analytical problem-solving.

Intentions Are Transferred into Action Through Positive Affect

According to PSI theory, it takes positive affect (e.g., anticipation of success) to overcome the inhibition of action and recouple intention memory with its output system: intuitive behavior control (see Fig. 9.2). *Intuitive behavior control* is characterized by an execution of learned behavior sequences that combine information across multiple sensory modalities and integrate the finer details of sequential motor programming (e.g., Anderson et al. 2008; Doya 2000; Lehéricy et al. 2006). In addition to the execution of automatic, preprogrammed behavioral routines, it consists of

spontaneous, rather elaborated and flexible patterns, for example, intuitive parenting programs observed in early parent–child interactions (cf. Papoušek and Papoušek 1987). Positive affect can activate intuitive behavior control and stimulate a smooth transmission of intentions into action.

Positive Affect Is Self-Generated in Extension Memory

One might argue that, at least in achievement flow, positive affect is inherent in the activity itself because flow activities are fun and interesting. And indeed, positive affect is typically increased *after* flow activities (e.g., Rogatko 2009). However, flow activities are also difficult and challenging. These characteristics might as well reduce positive affect *during* flow activities. According to PSI theory, a participation of extension memory in action control is necessary in order to maintain confidence in the ability to master difficulty and to self-generate positive affect (see Fig. 9.2). *Extension memory* is a network of central executive functions that is way more extended than intention memory. It operates according to connectionist principles (Rumelhart et al. 1986) and is supported by intuitive-holistic (right-hemispheric) information processing (Beeman et al. 1994). This system gives an overview of extended semantic fields (Rotenberg 1993), relevant episodes experienced (Wheeler et al. 1997), and integrated self-representations (Kuhl 2000). The self-related part of extension memory can be regarded as the implicit self (Greenwald and Banaji 1995).

There is accumulating evidence that the self is a strong source of affect regulation (Linville 1987; Rothermund and Meiniger 2004; Showers and Kling 1996) which can even operate intuitively and outside of individuals' conscious awareness (Jostmann et al. 2005; Koole and Coenen 2007). Action orientation, for example, is the ability to activate the implicit self in order to regulate affect—especially under difficult conditions (Jostmann and Koole 2007; Koole and Jostmann 2004). Thus, although individuals do not engage in conscious self-reflections during flow experiences, the self may be highly active on an implicit level. There is first evidence that the self is indeed more active in autotelic personalities (Baumann and Scheffer 2011): Individuals with *n*AchFlow had a significantly reduced tendency to confuse unattractive assignments as self-selected goals compared to individuals without *n*AchFlow. Stated differently, they have better self-access and do not introject social demands.

There Are Notions of Extension Memory in Flow Theory

Access to extended associate networks of action alternatives derived from autobiographical memory may be the functional basis of a sense of control and a confidence in the mastery of difficulty inherent in flow experience (Nakamura and Csikszentmihalyi 2002). Furthermore, extension memory is the basis for detecting semantic coherence (Baumann and Kuhl 2002) and forming coherent, motive-congruent goals (Baumann et al. 2005). Thus, the experience of coherent, noncontradictory

demands which is a defining component of flow (Csikszentmihalyi 1975/2000) may not only be a function of the activity but also of the individual's way of information processing. The parallel-holistic information processing format of extension memory and the extended nature of its associative networks enable individuals to satisfy multiple constraints simultaneously and to integrate even conflicting demands.

Achievement Flow Definitions

The foregoing analysis shows that PSI theory explains the phenomenon of flow through specific interactions of cognitive and affective systems. Because of the mutual modulation of affect and cognition, there are several ways to summarize the functional analysis of achievement flow within the framework PSI theory. In Box 9.4, three summaries (definitions) are offered that emphasize different aspects of the cognitive–affective underpinnings of flow.

Box 9.4 Three Definitions of Achievement Flow According to PSI Theory

1. *General*: Achievement flow is a smooth transition of intentions into action through self-motivation.
2. *Cognitive*: Achievement flow is an optimal coupling of intention memory and intuitive behavior control through extension memory.
3. *Affective*: Achievement flow is based on dynamic changes in positive affect.

The three definitions are not in contrast to each other but interchangeable. The first, more general definition, is not a mere reiteration of the phenomenon because the foregoing analysis shows that the terms intention (e.g., its association with difficulty and its inhibitory component), action (i.e., intuitive behavior control), and self-motivation (e.g., the implicit self as an agent of affect regulation) can be functionally elaborated within PSI theory.

The second definition focuses on the cognitive systems involved in achievement flow and is rather dense in jargon. The third definition offers a more parsimonious description of the functional underpinning of achievement flow by focusing solely on affect. It contains the same information as the other definitions because, according to PSI theory, cognitive systems are modulated by affect and vice versa.

The third definition of achievement flow in terms of affective change is in accordance with Csikszentmihalyi's (1975/2000) conceptualization of flow as a motivational state which comes into play in situations which are neither overexciting nor boring, and thus yield an optimal arousal range. The affective change assumption is also compatible with classical conceptualizations of achievement motivation. According to McClelland and colleagues, hope for success and fear of failure are based on affective changes early in life that accompany doing well or failing to do

well in various learning situations (McClelland 1985b; McClelland et al. 1953). Furthermore, achievement-related episodes typically start with a phase of reduced positive affect (when a person is confronted with difficulty) which turns into positive affect when the person anticipates or obtains success (Kuhl 2001, p. 551; McClelland 1985b; McClelland et al. 1953). Finally, affective change is also inherent in the conceptualization of *n*AchFlow. Remember that the need to achieve encompasses a focus on seeing difficulty which is associated with reduced positive affect (cf. Kuhl 2000, 2001; Kazén and Kuhl 2005), whereas its mastery-approach implementation is the ability to restore positive affect and enjoy difficulty (Baldwin 2001; Harackiewicz et al. 2002; McGregor and Elliot 2002). In the next section, empirical findings on trait configurations associated with *n*AchFlow are reviewed.

Trait Configurations

Baumann and Scheffer (2010) started to test Csikszentmihalyi's assumption of a dialectical principle inherent in autotelic personalities. More specifically, they tested the assumption that individuals high in *n*AchFlow have a combination of two kinds of traits. On the one hand, traits are needed that support an inhibition of positive affect and a focus on seeing difficulty. On the other hand, traits are needed that help to restore positive affect and to master difficulty. This specific combination of traits is proposed to stimulate an emotional dialectic that forms the functional basis of achievement flow.

