CHAPTER 1

Self-regulation in Health Behavior: Concepts, Theories, and Central Issues

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Good health is of critical importance to many people while they are generally aware that their behavior plays an important role in achieving and maintaining physical well-being. In Western societies, it is difficult *not* knowing that one is, to some extent, responsible for one's own health as people are continuously reminded of the importance of their behavior for staying healthy by both public health campaigns and medical care professionals (Brownell, 1991). Yet, even though good health is generally considered important, and many people have good intentions for health behavior, the vast majority report difficulties in consistently performing those behaviors. They may find it hard, for instance, to maintain a healthy diet or a pattern of regular exercise in the face of temptations of modern life (e.g., Rothman, Baldwin & Hertel, 2004). Changing a bad health habit seems even more difficult than maintaining a good one (Polivy & Herman, 2002; cf. Norcross, Ratzin & Payne, 1989).

The proverbial road to hell does indeed seem to be paved with good intentions (cf. Powers, Koestner & Topciu, 2005). The question is: Why is it so difficult to act upon intentions or maintain attempts for changing health behavior, even for people who seem to be motivated? Only recently has the so-called ''intention-behavior gap'' started to attract substantial attention, and currently this is one of the most researched aspects of health behavior (e.g., Sheeran, 2002; Sheeran, Milne, Webb & Gollwitzer, 2005; also see Sheeran, Webb & Gollwitzer, this volume), and a crucial aspect of self-regulation. Self-regulation broadly refers to the processes of goal setting and goal striving, and includes dealing with a range of challenges that individuals may face when trying to achieve something that is important but, almost by definition, difficult to attain (Mischel, Cantor & Feldman, 1996). Important new questions arise from a self-regulation approach to health behavior, such as the following: How do people set health goals, and do they in fact

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have health goals? Are these goals authentic or merely a response to persuasive health messages or other social influences that are not well considered and therefore prone to failure? Which types of health goals motivate behavior, and what happens when health goals are in conflict with other goals? What are the conditions that promote or hinder the successful pursuit of health goals? And how do people deal with distractions and temptations when striving for health goals?

Self-regulation theories have not been designed uniquely to explain and understand health behavior and they are relevant in other important contexts as well, such as learning or organizational behavior (cf. Karoly, Boekaerts & Maes, 2005; for an overview, see Boekaerts, Pintrich & Zeidner, 2000). However, the health domain poses special challenges for self-regulation theories because of the substantial discrepancy that has been noted between the importance of individuals' health goals (or at least, what they report to be important health goals) and their frequent failure to act upon these goals. In fact, self-regulation failure in the health domain is a prototypical case to illustrate the relevance of a self-regulation approach to behavior (Baumeister, Heatherton & Tice, 1994). In turn, health behavior research can benefit from a self-regulation approach as this explicitly frames health behavior as a process of investing in long-term goals that require the control of immediate needs, which is one of the most important and difficult self-regulatory tasks (Brandtstädter & Renner, 1990; Mischel et al., 1996).

We feel that the self-regulation approach opens new perspectives for the study of complex health-related behaviors, and we are convinced that applying a self-regulation approach to critical issues in health behavior will result in a better understanding of why and when people effectively invest in their long term health than traditional approaches so far have done. In our overview of self-regulation approaches to health behavior we will not limit ourselves to one or two particular perspectives, as others have done (e.g., Cameron & Leventhal, 2003), but instead adopt a broad view that highlights important basic processes of self-regulation of health behavior, notably those involved in flexible goal setting and tenacious goal striving (Mischel et al., 1996). In the remainder of this chapter, we will first discuss what generally is meant by self-regulation, and briefly trace the historical roots of this approach. Next, we elaborate on different theoretical approaches to self-regulation, highlighting the cybernetic control approach (e.g., Carver & Scheier, 1998), a strength perspective of self-control (e.g., Muraven & Baumeister, 2000), and behavioral enaction strategy (e.g., Gollwitzer, 1999), respectively. We then proceed with highlighting critical issues related to the self-regulation of health behavior. In the last section we will give an overview of the book.

WHAT IS SELF-REGULATION?

Compared to other living creatures, human beings are noted for having an extensive ability to exert control over their inner states, processes, and responses (Baumeister et al., 1994). People are able to resist their own impulses, adapt their behavior to a range of standards, and change their current behaviors in the service of attaining distal goals (Baumeister, 1999). The term self-regulation is often used to refer broadly to efforts by humans to alter their thoughts, feelings, desires, and actions in the perspective of such

higher goals (Carver & Scheier, 1998; Vohs & Baumeister, 2004). Hence, self-regulation refers to the person as an active agent and decision-maker, and is a vital aspect of human adaptation to life without which the individual would be a helpless spectator of events (Baumeister, 2005).

Psychologists' interest in self-regulation has burgeoned in recent years, and as an illustration Leventhal, Brisette and Leventhal (2003) found that two thirds of more than 2,700 publications containing the keyword ''self-regulation'' were published after 1990. This growing popularity promoted a range of views that differ in the various principles of self-regulation they emphasize and the specific mechanism they propose, but nevertheless share two basic properties (Cameron & Leventhal, 2003). A first common feature is to construe self-regulation as a dynamic motivational system of setting goals, developing and enacting strategies to achieve those goals, appraising progress, and revising goals and strategies accordingly. A second common characteristic is that self-regulation is also concerned with the management of emotional responses, which are seen as crucial elements of the motivational system, and that are conceived of as intricately linked with cognitive processes.