Traits Associated with Reduced Positive Affect

Examples of traits associated with a chronic inhibition of positive affect are introversion, an independent, schizoid-like personality style (Kuhl and Kazén 1997), and avoidant adult attachment (Brennan et al. 1998). Experimental analyses of the Big Five model have systematically demonstrated that introversion is related to a low activity of Gray's (1987) reward system (Diener et al. 1992; Derryberry and Reed 1994; Gupta and Nagpal 1978; Nichols and Newman 1986). Similarly, an independent, schizoid-like personality style is characterized by low sensitivity to positive affect as indicated by reduced reward learning (cf. Baumann et al. 2007). Finally, avoidant individuals emphasize self-reliance and actively distance themselves from social partners and emotions (Bowlby 1988; Mikulincer and Florian 1998). Because perceived progress toward intimacy is a strong source of positive affect (Laurenceau et al. 2005), this active distancing is also associated with an inhibition of positive affect. Taken together, despite their manifold differences, introversion, schizoid-like personality, and avoidance share the functional commonality of low sensitivity to positive affect.

Table 9.2 Autotelic trait configurations and behavioral patterns: *N*AchFlow is associated with high values in one of the left in conjunction with high values in one of the right variables

	Seeing difficulty (reduced positive affect)	×	Mastering difficulty (restored positive affect)
Traits	– Independent, schizoid-like personality style – Introversion – Avoidant adult attachment	×	– Mastery-approach orientation – *Action orientation* – *Internal locus of control*
Behaviors	– Decomposing and structuring tasks analytically – Generating hypotheses and plans to solve problems – Restraint from task-irrelevant social exchange	×	– Commitment to tasks and instructions – Spreading optimism and motivating the team – Staying power, good spirit in face of difficulties

Italicized variables have not been empirically tested for *n*AchFlow so far

Traits Associated with Restored Positive Affect

An orientation toward mastery-approach (Elliot 1999) is associated with the ability to restore positive affect. For example, mastery-approach has been found to foster the maintenance of students' interest over their college careers (Harackiewicz, et al. 2002; McGregor and Elliot 2002). Of course, there are more traits associated with the ability to restore positive affect. The prospective dimension of action orientation (Kuhl 1994a, b), for example, is most genuinely defined as the ability to self-generate positive affect (for an overview, see Koole et al. 2012). It even helps to counter-regulate the reduced well-being of schizoid-like individuals (Baumann et al. 2007). Similarly, the greater ability of individuals high in performance-related action orientation (persistence) and internal locus of control to actually utilize opportunities for flow also indicates a self-regulatory capacity (Keller and Bless 2008; Keller and Blomann 2008). However, their relationship with *n*AchFlow has not been tested so far.

Emotional Dialectics

In the studies by Baumann and Scheffer (2010), *n*AchFlow did not significantly correlate with any single trait but only with specific trait configurations conducive to dynamic changes in positive affect. More specifically, neither introversion, schizoid-like personality, and avoidance nor mastery–approach showed a significant relationship with *n*AchFlow. Only the high/high combinations of traits associated with low sensitivity to positive affect on the one hand and mastery-approach on the other hand were associated with higher scores on *n*AchFlow (see row "traits" in Table 9.2). The findings are consistent with Csikszentmihalyi's assumption of a dialectical principle inherent in autotelic personalities.

Behavioral Outcomes

The dialectical principle inherent in autotelic personalities has not only been observed on a trait level but also in overt behavior (Baumann and Scheffer 2011): During an outdoor assessment center, external raters coded participants' behavior along several dimensions. Participants with high scores on *n*AchFlow showed a high/high combination of two sets of behaviors: an analytical focus on problems as well as an optimistic belief in mastery (see row "behaviors" in Table 9.2). Jointly activating or alternating between both sets of overt behaviors partially mediated the direct relationship between *n*AchFlow and flow experience. The finding supports the assumption that autotelic personalities have indeed access to more extended networks of action alternatives. Access to such a rich repertoire should not only be conducive to frequent flow experiences but also to performance—especially in difficult tasks which require efficient volitional regulation.

On a macroanalytical level, the relationship between *n*AchFlow and volitional efficiency has been assessed with multisource feedbacks (Fletcher and Baldry 1999) in actual work settings. According to multiple sources such as supervisors, colleagues, and customers, participants with higher scores on *n*AchFlow were better in decisiveness, doing whatever it takes, customer orientation, and management of resources (Baumann and Scheffer 2011). Taken together, the findings support the assumption that *n*AchFlow is associated with complex behavioral patterns and high volitional efficiency which, in turn, may further stimulate the development of talent and autotelic personality system interactions in the long run.

On a microanalytical level, the relationship between *n*AchFlow and volitional efficiency has been assessed with the Stroop task (Stroop 1935). In this task, participants are asked to name the color hue of incongruent color words (e.g., naming the blue color hue of the word "RED"). The task is difficult (and stimulates intention memory) because participants have to overcome the automatic tendency to read the word. The increase in reaction times compared to easy trials (e.g., naming the blue color hue of the control stimulus "XXX") is called Stroop interference. Kuhl and Kazén (1999) and Kazén and Kuhl (2005) showed that the presentation of positive prime words (e.g., success) significantly reduces Stroop interference. The authors concluded that joint activation of intention memory and positive affect facilitates volition (i.e., the enactment of difficult intentions). Exactly this system configuration seems to be predominant and more easily activated in autotelic personalities. In a study by Baumann and Scheffer (2010), participants with high compared to low *n*AchFlow showed a significantly stronger removal of Stroop interference, that is, they had higher volitional efficiency.

Summary and Outlook

Summary

This chapter shows that frequent and intense flow experiences may be driven by stable personality dispositions. Individuals do not necessarily experience flow if they encounter optimal task conditions because they differ in the *need* to actively seek and in the *ability* to create their own flow experiences. As such, personality traits are boundary conditions for flow experience. The chapter introduced an implicit measure of achievement flow motive (*n*AchFlow) which integrates need and ability aspects and offers a way to operationalize Csikszentmihalyi's concept of an autotelic personality. The first empirical findings with *n*AchFlow are encouraging because the measure is relatively stable, valid in predicting flow experience, and supportive of central assumptions of flow theory. For example, the assumption of a dialectical principle inherent in autotelic personalities was supported by significant relationships between *n*AchFlow and high/high combinations of complementary or even opposing traits and behaviors. Within the framework of PSI theory, the dialectical principle can be functionally elaborated and parsimoniously summarized as dynamic changes between reduced and restored positive affect.

Outlook

Despite the encouraging first steps in measuring and empirically investigating an autotelic personality, there is a host of open agendas for future research. In my view, important future directions are as follows:

1. Flow theory. The OMT measure of *n*AchFlow offers the opportunity to systematically test Csikszentmihalyi's rich conceptual ideas about autotelic personalities. For example: What are the central parental practices and environmental conditions that foster the development of autotelic personalities? How do autotelic personalities manage to develop their talent to the fullest extent?

2. Measurement. Implicit motives are best measured if the ambiguous pictures stimulate the relevant motive. For achievement flow, the arousal potential of the present picture set is very limited. Only one picture was designed to stimulate *n*AchFlow and actually does arouse flow answers in many people. Thus, the picture set could be improved for researchers who are primarily interested in *n*AchFlow.

3. Affiliation and power. The present measure of an autotelic personality is restricted to flow in the achievement domain. However, flow experience may also arise from mutually coordinating one's own activities with other people. For example, flow frequently occurs while dancing, making love, conversing, and playing games with children. The OMT offers a way to measure the intrinsic components of affiliation (intimacy) and power (guidance) motives. Thus, the question whether there is

a stable motive behind frequent flow experiences in the social domains (*n*AffFlow or *n*PowFlow) can be addressed empirically.

According to PSI theory (Kuhl 2000, 2001), flow in the affiliative domain has different functional underpinnings: Intention memory and reduced positive affect should be less involved because social interactions rely more strongly on intuitive patterns of behavior control which are supported by positive affect (cf. Papoušek and Papoušek 1987). Individuals who are very analytical, planful, or dejected while interacting with other people are perceived as rather stiff, irritating, or even manipulative and, thus, disturb a mutual tuning between interaction partners. Consistent with this assumption, Kazén and Kuhl (2005) did not find a removal of Stroop interference after positive affiliation primes (e.g., love). Affiliation does not seem to activate a top–down control of action through intentions.

4. Negative affect. The analysis of achievement flow focuses solely on positive affect. According to PSI theory, negative affect is not involved in achievement flow. This analysis may be restricted to individuals high in *n*AchFlow. For individuals high in fear of failure, in contrast, negative affect may be present and disturb flow experience. The absence of negative affect (relaxation) may be an additional and necessary prerequisite for them in order to experience flow. This assumption is consistent with the findings by Engeser and Rheinberg (2008) and Schüler (2007) that individuals high in fear of failure are able to experience flow—albeit to a lower degree—when tasks are very easy or very difficult. Both task conditions reduce fear of failure because success is guaranteed (easy tasks) or failure not a shame (difficult tasks). Thus, for some individuals, low negative affect may be an additional prerequisite for achievement flow.

5. Dynamic processes. The assumption that dynamic changes in positive affect or dialectical processes between opposing traits and behaviors are inherent in autotelic personalities has been analyzed very statically so far (for a notable exception, see Ceja and Navarro 2009). It is not clear whether individuals are able to focus on opposing aspects simultaneously or alternate between foci. What is the time course of alternation? Is there system or chaos behind patterns of fluctuation? These questions are not only of theoretical interest. It has important practical implications when trying to support the development of autotelic personalities. The findings by Oettingen et al. (2001), for example, show that positive fantasies about desired futures have to be repeatedly contrasted with reflections on difficulties in present reality in order to improve goal commitment. If only one component is stimulated or if the alternation does not start with the right (i.e., positive) component, there is no improvement at all. Thus, it is important to learn more about dynamic process (cf. Ceja and Navarro 2009).

6. Outcomes. The operationalization of an autotelic personality with an operant motive measure has consequences for the type of expected outcomes. Operant motives are predictive of spontaneous in contrast to respondent behavior. Thus, experimentally producing an optimal challenge–skill balance (e.g., Keller and Bless 2008) or providing tasks that elicit moderate flow levels in most people (Baumann and Scheffer 2010)

may not be the best setting to test the predictive power of *n*AchFlow because it has a respondent component. Future studies should investigate if individuals high in *n*AchFlow tend to actively create flow experiences in the absence of such externally provided opportunities. Similarly, when investigating the relationship between *n*AchFlow and motivation, performance, and well-being, it will be important to look at outcomes that are less influenced by social demands. Furthermore, it will be important to assess whether spontaneous behavior, initiative, and open performance outcomes are appreciated or discouraged in the environmental setting (e.g., at school or at work).

Study Questions

- Does everybody experience flow if task difficulty matches personal skills?

  Answer. Although many people do experience flow if task difficulty matches skills, not everybody does. Personality traits are boundary conditions for the ability to experience flow under optimal task conditions. The perception and sustainment of balance between challenges and skills is an active, self-regulatory process that some individuals are more capable of than others.
- Is an autotelic personality just the same as having frequent and intense flow experiences?

  Answer. Frequent and intense flow experiences might be due to lucky circumstances (e.g., living in an optimal environment). Autotelic personalities, however, are not just lucky to be externally provided with optimal challenges. In addition, they actively seek and create optimal challenges (e.g., moderate task difficulty). Thus, autotelic personalities combine a *need* to see(k) difficulty with an *ability* to master it.
- Why does flow in achievement contexts involve the formation of intentions?

  Answer. Flow occurs during challenging/difficult tasks. Without any difficulty, a task could simply be executed with preprogrammed behavioral routines. If such routines are not yet available, an intention is formed and premature action inhibited. This allows analytical problem-solving (i.e., mental simulation of action alternatives and sequencing of several action steps) in order to prepare behavior.
- When are intentions transferred into action?

  Answer. Intentions are transferred into action when positive affect (i.e., anticipation of success) indicates that a problem is solved or a difficulty overcome.
- Why are flow activities not purely positive?

  Answer. Flow activities are not purely positive because they are moderately difficult which is associated with a dampening of positive affect.
- Where does positive affect during flow activities originate?

  Answer. Positive affect has to be self-generated through a deep confidence in one's ability to master difficulty (i.e., self-motivation).
- Why do autotelic personalities have high access to the self although flow experience is defined as a state of low self-centeredness?

Answer. It is important to distinguish between explicit conscious reflections about the self (self as object) and implicit self-representations of own needs, goals, experiences, and action alternatives (self as subject/agent). Whereas self-reflections are reduced during flow, feelings of self-determination are increased and support the deep confidence in the ability to master challenges.

- What do a schizoid personality style, introversion, and avoidant adult attachment have in common?

  Answer. These personality traits share a low sensitivity for positive affect which stimulates analytical problem-solving and a tendency to see(k) difficulties.
- Can flow be experienced in affiliation and power contexts?