An issue of particular relevance in self-regulation concerns the processes involved in effective goal-pursuit that often extends over long periods of time and is frequently confronted with obstacles and temptations. How do individuals manage to successfully quit smoking, for instance, even though from time to time they may experience urges and cravings, and encounter numerous situations in which a cigarette is on offer? More generally, how do people manage the trade-offs and choices between distal goals and immediate urges? And how do they stay on track in cycles of waxing and waning commitment to their goals (cf. Klinger, 1977)? Some of these ''preliminaries of willing'' (cf. James, 1890), are related to the process of goal setting, and effective self-regulation is more likely when a goal is construed as personally meaningful, supported by favorable expectations about one's ability to execute the necessary actions, and the choice of appropriate standards for performance (Mischel et al., 1996). Several other processes contribute to the successful enaction of intentions, such as effective planning and adequate self-instruction to implement plans. Detailed overviews of ''goal-guidance processes'' (Maes & Karoly, 2005) are presented by other authors (e.g., Gollwitzer & Moskowitz, 1996; Kuhl, 2000; Maes & Karoly, 2005; Mischel et al., 1996).

Successful self-regulation requires the strategic mobilization of thought, feeling, and action (Cantor, 1990; Gollwitzer, 1996; Kuhl, 2000), in particular when facing obstacles and conflicts between goals, and self-regulation generally is construed as a systematic process that involves conscious effort to influence thoughts, feelings, and behaviors in order to achieve a goal in the context of a changing environment (cf. Zeidner, Boekaerts & Pintrich, 2000). Phrased differently, self-regulation entails individuals' involvement in the management of their own change processes (Abraham, Norman & Conner, 2000), including the conscious consideration of the relative importance of potentially competing goals, and goal prioritization in particular (Abraham & Sheeran, 2000). The unique contributions of the psychological self-regulation perspective to an explanation of (health) behavior can best be understood when considered in the historic context of other perspectives on behavior, especially insofar as they relate to the role of motivation (Bandura, 1986; Mischel et al., 1996).

The Emergence of a Self-regulation Perspective

Since the emergence of psychological science in the late 19th century, psychologists have proposed a range of substantially different views on the nature of motivational processes that underlie human behavior. However, be it the trait-disposition view, the biological perspective, psychoanalytic thinking or learning theory, to name but the most important perspectives, the approaches that have dominated thinking about motivation and behavior for most of the 20th century shared one critical assumption. All considered behavior to mostly result from non-reasoned processes. The precise processes that have been proposed differed between these perspectives, but none included reasoning. Indeed, for much of the history of psychological thought, motivational processes have been considered as substantially different from and independent of cognitive processes. Only more recently have scholars started to invoke human agency and systematically address the ways in which motivation and cognition are intricately linked (cf. Mischel et al., 1996). A major change in thinking about how motivation and cognition are related is evident in Bandura's view that cognitive processes play a central role in human learning as well as motivation (Bandura, 1977). An important cognitive process underlying motivation is that reinforcements create expectations of future outcomes, which guide behavior through the processes of goal setting and self-evaluation against these standards, a notion that has become central to the self-regulation perspective of behavior. Indeed, it has been noted that the concept of self-regulation originates with attempts to make learning theory more sophisticated and flexible to encompass a larger portion of behavior (Baumeister, 1998).

Bandura's writings (e.g., 1977, 1986) have proven particularly seminal for the emergence of a self-regulation perspective, highlighting central issues such as the symbolic representations of goals and self-reflective monitoring of behavior in the pursuit of goals. Bandura's Social Cognitive Theory posits that individuals engage in behavior because of the outcomes they hope to achieve, and these action expectations reflect the motivational function of reinforcement (Bandura, 1977, 1986). People strive to gain anticipated positive outcomes and to forestall potential negative outcomes, and this goal striving is further governed by individuals' self-efficacy beliefs. As a general rule, people undertake those tasks for which they judge themselves efficacious. Self-efficacy is particularly important to self-regulation because it influences a host of variables that come into play as people strive to regulate their behavior (Cervone, Mor, Orom, Shadel & Scott, 2004). Self-efficacy beliefs affect the level and type of goal individuals adopt, which in turn influences performance. Explicit, challenging goals raise motivation and goal attainment (Locke & Latham, 2002), and individuals with high self-efficacy are more likely to adopt and remain committed to highly challenging goals.

The major contribution of Social Cognitive Theory arguably lies in the proposition that self-efficacy beliefs affect standards of performance (i.e., goal setting), a suggestion that has rapidly been included in other motivational theories of behavior. Only recently increasing attention is being devoted to explicating the ways in which self-efficacy beliefs also affect strategies for achieving goals (Bandura, 1991; Cervone et al., 2004; Luszczynska & Schwarzer, 2005; Schwarzer, 1992), but the proposed mechanisms substantially overlap with processes that are central to other accounts of self-regulation. Also, according to Carver and Scheier (1998), Bandura has been somewhat reluctant to

adopt the vocabulary of feedback control, which constitutes another important feature of self-regulation (Miller, Gallanter & Pribam, 1960; Carver & Scheier, 1982), and one that we will discuss in the next section.

MODELS OF SELF-REGULATION

Cameron and Leventhal (2003) note that the term self-regulation has been so widely used in recent years that one cannot but wonder whether all theories of (health) behavior are self-regulation models. Obviously, the answer should be no. Following other authors in the field of self-regulation (Carver & Scheier, 1998; Mischel et al., 1996), we apply three criteria for including models of behavior as self-regulatory models: (a) The explicit consideration of goals, (b) a view of the person as an active agent in shaping his or her own behavior, and (c) an emphasis on volitional processes in goal striving.

Central to all self-regulation models of behavior is the concept of goals. Different type of goal constructs have been proposed, including personal strivings (Emmons, 1986), life tasks (Cantor & Kihlstrom, 1987), personal projects (Little, 1983) or self-guides (Higgins, 1987), each emphasizing different aspects of goals but having in common the idea that goals energize and direct activities as they give meaning to people's lives (Baumeister, 1989). Indeed, understanding the person means understanding the person's goals (Carver & Scheier, 1999). By definition, goals are future-oriented as they relate to how people think of their unrealized potential and the kind of things they might want to achieve. Most theoretical accounts of self-regulation cast goals as guiding principles that people consciously and intentionally set to effectively steer their behavior (e.g., Austin & Vancouver, 1996; Elliott & Dweck, 1988; Pervin, 1989). We consider a theory to be a self-regulation model when it starts from the assumption that individuals are agents that somehow are involved in shaping their own destiny. This can be as active decision-makers, but also includes instances in which individuals act to achieve goals of which they are not consciously aware (e.g., Bargh & Chartrand, 1999; Fitzsimons & Bargh, 2004; Strack & Deutsch, 2004).