  Answer. Flow is not restricted to achievement contexts. However, the functional underpinning of flow in social contexts may differ. For example, analytical problem-solving and intentional/planned behavior may be less adaptive during a romantic interaction with one's love.

Chapter 10
Theoretical Integration and Future Lines of Flow Research

Stefan Engeser

Abstract The final chapter provides a short summary of all chapters of the book and points to similarities between the chapters and what these imply for future research. It highlights some details on the differentiation of frequency and intensity of flow and how this could be conceptualized. Next, the role of intrinsic and extrinsic reasons for action is discussed. For the development of autotelic personality, it is proposed that we do not have to start from scratch on this important topic. Further, the chapter discusses that we are close to a common understanding on the measurement of flow using the experience sampling method (ESM) and that this method provides rich data that are not being fully utilized. Finally, some speculation on cognitive aspects and flow is made regarding the first data at hand. The chapter ends with a personal view on one possible research agenda.

Summary of the Chapters

The first chapter of Engeser and Schiepe-Tiska presents the concept of flow and draws the historical lines of flow research. In introducing the concept of flow, the components of flow are described. It is pointed out that there is a high level of agreement on these constitutional components and only small variations and differences have emerged in the flow research since the first comprehensive description by Csikszentmihalyi (1975). The starting point of the flow research was a shift to viewing the experience of performing enjoyable acts on its own terms. To study the experience on its own terms, Csikszentmihalyi used various methodological approaches, which ultimately led to the discovery of recurrent experiences in diverse activities labeled flow. Besides this new paradigm and methodology, a milestone has been the formulation of a model that explained why activities are enjoyable in

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themselves. Evidence of the importance of the experience on its own terms emerged in details of the work of Rheinberg in Germany, with a similar but independent research agenda and methodology. Two further important steps of flow research were the study of flow in daily experiences and a focus on flow with well-being and creativity, which are still major concerns in current flow research, as pointed out at the end of the chapter along with other current research topics.

The concept of flow was further examined by Moneta in Chap. 2. He presented the three main approaches to measure flow and described how the measurement and the concept of flow are interrelated and influence each other. In working out the strengths and weaknesses of each approach, he provides us with a very helpful guide regarding when to use a certain approach. This also provides a solid base upon which to improve the measurement of flow and to look for possible new ways to tackle weaknesses in order to achieve a more valid measurement of flow and address new research questions. As the measurement of flow and the concept of flow are interrelated, he also pointed out that new measurements need conceptual work to account for the complexity of flow (cf. "Hypothetical Hybrid Model" in his chapter).

Keller and Landhäußer, in Chap. 3, also look into the concept of flow and revisited the flow model. They critically discussed some aspects of what Moneta presented as the second main approach to measure flow ("Capturing Flow in Daily Experience"). They advocated that demands instead of challenges should be used to capture the balance of challenge/demands and skills and argued that challenge already implies an assessment of skills. Based on further methodological considerations, they also called for the subjectively experienced balance to be assessed rather than measuring demands and skills separately and calculating the balance. This would solve methodological problems and simplify research without departing from theoretical assumptions. However, if the research addresses how challenges/demands and skills determine the experience of flow, both have to be assessed separately (see Moneta "The Regression Modeling Approach"). Keller and Landhäußer also proposed a new model of flow with value as a main condition of flow.

Landhäußer and Keller (Chap. 4) took a closer look at flow and intrinsic motivation and at the affective, cognitive, and performance-related consequences of flow. As mentioned by Engeser and Schiepe-Tiska (Chap. 1), the consequences of flow have been less intensively studied. Moneta (Chap. 2) also expressed the need to focus on the validity of the flow measures, which would be accomplished by taking consequences of flow as a research agenda. Landhäußer and Keller report support for the relationship between flow and different measures of intrinsic motivation, thus providing additional evidence that the "flow state is a self-justifying experience" (Nakamura and Csikszentmihalyi 2005, p. 96). The effect of flow on positive affect is less consistently supported, as is the effect on performance-related consequences.

Schiepe-Tiska and Engeser (Chap. 5) address a lingering problem that the flow model seems to be more applicable for achievement situations. To address this, Schiepe-Tiska and I take recourse to the broader understanding of challenge and skills as opportunities for action and action capabilities accompanied by the focus that the structure of the activity has to be clear in order to foster flow (cf. Box 1.2 and "An exploratory model of play"). It is argued that individual preferences in the form of the affiliations and power motive help to structure the situations, and this

provides support for individuals to choose upon action opportunities and to know what to do next while being engaged. This perspective is extended for social situations and teams.

Abuhamdeh (Chap. 6) provides a conceptual framework for the integration of flow theory and the cognitive evaluation theory (CET). Both theories are meant to explain intrinsically motivated behavior and have been considered as being two sides of the same coin. But in reviewing the empirical findings, he worked out that both theories hold the greatest explanatory power for distinct aspects of behavior. Flow theory can best describe enjoyment in already intrinsically motivated behavior. In this case, optimal challenge (as the central part of the flow theory) will lead to enjoyment of enacting. CET, on the other hand, is more powerful to explain how intrinsically motivated behavior develops on the basis of perceived competence. The discussion of the CET's perceived autonomy proposition points to a similar conclusion. Flow theory applies for activities which are freely chosen (i.e., self-determined), and CET explains how the feeling of self-determination leads to intrinsic motivation.

Schüler (Chap. 7) took a closer look at negative effects of flow. She outlined that (1) neglecting further goals and values, (2) narrowing the focus of attention, (3) being overoptimistic, and (4) neglecting temporal information could lead to negative effects of flow. Theoretical considerations and empirical results on the topics of addiction, risk-taking, and combat provided first (but strong) evidence that there are negative effects in this respect and that flow has the potential for unflavored consequences. Schüler argued that the self-rewarding nature of flow is the basic mechanism by which people engage in the activity in disregard of negative aspects. This constitutes a kind of paradox, in terms of a positive experience having negative effects. Therefore, we have to bear in mind the dark side of flow in order to prevent or counter this, and Schüler outlined how this could be addressed.

Peifer (Chap. 8) advocated that psychophysiological methods and findings have the potential to provide a better understanding of the flow experience and to extend existing measures of flow. She provides a sound conceptual framework and overview of the research on different psychophysiological domains. She considered conceptual similarities between the flow and the stress model and showed that flow is one way to cope with potentially stressful demands. On the other hand, flow itself shares characteristics of stress ("eustress") itself, and first correlations with cortisol levels and flow support this understanding (see also Results on Cardiovascular Measures in her chapter). Cortisol provides the energy for coping, but when cortisol levels are chronically high or too high, this is harmful and dysfunctional. However, research has only just begun to explore the links between flow and psychophysiological aspects and Peifer point to several directions of future research agendas.

Baumann (Chap. 9) reviewed the concepts of the autotelic personality as provided by Csikszentmihalyi and others. She concluded that the existing measures of the autotelic personality cannot fully capture the complexity required to account for the theoretical concept. Subsequently, she outlined the personality dispositions that serve as boundary conditions of flow experience: the need and the ability to achieve flow. The achievement motive might represent the need aspect and self-regulations

the ability aspect (cf. Chap. 3 and "Directions for Future Methodological Research" in Chap. 4). Baumann offered an integrated measure, and first data on its validity are very promising. Additionally, her further presented functional approach deepens our knowledge of affect and flow and thus helps us to better understand this controversial aspect of flow research (cf. Chap. 4). Among other things, she proposed that positive affect has to be downregulated in order to face the challenges and acknowledge the difficulties which are posed by challenging activities. During the activity itself, positive affect will boost self-motivation and persistence. This functional approach also nicely provides the basis upon which to specify personality dispositions that are prone to this flow-fostering affect regulations: seeing and mastering difficulties.

Beyond the Balance of Demands and Skill

I would like to point out that all chapters see the balance of demands and skills as an important aspect in flow research. A further common agreement is that this balance alone cannot explain the experiences. Therefore, the flow model presents a central aspect but not the whole picture. I would suppose that most researchers in flow would go along with this view, as Csikszentmihalyi himself has pointed to this since the beginnings of flow research (e.g., the concept of the autotelic personality). The prevalent view is that personal and situational factors serve as moderators of when and how the balance will lead to flow. Examples for personal variables are provided by Keller and Landhäußer in the framework of regulatory fit, needs achievement, and the other personality dispositions discussed by Baumann (cf. Schüler). Moneta and Abuhamdeh pointed to the state-level moderators of motivational orientation (intrinsic or extrinsic nature of the task), and Abuhamdeh additionally discussed perceived outcome importance and perceived self-determination. Baumann outlined dynamical and transient aspects of affect regulations to explain when challenges are recognized and approached. Keller and Landhäußer introduced the value concept as an additional factor independent of the balance of demands and skills. Additionally, Schiepe-Tiska and Engeser reported that individual preferences will structure activities independently of a balance of demands and skills. Finally, Keller and Landhäußer's framework of regulatory fit could be seen as generalization of the balance principle beyond demands and skill.

As just mentioned, Keller and Landhäußer extended the flow model with value attributed to the activity as an additional factor that predicts flow. This approach is in line with considerations by Nakamura and Csikszentmihalyi (2005). They state that interest serves a similar role to that proposed by Keller and Landhäußer for values. The more a person is interested in an activity, the more likely it is that the person will experience flow when there is a balance between challenges/demands and skills (cf. Chap. 6). They further proposed that past flow experiences foster the interest in an activity. Consequently, past flow experiences will foster flow

experiences in the future. This could also be inferred from the concept of values as proposed by Keller and Landhäußer. The value of an activity is dependent on the hedonic experience the person had with an activity. As the hedonic experience should be higher with the experience of flow, flow itself would be a predictor of flow in the activity in the future. The appeal of this assumption would be that the prediction of flow could be made within a single theoretical approach, and for reasons of parsimony, I would like to encourage this assumption, especially when taking into account that the concept of values as taken from Higgins (2006) is complex and multifaceted.

Frequency and Intensity of Flow

Presented by Moneta (Chap. 2) and strongly proposed by Keller and Landhäußer (Chap. 3), the flow experience could and should take into account frequency and intensity of the flow experience. A differentiation between frequency and intensity is not so easy to accomplish as it might initially appear. It touches on a basic problem in flow research that has not yet been fully addressed. To illustrate the problem, I presented three possible relationships between factors fostering flow and the flow experience in Fig. 10.1. If the experience is a yes-or-no phenomenon, flow will not be experienced until the factors contributing to flow are sufficiently presented. The person either experiences flow or does not, and there is no in-between of a little bit of flow. When discussing this with other people, this is how they intuitively understand it. I myself sometimes think about the phenomenon in this way, and the (first) interview studies also seem to suggest this understanding. A person is in flow or is not in flow, and in this case, frequency and intensity are equal, and a

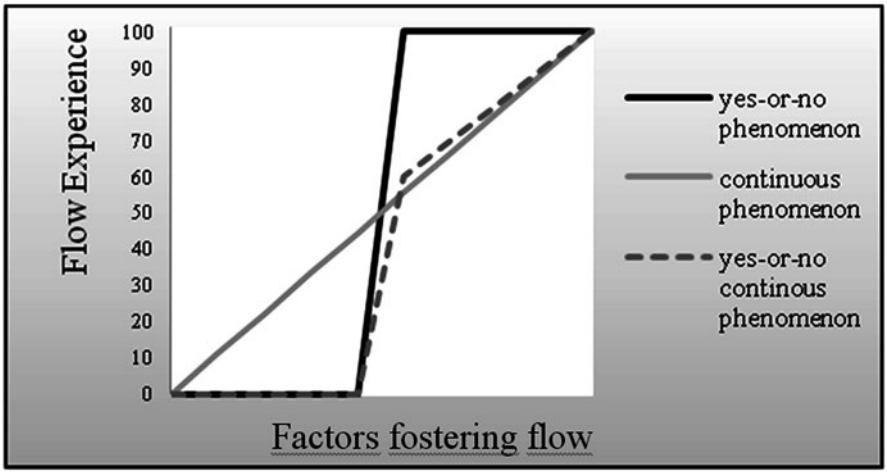

Fig. 10.1 Possible relationship between factors fostering flow and the experience of flow

differentiation between the two would be meaningless (leaving aside the length of time of the experience—see below for this point).

That flow may not be a yes-or-no phenomenon was already addressed by Csikszentmihalyi (1975) when he looked for flow patterns in everyday life. He stated that "In fact, the flow model suggests that flow exists on a continuum from extremely low to extremely high complexity" (p. 141). I illustrated this in Fig. 10.1 as a continuous phenomenon: The more factors fostering flow that are presented, the higher the experience of flow. Csikszentmihalyi labeled less intense flow experience as "microflow" in contrast to "deep flow" (cf. "shallow" and "deep flow" in Chap. 2). He argued that the components of flow are less intensely present. For example, the person does not absorb all of his or her attention in one activity or does not feel in total control. Nevertheless, microflow is positively valenced, and the person does feel "free" to act upon the activity without anxiety or boredom.