In addition to acknowledging the importance of goals and goal setting as motivational underpinnings of human action, a self-regulation theory of human behavior also should make explicit the processes that are involved in striving to attain the specified goal. That is, self-regulation theories are not only concerned with motivation but also with volition, and the processes of goal setting and goal striving are construed as intricately linked in a recursive process, which dynamically adapts to changes in the context in which the self-regulation occurs. We next introduce major theoretical approaches to self-regulation that differ in the extent in which they incorporate these different features. We distinguish among cybernetic control theory (e.g., Carver & Scheier, 1998), models of willpower and self-control resources (e.g., Baumeister et al., 1994; Mischel et al., 1996), and behavioral enaction theories (e.g., Gollwitzer, Fujita & Oettingen, 2004; Schwarzer, 2001).

Cybernetic Control Theory

For a long time, the cybernetic view of self-regulation developed by Carver and Scheier (Carver, 2004; Carver & Scheier, 1998; Scheier & Carver, 2003) has more or less been

equated with the self-regulation perspective, not in the least because it was one of the first self-identified self-regulation theories. Central to Carver and Scheier's approach to self-regulation, which continues to be ''the bedrock of self-regulation science'' (Vohs & Baumeister, 2004, p. 4), is the notion that ''individuals live life by identifying goals and behaving in ways aimed at attaining those goals'' (Scheier & Carver, 2003, p. 17). Behavioral self-regulation hence entails that individuals hold a goal, monitor progress towards the attainment of this goal, and act in ways to reduce any discrepancy between the current state and a standard as specified by the goal, and they do this in ways that fit the situation and their personalities (Carver, 2004).

This dynamic process of feedback control is summarized by the Test-Operate-Test-Exit cycle (TOTE; Miller et al., 1960; Powers, 1973), in which stimulus input is evaluated through a comparison with a reference value or standard (Test), acted upon to bring the person's situation in line with the standard (Operate), which constitutes the systems output function, and tested again to evaluate whether the standard has been reached (Test). If so, the control process is ended (Exit). Feedback loops are discrepancy reducing (or ''negative'') when behavior decreases any discrepancy between the person's current state and the goal. This process is seen when someone attempts to attain a valued goal or conform to a standard, such as exercising more or eating more fruits, and refers to approach behaviors. A discrepancy enlarging (''positive'') feedback loop is involved in acts of avoidance, as in not eating high caloric foods or reducing alcohol intake. It is in particular the consequences of behavior that constitute useful feedback, and self-regulation in essence refers to an internal guidance system that operates on the short-term effects of actions (Carver & Scheier, 1998), and can override normal response tendencies.

A central idea in Carver and Scheier's theorizing of self-regulation is that goals differ in abstraction, and are organized hierarchically. They similarly propose a hierarchy of feedback loops in which lower order goals are controlled by higher order goals (Carver & Scheier, 1982; cf. Powers, 1973). In this hierarchical system of self-regulation, a lower level represents the means towards the ends specified at the next higher level, and what results is a ''cascade of control'' (Scheier & Carver, 2003, p. 20), which extends from the most abstract top level at which system concepts (or ''be'' goals) are represented, such as being a healthy person, down to motor control goals at the lowest level, such as walk to work instead of driving by car (Carver & Scheier, 1982). An implication of the notion of hierarchy is that goals vary in importance. The higher in the organization, the more goals are tied to the sense of self and the more an individual is committed to this goal. In turn, high goal commitment is often associated with affect, and affect in particular is thought to be involved in priority management (Carver, 2004). Carver and Scheier (1998) have suggested that the feelings a person experiences reflect how well the behavior regulation process is doing. This self-awareness or self-monitoring of affect is crucial for the understanding of self-regulation processes as the affect resulting from either slower or faster than expected progress to the standard is believed to determine further action.

Given that the function of feedback systems is to reduce discrepancies, positive affect is suggested to promote slowing down or *coasting*, as a result of which the positive affect gradually fades (Carver, 2004). While people are generally thought to strive for continued pleasure, this makes functional sense because it can explain why someone would ever stop a pleasurable activity and attend to other important issues and concerns. Negative

affect is proposed to promote that a person tries harder, but an impulse to withdraw or disengage may also occur when the person's expectancy of being able to reduce the discrepancy is unfavorable (cf. Carver, 1979). Sometimes this disengagement involves scaling back to the pursuit of a less demanding goal, which adaptively keeps the person in specific domain of goal pursuit. An import issue concerns when it is adaptive to give up, and Scheier and Carver (2003) suggest that this is the case when it leads to taking up of other goals, which can be substitutes for the abandoned goal (Wrosch, Scheier, Miller, Schulz & Carver, 2003; see also Rothermund, this volume).

Theories of Willpower and Self-control Resources

Whereas the Carver and Scheier approach to self-regulation highlights the process of self-monitoring as crucial in acting upon the experience of discrepancy between a current state and a desired goal, Baumeister's self-control strength theory emphasizes the resources involved in making changes and adjustments in one's behavior to achieve a goal (Baumeister, Bratslavsky, Muraven & Tice, 1998). In cybernetic terms this self-regulation resource approach focuses on the operate phase of the TOTE loop, and much less on performance standards or monitoring progress (Baumeister & Heatherton, 1996). As such, both approaches are believed to be complementary, and to address different aspects of self-regulation (Vohs & Baumeister, 2004). The approach advocated by Baumeister and colleagues entails that self-control or willpower plays an essential role in self-regulation, as self-control is required to resist urges and temptations that would otherwise interfere with the individual's long-term interests. This emphasis on the importance of self-control and willpower is shared with earlier theories concerning postponing the fulfillment of immediate needs, such as Mischel's delay of gratification paradigm (Mischel, Shoda & Rodriguez, 1989).