In the case of a continuous phenomenon, the differentiation between intensity and frequency is in essence the same as for the yes-or-no phenomenon. One might divide the flow experience into high and low (or high, medium, and low) and count the frequencies. But in this case, it is essentially being treated as a yes-or-no phenomenon (at the expense that the full information is not used in analyzing the data). Yet, the problem of differentiating between frequency and intensity cannot be accomplished in this way too.

An easy way out is to take the length of time of the flow experience into account. One person might be in flow several times a day but for a short period of time, and another person might be in flow once a day but for a long period of time. In a sense, they experience the same amount of flow (intensity will be the same), but one person experiences it more frequently. Csikszentmihalyi (1975) already pointed out this possibility of differentiation (p. 158). This differentiation also allows for an interesting research question. I would expect longer time periods to be more rewarding than more frequent shorter periods, the rationale for this being that the longer periods indicate or provide more order in the person's life than shorter periods (cf. Csikszentmihalyi 1975, p. 158ff).

In Fig. 10.1, I depicted a third possible pattern, which is termed a yes-or-no continuous phenomenon. Flow is not experienced when factors fostering flow are below a certain threshold. Beyond this threshold, a person experiences flow, and the intensity of the experience becomes even more intense the more factors are present. Researchers could count the experience of flow and obtain a measure of frequency. Within this flow experience, the intensity could be used as additional information. In contrast to the continuous phenomenon, only flow experiences are taken into account, and the measure of intensity is only applied to such instances. In looking at existing measures of flow described by Moneta (Chap. 2), one could use the Flow Questionnaire and combine it with measure of the "componential approach." Alternatively, like Landhäußer and Keller (Chap. 4), one could use a purely componential approach. They counted flow frequency when the intensity of the measure surpassed a certain threshold and took the intensity of the measure for these instances as additional information. The delicate aspect concerned here is that appointing the exact threshold is not clear-cut based on our current knowledge (cf. Chap. 2).

Frequency and Intensity of the Components of Flow

To complicate matters of frequency and intensity of flow, the different components of flow (cf. Box 1.1) may follow different patterns. On the other hand, the different components offer a way in which to focus research on one aspect in order to study possible patterns. I would expect the components to follow the pattern of the continuous phenomenon, for example, people feel more and more in control the better their skills fit to the demands/challenges. Looking at the componential approach presented by Moneta (Chap. 2), empirical results support this assumption. But how each component contributes to the holistic feeling of flow is less clear, as pointed out by Moneta when discussing the third weakness of this approach (summing up the means on each component may not always capture flow). On a conceptual basis, the relationships just outlined could be used with the components of flow instead of the factors fostering flow (cf. Fig. 10.1). In the yes-or-no pattern, flow will be experienced when each component is beyond a certain threshold, and in the continuous pattern, it would increase in a linear fashion as the components are more pronounced (the yes-or-no continuous being a mixture of the two patterns).

Research might tackle this problem empirically. The holistic experience of flow would have to be assessed in line with the measurement presented in the section "Capturing Flow in Special Endeavors" by Moneta (Chap. 2) and serves as the dependent variable predicted by the components. As simple as it sounds, it will pose methodological challenges. Researchers would need a lot of data points to estimate the relations. When taking interaction effects of the components into account (e.g., the high intensity of one component could compensate for low intensity in another component), even more data are required (cf. McClelland and Judd 1993). Nevertheless, a research program addressing this problem seems worthwhile and may be particularly valuable with psychophysiological measures (of each component). This would provide valuable data concerning how psychophysiological measures are related to flow and would additionally address how physiology and subjective experience are related (cf. Chap. 8). Considering the different components could also address the suggestions made by Keller and Landhäußer to induce flow via selectively manipulating one component of flow.

The serious methodological problems pointed out here would be moderated by theoretical assumptions. The purely positivistic approach of collecting data and seeing what form relationships take would be guided by theoretical assumption. Keller and Landhäußer (Chap. 3) offer support in this respect. They outlined that goals and feedback contribute to the experiences of the balance of demands and skills. This reduces the aspects to be considered. Moneta (Chap. 2) outlined an approach in his "hypothetical hybrid model." Flow was induced through concentration, and the effect on flow was moderated by balance (clearness of goals and feedback could possibly be subsumed under this according to Keller and Landhäußer). Flow itself is indicated by the experience of control, action-self merging, autotelic nature, loss of self-consciousness, and time distortion. At least for a starting point, this could be reduced further. The autotelic nature may be left out based on the argument of Engeser and Schiepe-Tiska (Chap. 1). Time distortion may also be

omitted. It was not a component in the description of flow by Csikszentmihalyi (1975), and it could be argued that it is merely an indicator of the loss of self-consciousness and the direction of the time distortion is not clear (cf. Jackson and Eklund 2002), although mostly time is experienced as passing more quickly.

Intrinsic and Extrinsic Reasons for Action

Since the beginnings of flow research, Csikszentmihalyi acknowledged that reasons other than intrinsic ones might serve as the starting point for action when flow is experienced (cf. Chaps. 1 and 5). Thus, the experience while doing the activity is not the initial reason for action (cf. Landhäußer and Keller, first concept of intrinsic motivation in Box 4.1). Conversely, it might be the activity itself that provides the reason for action (i.e., to experience flow), but extrinsic reasons would suggest not carrying out the activity (cf. the potential negative outcomes in Chap. 7). Technically speaking, this means that intrinsic and extrinsic reasons for action can be dissociated, and they are partially independent of each other (Chap. 6). I will go into some implications of this dissociation, because this seems to me a lingering question in flow research.

I assume the question is lingering because it is somehow paradoxical that an intrinsically rewarded experience could be triggered by extrinsic reasons. Therefore, flow is not completely associated with seemingly positive aspects, and this may be hard to accept. But if we do accept it, matters are quite simple and represent the acknowledgement of the activity as an entity in its own right (Chap. 1 "The beginning"). This would also allow us to address research questions in an impartial manner. Just to take an illustrative example, we could pay money for the engagement in an activity in which a person would have never been interested. While doing the activity, the person will become familiar with the activity and possibly may experience flow. Once the person experiences flow, this may become a reason for action in itself as flow is a rewarding experience.

This would mean that an initially extrinsically motivated behavior could become intrinsic during its performance, and this becomes an intrinsic reason for acting upon it in the future. This phenomenon closely resembles the "functional autonomy" proposed by Allport (1937). The theory of biocultural evolution by Massimini et al. (1988; cf. Chap. 1) also suggests this basic principle as important, and Abuhamdeh (Chap. 6) points to this principle too. Keeping this in mind would provide us with the possibility to induce flow experiences, particularly when the person is not familiar with the activity or intrinsic reasons alone would not justify engagement. Intervention programs to foster flow could also rely on this.[1]

[1]This does imply that with extrinsic reason, the experience of flow is very likely. I shall merely propose that it is possible. Additionally, the extrinsic reasons for action have to be taken out of the focus while acting, as otherwise, flow is not possible (as the person also pays attention to the outcome or reason and not to the action itself).

On the other hand, the assumed reluctance to accept that flow could be triggered by extrinsic reasons may (implicitly) reflect a hesitation to manipulate individuals. We set up extrinsic reasons and might realize flow-fostering characteristics that make the experience of flow very likely. When the person experiences flow, we expect the person to subsequently carry out the activity for intrinsic reasons alone. Thus, we not only set up extrinsic rewards (e.g., like in instrumental conditioning) but also build our intervention on the positive experience of the activity itself. Therefore, the power to manipulate individuals has advanced through our deeper understanding of what makes an activity a rewarding experience and this would be in line with the potential dark sides of flow as reflected upon by Schüler (Chap. 7). This may be indicated by the use of flow to make persons become attracted or addicted to video games or for marketing purposes. We should recognize this and keep this in mind in order to be sensitive in this respect and use the power for influencing individuals with considerable caution.

Development of Autotelic Personality

Nakamura and Csikszentmihalyi (2005) urged research into early childhood in order to understand the development of autotelic personality in general and to investigate adolescents who seek challenging activities and do not "prefer states of control, relaxation, and even apathy" (p. 101). Going along with the need for this direction in future research, I would like to point out that we do not have to start from scratch. The personality dispositions outlined by Baumann (Chap. 9) representing an autotelic personality have already gathered knowledge in this respect. We do, for example, have some solid empirical data on the development of the need for achievement. My favorite work in this respect is a study by Trudewind (1975; cf. Brunstein and Heckhausen 2008). He observed the interaction of mothers and second-grade children while doing homework. Half of the children had shown a positive approach to achievement situations in the first year of school, while the other half had developed a strong fear of failure (thus avoiding achievement situations). As expected, the mothers of children with a negatively developed approach praised success less and punished failures more strongly, attributing failure to the child's lack of ability and success to good luck. Related to this, they compared the children's achievement with other children instead of taking the individual ability of their own child into account, therefore hindering the child to set standards based on his or her own ability (i.e., no balance of demands and skills is achieved).

Thus, the development of the achievement motives informs us about the development of the autotelic personality (cf. Brunstein and Heckhausen 2008). The same holds true for other personality dimensions presented by Baumann in Chap. 9. I would recommend that future research on the development of the autotelic personality could also rely on these data, especially when keeping in mind that research to understand the development of personality is not as easy to accomplish when longitudinal data have to be collected for a fairly long period of time.

Flow and ESM

Nakamura and Csikszentmihalyi (2005, p. 101) expressed the hope that we are nearing a "consensual ESM measure to facilitate the accumulation of knowledge." In reviewing the chapter of the book, I believe this to be in our grasp. I would strongly advocate the use of the experience sampling form (ESF) and additionally include items for all components of flow (cf. Chap. 2). As some components of flow are already measured in the ESF, this would mean adding only a few items, with the great advantage that flow is measured with all its components (this has already been realized, as Moneta presented; cf. Flow Short Scale in the Appendix). Further, demands of the activity should be measured and also include a direct measure of flow as advocated by Keller and Landhäußer (Chap. 3). I expect that most or all researchers on flow could consent to these extensions. For special research questions (e.g., value of the activity, motivational orientation), researchers could possibly add some more items, and for some research questions, some of the items of affect of the ESF may be left out.[2]

In reviewing the research on ESM, it seems to me that the potential of this method is not being fully utilized. Most prominent is the only rare use of a longitudinal design of the data (e.g., Ceja and Navarro 2011), which, thanks to advancements in analytical tools, is nowadays relatively easy to accomplish. One could address research questions such as how flow will influence affect at later measurement points, or how the experience at work will influence the experience in leisure activities (Engeser and Baumann, in preparation). Both are examples of questions at the heart of flow research. Similarly, the use of a longitudinal design would also provide information about fluctuations of different experiences. As mentioned by Engeser and Schiepe-Tiska (Chap. 1), a meaningful alteration of different states may be optimal, and the contributions of Peifer (Chap. 8) also point in this direction (cf. Nakamura and Csikszentmihalyi 2005). Flow shares aspects with stress, and by disregarding relaxation, one would risk exhausting resources. According to this rationale, life satisfaction should be high for persons who experience more flow, but only when times of relaxation are experienced too. Otherwise, the experience of flow might even harm life satisfaction (at least from a longer-term perspective).

To study sequential data, it would be helpful to sample data with short and long intervals in order to gain more information about temporal pattering (if only relatively similar time intervals are sampled, the total range of information could not be extracted from the data; see Oud and Delsing 2010). It would also be helpful to sample data under special circumstances where the sequential influences are expected to be particularly strong or represent the research interest (e.g., transitions from work to leisure). This would resemble the approach by Aellig (2004) or Delle Fave et al. (2003) to measure flow for the special activities of climbing and

[2] Researchers could also sample some aspects not at every measurement point in order to keep the measurement short and nevertheless gain some information about this aspect.

mountaineering. Sampling selective activities would also tackle a disadvantage of the ESM method that rare activities are too infrequent to be analyzed properly (this is of special importance for flow research as, e.g., deep flow is a rare phenomenon). Similar research methods to the Day Reconstruction Method may be even more helpful, as Moneta (Chap. 2) and Landhäußer and Keller (Chap. 4) outlined.

Cognitive and Performance-Related Consequences

Landhäußer and Keller (Chap. 4) reasoned that flow influences the kind of processing styles and allocation of cognitive capacity. First data of their own research indicate that flow fosters a bottom-up processing style. I was initially surprised that flow is accompanied by bottom-up processing, as flow represents a highly ordered state. It should at least implicitly be guided by top-down processes that provide the structure for action. Thinking twice, I wondered whether the structure is already so clear that top-down processing could be reduced to a minimum level, and instead, it becomes more important to be "open-minded," as implied by a bottom-up processing style (cf. Chap. 9).