The Baumeister model holds three central assumptions. First, it states that there is a limited capacity for self-regulation because self-regulation is an effortful process. Second, the theory holds that all self-regulation tasks draw on the same (limited) resource, making it difficult to engage in continued self-control once the resource has been employed for an initial task. The third and probably most important assumption is that successful self-regulation entirely depends on the availability of the resource. A series of experimental studies have provided evidence for the first two assumptions, demonstrating that the capacity for controlling the self draws on a resource that resembles a strength, more than a skill or a knowledge structure and is hence vulnerable to depletion (Baumeister et al., 1998; Muraven, Tice & Baumeister, 1998). That is, the resource for self-regulation is limited in such a way that expending it is followed by a period of reduced capacity until it builds up again, much like a muscle works (Muraven & Baumeister, 2000). However, it has been suggested that depletion effects may also be related to decreased motivation (Martijn, Alberts & De Vries, this volume; Muraven & Slessareva, 2003).

Regarding the third assumption of the model, evidence is mixed. To date, most studies applying self-control resource theory have been concerned with explaining self-regulation failure, which seems reasonable because of its emphasis on the limited availability of self-control (Baumeister & Heatherton, 1996; Baumeister et al., 1994; Muraven et al., 1998). Indeed, the scarce capacity for self-regulation may provide a good account of why so

many people fail in acting upon their intentions or do not maintain initial attempts to change their behavior. That is, they may be able to withstand the temptations of cigarettes, alcohol or fattening foods for a short while but, as the theory predicts, sooner or later they will give in because of self-control depletion. Often they do so for the hedonistic motive of feeling good in the short term or because they fail to recognize the long-term benefits of self-control (Leith & Baumeister, 1996; Tice, Bratslavsky & Baumeister, 2001).

Despite its relevance for understanding self-regulation failure, which seems especially important in the field of health behavior, the resource approach has some trouble in explaining why and how people may achieve successful self-regulation. There is some evidence that self-control may improve as a result of exercise (Muraven, Baumeister & Tice, 1999), but overall the theory is more concerned with explaining the conditions that hinder self-regulation than those that may promote it. Because of its emphasis on self-control as the essential feature of self-regulation the theory also tends to neglect other important aspects of self-regulation, most notably how people determine their strategies for goal achievement in the face of distractions and frustrations (an issue we will discuss later in this chapter). Thus, although self-control may be a powerful device in withstanding immediate urges that may interfere with striving for long-term goals, the resource approach remains rather implicit about how people engage in successful goal pursuit once they have effectively inhibited their impulses. In addition, the resource approach also is somewhat vague about the way goals regulate behavior, and implicitly seems to hold that people are driven by immediate interests only. These issues are addressed by a third type of self-regulation models, which we will discuss in the next section.

Behavioral Enaction Theories

In contrast to classic social-cognitive models that focus on the role of motivation in behavior (for a discussion of social-cognitive models of health behavior, see later this chapter), more recent models in this tradition have become increasingly concerned with the volitional processes involved in the initiation and maintenance of actions to achieve one's goals (Abraham & Sheeran, 2000). These models have been termed behavioral enaction models, and we consider them models of self-regulation because they not only address processes involved in goal setting but also distinguish important aspects of goal striving.

In recent years a number of theories have been proposed that have in common the assumption that the process of behavior change can be best described as a passing through a number of distinct stages, and that suggest factors that might influence the transition from one stage to another. Stage models hold that individuals in different stages will behave in qualitatively different ways, and propose that interventions needed to move individuals further in the process of change should vary from stage to stage (Weinstein, Rothman & Sutton, 1998). These models differ in the number of stages they propose and, more importantly, in how specific they are with respect to the psychological mechanisms and strategies that are involved at different points in the process of behavior change.

Well-known stage models of behavior change, notably the Transtheoretical Model (Prochaska & DiClemente, 1984), but also Weinstein's Precaution Adoption Process model (Weinstein, 1988), propose five to six distinct stages of change. These refer to the transitions a person experiences from initially unaware of a problem to undecided about taking action, considering action, initiating effective action, and through to successful maintenance and avoidance of relapse. While these models have intuitive appeal and hold substantial heuristical value for large scale prevention as well as change attempts in therapeutic settings, the mechanisms of change that are involved in stage transitions remain rather unspecified (Weinstein et al., 1998). Armitage and Conner (2000) note that in both these models the description of what occurs in terms of social-cognitive processes is rather imprecise, and it remains unclear whether they truly describe the change process, or strategies for goal pursuit at all. In addition, these models are rather implicit about the role of personal goals, which is probably related to their development in the context of behavioral interventions that may often serve to convince individuals of the need to adopt a particular health goal.

Other important stage models distinguish between a motivational and a volitional phase to behavior change, as implied by the classic distinction between goal setting and goal striving (Lewin, Dembo, Festinger & Sears, 1944). A model that has proven particularly influential is the model of action phases (Heckhausen & Gollwitzer, 1987; Gollwitzer, 1993). This model argues that an individual selects a particular behavior because of expected consequences, and then sets out to implement it in a specific way. The entire behavior change process is thought to consist of four stages: 1) a predecisional phase in which potential goals are deliberated, and a decision to pursue one of them is made; 2) a post-decisional phase in which ways of implementing goals are considered, and some means of goal attainment are selected; 3) an actional phase in which functional behaviors to attain the goal are initiated; and 4) a postactional phase in which attained outcomes are evaluated.

While no empirical work has directly assessed the propositions of the model (Armitage & Conner, 2000), it has proven an important conceptual basis for contemporary work on the implementation of intentions (cf. Gollwitzer, 1996). Gollwitzer, Heckhausen and Steller (1990) propose that each phase involves a distinct mindset that tailors a person's cognitive processing to meet the task demands of that phase (i.e., cognitive tuning). Gollwitzer and colleagues reported a number of studies examining the deliberative mindset of the predecisional phase and the implemental mindset of the post-decisional phase, and made clear that goal setting and goal striving differ in nature. They further noted that researchers interested in goal-oriented behavior did not develop distinct theories to account for goal striving, but rather stretched expectancy-value theories to make them account for goal setting as well as goal striving (Gollwitzer et al., 1990).

Gollwitzer (1996) advances the view that planning promotes the willful implementation of a person's goal and thus provides volitional benefits. In particular, it is proposed that planning helps to alleviate crucial volitional problems of goal achievement, such as being too easily distracted or giving up in the face of difficulties when instead increased effort and persistence are needed. These beneficial effects of planning are achieved by the formation of implementation intentions (if-then plans that specify when, where and how an instrumental goal-directed response is to be initiated) that should be particularly facilitative when faced with implemental problems (for overviews, see Gollwitzer, 1999;

Gollwitzer et al., 2004; Sheeran, 2002; Sheeran et al., this volume). It is proposed that, in short, the formation of implementation intentions delegates control over goal-directed action to the situation, similar to the operation of habits. However, the automatic control implied in implementation intentions is created at once through a willful act, rather than established over time via repeated pairings of stimulus and response.

Applying Self-regulation Theories to Health Behavior

Our previous discussion of major theoretical approaches to self-regulation illustrated that each of these theories emphasize different aspects of the self-regulation process. However, regardless of the specific processes of self-regulation that are highlighted in these approaches, none of them were specifically designed for understanding and explaining self-regulation processes in health behavior. In that respect these models differ from, for example, the self-regulation approach to health behavior developed by Howard Leventhal and his co-workers (e.g., Leventhal et al., 2003), which will be discussed in a later section. Important issues, therefore, are to what extent these three generic approaches to self-regulation are relevant for the health behavior domain, and whether some approaches are more suited to promote understanding of self-regulation of health behavior than others. This entails the question whether health behaviors represent a special category of behavior or are more or less equivalent to other types of behavior.

Health behaviors may be governed by the same principles as other behaviors that are subject to self-regulation because they involve the person as an active agent and draw on volitional processes of goal striving. However, there is some debate about the extent to which goals are true guides of health behavior. For instance, are we really self-regulating (choosing our own goals) or are we being regulated (following doctors orders) when we decide to quit smoking or eat a healthy diet (cf. Brownlee, Leventhal & Leventhal, 2000)? If the latter would be the case, then a self-regulation perspective would not add much to our understanding of why people either succeed or fail in that behavior. In a similar vein, we may wonder whether people who consume plenty of fruit and vegetables or who exercise a lot, do this for the sake of their long-term health or simply because they enjoy the taste of fresh fruit or love being physically active.

In a way, then, one of the important questions for self-regulation theories of health behavior is to what extent people have adopted health goals that direct their behavior (see also Gebhardt, this volume; Rothermund, this volume). Nevertheless, it seems reasonable to assume that when people are practicing health behaviors, that is, when they do things that bear relevance for their health, they mostly engage in acts that require substantial effort, and need an active self to resist impulses that may threaten involvement in the behavior. These are the types of actions self-regulation theories generally are concerned with, and the next issue is to determine the relevance of each of the genereric self-regulation approaches described earlier for the domain of health behaviors.

All three theoretical perspectives on self-regulation have been successfully employed in examining issues related to striving for health goals, albeit with different emphases. The framework offered by cybernetic control theory, for example, has been used to explain self-regulation processes in patients dealing with chronic illness and has drawn

special attention to the way positive outcome expectancies (optimism) may affect these processes (Carver, Scheier & Pozo, 1992; Carver et al., 1993; Scheier & Carver, 1992). Unfortunately, no studies have directly tested the full TOTE cycle in the context of health behavior, or any other types of behavior for that matter. However, this approach proposes a series of assumptions that seem relevant for health behavior and require further examination. For instance, is it really true that people will try harder to attain their goals when they are confronted with difficulties in goal attainment, and is it equally true that negative affect that may result from the less than optimal pursuit of a particular health goal can motivate people to put more effort in their strivings? These propositions are central in Carver and Scheier's theory but seem at odds with most observations of striving for health goals that suggest that people give up rather easily in the face of obstacles.

Further issues that are central to the Carver and Scheier theory, but have not yet been examined empirically relate to the proposed hierarchical structure of goals: At what level do people conceive of their health goals? Are health goals "be" goals or more instrumental types of goals? And when do people pay attention to health goals? It may be that in particular people who experience positive affect related to other, non-health goals can afford to pay attention to goals in need of repair, and people may hence attend to health goals only when other things are going well (Carver, 2003). The Carver and Scheier approach thus raises a myriad of important issues that require further examination in the health behavior domain. In fact, health behaviors may provide excellent cases to examine these issues because at first glance findings in this domain seem at odds with essential propositions of the theory.

The self-control strength approach advocated by Baumeister and colleagues highlights the importance of resources to regulate the self and has intuitive appeal when attempting to explain why so many people fail in their striving for health goals. Indeed, health behaviors provide a host of good examples of unsuccessful goal striving, such as that many people eventually fail when trying to control their appetites and cravings for fatty foods and nicotine, as exemplified in Baumeister's seminal work on self-regulation failure (Baumeister et al., 1994). Unlike cybernetic control theory, the limited resource approach has been applied to a range of health problems, including overeating (Kahan, Polivy & Herman, 2003; Vohs & Heatherton, 2000), smoking (Sayette, 2004), alcohol abuse (Muraven, Collins & Nienhaus, 2002), and condom use (Bryan, Schinkeldecker & Aiken, 2001).