This might also help us to understand why flow is sometimes related to better performance and sometimes not. In some instances, top-down and in others bottom-up processes may lead to better performance. Similarly, the allocation of cognitive capacity, which is central for the flow concept, will shed light on this, and more research on this is clearly warranted (cf. Bruya 2010a, b; Nakamura and Csikszentmihalyi 2005). In the case of a marathon run, Engeser and Schiepe-Tiska (Chap. 1) speculated that the demand is a vivid self-control that is not compatible with the experience of flow. In swimming, as in many other sports, the demand lies in the perfect execution of movements learned over years of intensive training. Flow might be a perfect state that allows these highly practiced abilities to be performed to their full extent. Albeit highly speculative at this point, a bottom-up processing style makes the individual attentive to minor discrepancies of movements or situational changes, allowing him or her intuitively adapt to this appropriately (cf. Chap. 9). Besides this possible link between cognitive aspects and performance, cognitive mechanism would also be one good possibility to relate brain functions or other psychophysiological correlates and the experience of flow more precisely.

To determine the causal link of performance, Landhäußer and Keller pointed to methodological and conceptual problems in empirically testing this link. They pointed out that many studies rely on correlational data in a cross-sectional design. Experimental design also poses fundamental problems in studying the causal link. There are experimental ways to manipulate flow (i.e., varying demands of tasks) and measure performance easily. But whether flow itself is the mediating variable is not that clear, and thus, the causality is not strictly tested. One other way would be to carry out cross-lagged analysis on the basis of longitudinal data. As discussed above, the ESM provides such data but does not yet include performance measures. However, this is principally not a problem, and a suitable design could find ways to measure performance meaningfully.

Although not conclusive, there is conceptual and empirical evidence that flow fosters performance in causal ways (for some activities). But it could be that flow is (for some activities) merely an indicator of high performance, thus not causally influencing performance. We search for causality, but having a good indicator of high performance is valuable too. On a subjective level, it provides the individual with the feedback that performance is, or has been, good, and scientists may be interested in having an indicator of when measuring performances is not possible or is inappropriate. We should also keep in mind that the core of the flow concept is motivation rather than performance itself. Therefore, finding no short-term causal relationship of flow and performance would not call the concept into question. Much more critical is that flow predicts engagement in an activity or other closely related variables of motivation.

Epilogue

In the first version of his flow model, Csikszentmihalyi (1975) postulated that when skills are much higher than challenge/demands, the person will experience anxiety (see Box 1.2). This seems a little surprising and was not further explicated by Csikszentmihalyi. In the first chapter, we read from Csikszentmihalyi's other works that humans need structure, as otherwise, a state of disorientation, chaos, and anxiety will result when there are no opportunities to act out skills. This could best be understood when imagining extreme examples of sensory deprivation or being imprisoned in isolation. Considering this aspect, I asked myself what could happen when individuals (habitually) avoid situations where demands match or exceed skills.

Csikszentmihalyi's (1975) flow deprivation experiment may guide this research question. He studied what happened when persons voluntarily skip all activities in which they normally engage just for "play" and noninstrumental reasons. Although the sample was small, effects on concentration, sleepiness, health, and basic functioning were found. Extrapolating the results, one could even expect people to lose normal functioning, developing clinical symptoms of mental illness. Thus, reviving the deprivation study could tell us much about human functioning, and research in this area seems highly warranted (cf. Nakamura and Csikszentmihalyi 2005).

The importance of such "big questions" came to my mind when I contrasted two friends who found themselves in comparably unfavorable life situations. After disruptions of structure in their lives (breakdown of a relationship, unemployment), one found an easy way to structure his life again (at least partially): He was able to build on his interest in the biology of ants. He describes losing track of time and space when out looking for ants of a certain subfamily, watching their behavior, or taking pictures. He actually carries a GPS device with him to find his way back! Another friend could not rely on such an experience and started to think over and over about the same things, feeling like he was imprisoned in isolation. In the past, he

had also avoided challenges (e.g., looking for jobs that are well below his qualification level; not carrying out achievement-oriented leisure activities like sports) as they posed a threat to him.

It would be of interest whether the negative development of the second friend could have been expected long before he actually encountered the serious problems. Was it due to his avoidance of challenges as such and/or that he had not found a single activity providing the experience of flow even in troublesome times? Perhaps flow research could give us some insights into this. Beyond the perspective of flow research, exploring task incentives aside the experience of flow could be a valuable undertaking, relying, and extending on the work described by Engeser and Schiepe (Chap. 1). Csikszentmihalyi and Rheinberg both describe such incentives that justify engagement in activities for the mere experience itself. The motive concept introduced by Schiepe-Tiska and Engeser may provide a first conceptual framework to classify such incentives and provide models in similar vein to the manner in which the flow model. How these task incentives develop and how extrinsic and intrinsic reasons are connected could be of interest too, and Abuhamdeh (Chap. 6) provides one possible mechanism for this.

Appendix: Flow Short Scale

Items of the Flow Short Scale by Rheinberg, Vollmeyer, and Engeser (2003; cf. Engeser & Rheinberg, 2008). Items 1–10 measure the components of flow experience. The items 11, 12, and 13 measure the perceived importance or perceived outcome importance (cf. Abuhamdeh, Chap. 6 of this volume). The flow items could be separated into two factors: (1) fluency of performance (items 2, 4, 5, 7, 8, 9) and (2) absorption by activity (items 1, 3, 6, 10). With the additional items, demand, skills, and the perceived fit of demands and skills are measured (cf. Keller and Landhäußer, Chap. 3 of this volume).

	Not at all	Partly	Very much
1. I feel just the right amount of challenge	○—○—○—○—○—○—○		
2. My thoughts/activities run fluidly and smoothly	○—○—○—○—○—○—○		
3. I do not notice time passing	○—○—○—○—○—○—○		
4. I have no difficulty concentrating	○—○—○—○—○—○—○		
5. My mind is completely clear	○—○—○—○—○—○—○		
6. I am totally absorbed in what I am doing	○—○—○—○—○—○—○		
7. The right thoughts/movements occur of their own accord	○—○—○—○—○—○—○		
8. I know what I have to do each step of the way	○—○—○—○—○—○—○		
9. I feel that I have everything under control	○—○—○—○—○—○—○		
10. I am completely lost in thought	○—○—○—○—○—○—○		
11. Something important to me is at stake here	○—○—○—○—○—○—○		
12. I must not make any mistakes here	○—○—○—○—○—○—○		
13. I am worried about failing	○—○—○—○—○—○—○		

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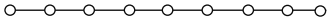
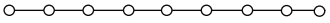
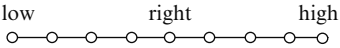
• Compared to all other activities which I partake in, this one is …	easy — difficult 
• I think that my competence in this area is …	low — high 
• For me personally, the current demands are …	too low — just right — too high 

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