In a series of studies Vohs and Heatherton (2000), for example, found that a depletion of resources as a result of overriding the temptation of chocolate candies, led to more ice-cream eating among chronic dieters (but not among nondieters who were not actively trying to inhibit caloric intake). These findings support the resource model of self-regulation as an explanation for dieting failure: Exertions of self-control, whether or not related to inhibiting an impulse to eat, may make it more difficult to inhibit eating immediately thereafter. The model thus bears relevance for an understanding of health behavior, especially those that involve the restraint of impulses. The model does not, however, offer a full understanding of the conditions under which people will successfully control their impulses and maintain their striving for health goals. That is, having enough resources may be an essential but not sufficient ingredient of self-regulation, especially insofar as complex behavior is involved.

As outlined above, this is addressed in behavioral enaction models, which represent an approach to self-regulation that probably has been most extensively tested in the domain of health behavior (e.g., Gollwitzer & Oettingen, 2000; Sheeran et al., 2005; Sheeran & Orbell, 2000; also see Sheeran et al., this volume). Indeed, a fair amount of studies have shown that implementation intentions are useful devices to promote acting upon good intentions to perform a wide range of health behaviors, including exercise (Milne, Orbell & Sheeran, 2002), testicular self-examination (Steadman & Quine, 2004), and cervical cancer screening (Sheeran & Orbell, 2000). Recent findings, however, seem to suggest that effects of implementation intentions in the domain of health behavior are partly influenced by the extent to which people are intrinsically motivated to perform that behavior (Sheeran, Webb & Gollwitzer, 2005) Again, the nature of health goals seems to be crucial for understanding self-regulatory processes in health behavior. There is some evidence that suggests that implementation intentions arouse negative affect in those who have adopted high standards, and consequently make these individuals actually perform worse (Powers et al., 2005).

In sum, it appears that each of the three theoretical approaches to self-regulation bears relevance for understanding the self-regulation of health behavior. Depending on what part of the self-regulation process is under study—how health goals guide behavior, why people fail in maintaining the pursuit of health goal, or how they may increase the likelihood of acting upon their good intentions—specific approaches can provide a useful framework for explaining health behaviors. Nevertheless, a number of issues that are particularly relevant to understand how self regulation of health behavior works, remain hitherto unaddressed. We will address some of these in the next section.

CRITICAL ISSUES IN SELF-REGULATION OF HEALTH BEHAVIOR

Despite the relevance of the self-regulation approach for a better understanding of the processes involved in striving for health goals, the lack of an encompassing theoretical framework to examine the processes involved in self-regulation remains a particularly important issue, as exemplified in our discussion of theoretical models of self-regulation in the previous section. Even though all approaches more or less share an emphasis on difficulties associated with goal pursuit, each approach seems to highlight different aspects of self-regulation. This state of affairs has brought some authors to wonder whether the field of self-regulation is mature enough to be discussed in a handbook (Royer, 2003) or to complain that self-regulation theory may be ''too good to be true'' (McKeachie, 2000, p. xxii).

However, notwithstanding these critical notes we believe that a self-regulation approach to health behavior has some unique features that have surplus value as compared to more traditional approaches to health behavior, in particular social-cognitive models. In this section we discuss views derived from other theoretical approaches to health behavior to delineate the unique contribution of a self-regulation perspective on goal-related processes involved in health behavior. By doing so, we will address critical issues that merit further attention, and that in part will be addressed in this volume.

Social Cognition and Self-regulation

Social-cognitive models have been the predominant approach to understanding and explaining health behavior since the 1950s (for overviews, see Armitage & Conner, 2000; Conner & Norman, 1996; De Wit & Stroebe, 2004). Models like the Health Belief Model (Rosenstock, 1974), Protection-Motivation theory (Rogers, 1983), and Theory of Planned Behavior (Ajzen, 1991) have in fact dominated theorizing of health behavior for decades. The common ground of this type of model of behavior is that they specify a limited set of beliefs that are proposed as proximal determinants of motivation, often represented as an intention to act. The different models are loosely derived from a predominantly economic expectancy-value or subjective expected utility view that suggests that individuals are motivated to strive for those goals and enact those behaviors that are most likely to result in highly valued outcomes. By far the most popular model in this category, the Theory of Planned Behavior (Ajzen, 1991), is exemplary of the kind of reasoning adopted in many motivational models that view motivation as sufficient for successful action: If a person holds a positive attitude about the behavior, thinks others would approve of the behavior, and the behavior is under personal control, he or she forms an intention and subsequently acts upon it.

Social-cognitive models of health behavior can be regarded as rudimentary self-regulation models, as they are somewhat concerned with the way people engage in future action. Most of these models also incorporate concepts of volitional control. In a way, then, social-cognitive models include the processes of goal setting and goal striving that are central to self-regulation (cf. Bagozzi, 1992; Maes & Gebhardt, 2000). However, intention formation is not necessarily identical to goal setting, because intentions often tend to involve rather specific acts whereas goals tend to be of a higher-order, abstract nature (Austin & Vancouver, 1996; see also Gebhardt, this volume). In a similar vein, perceived personal control is not equivalent to goal striving, as people will not always engage in behavior they consider under their personal control (Armitage & Conner, 1999; cf. Abraham, Sheeran & Johnston, 1998).

In a more general sense, the Theory of Planned Behavior and other motivational models that highlight behaviors as resulting from weighting the pros and cons, may be criticized because of their ''consequentionalist'' nature (Loewenstein, Weber, Hsee & Welch, 2001). By focusing on the role of future outcomes of behavior as leading factors in behavioral decision-making these models tend to underestimate the role of the here and now in whether or not individuals act on intentions. Deliberate intentions are often overruled by reactions to compromising situations, as is for example demonstrated in research on behavioral willingness to act against one's intentions (e.g., Gibbons, Gerrard, Blanton & Russell, 1998; also see Gibbons et al., this volume). For this reason, some authors consider models like the Theory of Planned Behavior more as theories of intentions than of behavior (Greve, 2001). It can be argued that because of their emphasis on intention formation, and because the relation between intention and behavior is considered as unproblematic, motivational models of health behavior provide only a limited account of how people may strive to attain health goals.

Coping and Self-regulation

One of the most challenging self-regulatory tasks is tenacity in goal pursuit when difficult or frustrating situations are encountered (Brandtstädter & Renner, 1990; Mischel et al., 1996). Indeed, distractions and temptations are often regarded as the main causes of self-regulatory failure (Baumeister & Heatherton, 1996). However, compared with processes of goal setting and goal striving relatively little is known about how people deal with adversity during goal pursuit and how ways of coping may affect goal attainment. The way people respond to frustration and distress has been highlighted in the stress and coping literature. Unfortunately, however, the literatures on self-regulation and coping have largely developed independently, even though they share a concern with what people do when they anticipate or encounter adversity (Carver & Scheier, 1999; Lazarus & Folkman, 1984).

Only few authors have attempted to integrate concepts derived from stress-coping theory in the theoretical framework of self-regulation, and Leventhal's self-regulation model is one of the exceptions that explicitly pay attention to the role of coping (Leventhal, Meyer & Nerenz, 1980). The model holds that mental representations of actual or future health threats elicit coping ''procedures'' for dealing with these threats, and that dimensions of these representations in terms of timeline, causes, or consequences determine the selection of coping strategies. However, as the concept of health goals is rather implicit in Leventhal's model, or at least not more specified than a general assumption that people are motivated to act in response to a health threat, this approach provides little information about the role of coping in staying on track during goal pursuit. Moreover, the role of coping has not been a point of great interest in the model as most research has been focused on the dimensions of mental representations of illness (Leventhal et al., 2003; Hagger & Orbell, 2003). Extending self-regulation models with concepts derived from stress-coping theory seems to be important, however (Aspinwall, 2004; De Ridder & Kuijer, this volume).

Self-regulation theories emphasize long-term goal pursuit without explicitly considering the short-time regulation of goal frustrations, and theories of stress and coping may be helpful in explaining how effective dealing with such frustrations might benefit continued goal striving. In addition, the coping literature may provide more insight in how conditions of high distress create major shifts in goal priorities (Emmons, Colby & Kaiser, 1998). Research at the interface of coping and self-regulation is scarce, however. One particularly interesting attempt to consider the role of coping in the context of goal striving is the proactive coping model developed by Aspinwall and Taylor (1997). This model explicitly deals with coping processes in the service of long-term goals and highlights how people may employ coping efforts to prevent potential future stressors that may pose a threat to their goals. It is important to note that the coping literature may not only be informative for a better understanding of self-regulation processes. In a similar vein, the coping literature might benefit from the extended self-regulation framework. In recent years, critical reviews of the coping concept have been published pointing to such problems as a failure to understand how stressful situations may shape coping responses (Aspinwall, 2004; De Ridder & Kerssens, 2003). Explaining stressful situations in terms of interruptions of goal striving or in terms of threats to goals (Lazarus, 1990), therefore seems a promising area of future research.

Self-control and Self-regulation

Many authors emphasize the role of willpower or self-control in self-regulation (Mischel et al., 1996), as exemplified in the limited resource approach to self-regulation discussed previously. The general idea is that when faced with the temptation of immediate rewards people need to exert some control over their impulses to continue striving for long-term goals. Yet, the extent to which self-control is sufficient for successful self-regulation is the subject of recent debate. Whereas some authors tend to consider self-control as synonymous with self-regulation (Muraven & Slessareva, 2003; Vohs & Baumeister, 2004), others question the central role of self-control and find positive outcome expectancies more important for explaining self-regulatory behavior (Scheier & Carver, 1992). Some authors even argue that self-control may compromise self-regulation as the stoic denial of immediate needs may affect efforts to engage in future-directed behavior, implying that attention to immediate needs is more adaptive for long-term goal striving (Fishbach, Friedman & Kruglanski, 2003).

These diverging opinions on the role of self-control may be explained by different views on the nature of self-control: Is self-control an individual ''strength'' that people may or may not have? Or is self-control related to the situational circumstances that may or may not allow the individual to exert control? While trait explanations emphasizing self-control as a strength can predict stable individual differences in self-control, they do not resolve one of the most important questions for a theory of self regulation that should specify what makes self-control possible (Mischel et al., 1996). Several studies have shown that conditions of uncertainty are highly relevant for self-control in terms of inhibiting impulses. For instance, in the typical delay of gratification task the motivation to exhibit self-control is strongly affected by the certainty of the delayed reward (Mischel & Ayduk, 2004). It has been argued that the decreased motivation for engaging in self-control under conditions of uncertainty is adaptive. If it is highly uncertain whether one will be able to collect the long-term reward, it may be wiser to choose the immediate reward even when it is smaller or one would have no reward at all: ''The future is uncertain, eat dessert first,'' like the proverb states. Uncertainty of long-term gains while confronted with big immediate rewards is typical for many health goals: Even if one refrains from highly rewarding but unhealthy habits like smoking or eating fattening foods, it is uncertain whether one will remain healthy in the long run. As we are not prepared by evolution to recognize the dangers of hamburgers, cigarettes or unsafe sex but still experience their rewarding value, inhibiting these impulses may be a difficult task (Loewenstein et al., 2001).

In the domain of health behavior then, self-control in terms of the capacity to override impulses seems to be a necessary but not sufficient factor in successful self-regulation. Recently, it has been argued that there may be actually two distinct systems of self-regulation with two sorts of operating characteristics; one system dealing with the restraint of unwanted or unplanned impulses and the other system dealing with acting upon premeditated and planful actions, labeled as the hot system and cool system respectively (Metcalfe & Mischel, 1999). This distinction may have important implications for the psychology of health behavior as it might explain why the effortful, planful system is functioning less when the individual is confronted with impulses that require

immediate control, leaving in charge impulsive, hot system with only short-term goals (see also De Ridder & Kuijer, this volume).

Initiating and Maintaining Goal Pursuit

Most social-cognitive models of health behavior hitherto have approached health behavior change as a static event: Once people have made a commitment to behavior change they will engage in attempts for actually changing their behavior. This is even true for most applications of stage models as they tend to focus on the early stages of behavioral change, describing the transition from considering change to initiating change. One of the potentially interesting contributions of a self-regulation perspective to health behavior derives from its emphasis on behavior in a more extended time framework. The prominent role of goals in self-regulation models dictates that behavior should be viewed in the context of the long-term goals that people have adopted. As health goals are almost by definition distal goals, pursuit should be maintained over a long period of time while the outcome is uncertain. Indeed, one may successfully stop smoking or lose some pounds, but there is no guarantee that one will not die from cancer or heart disease. In other words, even if one manages to change behavior, the reward for these efforts may only be manifest many years afterwards, and the issue of behavioral maintenance is thus particularly relevant for health behavior.

Maintenance of health behavior change has only infrequently been studied from the perspective of self-regulation approaches (cf. Maes & Karoly, 2005; also see De Wit, this volume), but research hitherto suggests that the initiation and maintenance of health behavior are affected by different factors (cf. Rothman et al., 2004). Rothman and colleagues argue that whereas the initiation of behavior change is related to the health goals people cherish, continuation of their goal-related efforts may be more related to their satisfaction with perceived progress to this goal (cf. Carver & Scheier, 1998). In a more general sense, a self-regulation perspective on behavioral maintenance is interesting because effortful attempts for self-regulation seem to alter perception of time (Vohs & Schmeichel, 2003), which may be one reason why continued attempts for behavioral change are prone to failure, if they do not become a routine or habit.

OVERVIEW OF THIS VOLUME

This volume brings together overviews of theorizing and research on self-regulation processes that are involved in health behavior and health behavior change. We have divided the chapters into two sections, one dealing primarily with processes involved in goal setting, the other related to processes of goal striving. In the first part, four chapters address topics related to the adoption of health goals and initial attempts for goal striving in the perspective of competing interests. Gebhardt (Chapter 2) discusses issues related to the role of health goals in personal goal structures. She specifically calls attention to the way health goals may interfere with other cherished goals. The next three chapters all deal with health goals of adolescents and the way these goals, if present at all, affect health behavior.

The health behavior of adolescents poses some interesting questions for those who study self-regulation processes, as many adolescents seem not very keen on spending a lot of effort in attaining these goals, despite a sincere interest in health. As a result, many studies on adolescent health behavior focus on what determines whether or not adolescents engage in risky health behaviors, such as smoking, excessive alcohol use, or unprotected sex. In Chapter 3, Gibbons, Gerrard, Reimer, and Pomery challenge the central assumption of many theories of health behavior as a reasoned and intentional activity. More specifically, they argue that health behavior, and especially behavior involving health risks, in adolescents is not premeditated but a reaction to social circumstances. As social goals seem more salient than health goals in adolescents, engagement in health risk behavior is explained as behavioral willingness to adapt to the social situation.

In Chapter 4, Engels and Bot provide a detailed analysis of how parents and peers affect adolescents, smoking and drinking behavior, which reveals that parents have a significant role in adolescent health risk behavior, although the social processes amongst peers have not yet been examined in detail. Chapter 5 by Gerrard, Gibbons, Stock, Houlihan and Dykstra also discusses the role of parents in the way adolescents react to health risk situations, with a focus on the development of temperament-based self-regulatory processes. The authors argue that these individual differences in self-regulatory competence determine how adolescents react to potentially risky social situations, but that parents can play an important role in helping their children to develop more self-control.

The second part of this volume addresses processes related to goal striving and goal persistence in the face of difficulties. Sheeran, Webb and Gollwitzer (Chapter 6) discuss the role of implementation intentions in the pursuit of health goals. They argue that forming so-called if-then plans is an essential self-regulatory tool when confronted with common problems in the pursuit of health goals, such as overcoming initial reluctance to act upon a health goal or maintaining initial strivings over a prolonged period of time. The formation of if-then plans may help to identify opportunities to act upon health goals. In Chapter 7, De Ridder and Kuijer address the role of coping and emotion regulation in the self-regulation of health behavior. They argue that in order to maintain striving for health goals, individuals need to take care of their short term frustrations and distraction that otherwise might interfere with goal directed behavior.

In Chapter 8, Martijn, Alberts, and De Vries discuss the role of self-control in self-regulation. They specifically argue that depletion of self-control is related to the beliefs people hold about the nature of self-control, and that depletion may be prevented when people are encouraged to persist. De Wit (Chapter 9) also addresses issues related to the persistence of initial efforts, and reviews the multitude of factors that seem involved. The prolonged maintenance of behavior change is rarely addressed in theory-based research, and understanding sustained change poses novel challenges to self-regulation theory and research. Finally, in Chapter 10 Rothermund addresses the important issue to what extent it is adaptive to continue striving for health goals when personal control is limited and resources are scarce. He raises the possibility that it is better to give up on health goals when striving is doomed to fail. Coming to terms with goals that might be pursued only with substantial costs allows a shift in attention to more promising goals and thus eventually benefits well-being.

Together, these chapters demonstrate the potential of a self-regulation approach to health behavior. They point to new areas for future research that may help us to understand and explain why and how people engage in behavior that is relevant for their health, although they often fail to take advantage of opportunities to perform that behavior and have difficulties in sustaining change.

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