

Self-Regulation Processes and Health: The Importance of Optimism and Goal Adjustment

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ABSTRACT This article discusses how self-regulatory models can be used to understand people's response to health threats. The article begins with a general discussion of the principles and assumptions of self-regulatory models of behavior. Two distinct lines of research are then presented addressing two important processes of adaptive self-regulation. First, we provide a brief overview of the literature on optimism and adjustment to chronic disease and other health outcomes. Second, we present an overview of the process of disengagement from unattainable goals, focusing on recent research. We close by making recommendations for future research.

The purpose of this article is to discuss some of the ways in which self-regulatory models of behavior can help us understand people's responses to health threats. This article begins with a general discussion of a set of orienting assumptions and principles embedded in models of self-regulation of behavior, placing the heaviest emphasis on our own approach. We then describe two distinct lines of research

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examining adaptive self-regulation. First, we discuss findings involving one aspect of effective self-regulation, focusing there on the relationship between dispositional optimism and adjustment to chronic disease and responses to health threats. Since the persistent pursuit of personal goals is only one part of adaptive self-regulation, we then consider the equally important process of disengaging from important goals by focusing on the recent literature on these issues.

BEHAVIORAL SELF-REGULATION

What do we mean by the term behavioral self-regulation? When we use this term, we are referring to processes by which behavior happens. We believe that human behavior is a continual process of moving toward and away from different kinds of mentally represented goals. The idea that human behavior is organized around goals is common among personality theorists (Austin & Vancouver, 1996; Bandura, 1997; Carver & Scheier, 1998; Elliot & Dweck, 1988; Emmons, 1986; Higgins, 1987). While goals are conceptualized differently among theorists, there are also many similarities. All share the view that goals energize and direct activities (Pervin, 1982), conveying the sense that goals give meaning to people's lives and that understanding the person means understanding the person's goals (Baumeister, 1989; Scheier & Carver, 2001). Goal-related theories often presume that the self consists partly of the person's goals and values and the organization among them.

Goals and Feedback Processes

Certainly, people's goals would not be meaningful or interesting if they were not somehow related to their actions. How are goals and action linked? In our view, goals serve as reference values for feedback processes. A feedback loop consists of four elements—an input function, a reference value, a comparator, and an output function—in a particular organization (see Figure 1; cf. Miller, Galanter, & Pribram, 1960).

An input sensor can be thought of as embodying perception: it brings in information about what exists. The reference value provides information about what is desired or intended (i.e., a goal). The comparator functions to compare the input and reference value, producing one of two outcomes: either the values being compared

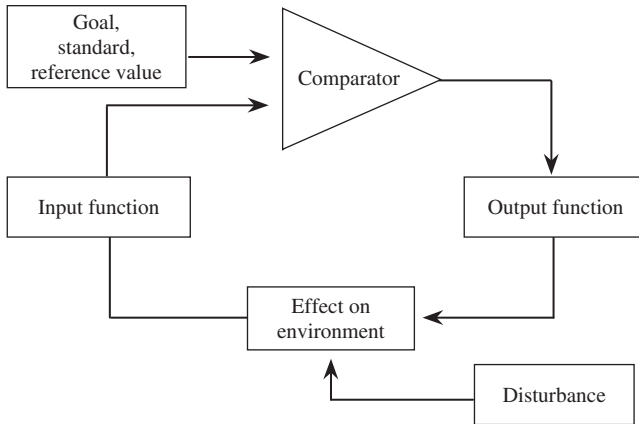


Figure 1

Schematic depiction of a feedback loop. In such a loop a sensed value is compared to a reference value or standard, and adjustments are made in an output function as necessary.

are discriminably different from one another or they are not. For the present purposes, the output function is behavior, though, sometimes, the behavior is a mental or physiological response.

There are two types of feedback loops, corresponding to two types of goals, and the nature of the output varies with the type of loop. In a *discrepancy-reducing* or *negative-feedback* loop, output intends to diminish discrepancies detected between the input and reference value. If no difference is found, the output doesn't change. If the comparison yields a discrepancy, the output changes so as to diminish the discrepancy. This matching of input to reference value or discrepancy reduction is reflected in attempts to approach desired goals.

In a *discrepancy-enlarging* or *positive-feedback* loop, the output increases differences between input and reference value. The reference value is one to avoid rather than approach (for distinctions between approach and avoidance goals, see Coats, Janoff-Bulman, & Alpert, 1996; Elliot & Sheldon, 1997). One could conceptualize such values as "anti-goals." The attempt is to move away from the reference value, but movement away in one direction is as good as movement in another. In living systems, discrepancy-enlarging loops are usually constrained by discrepancy-reducing loops (Carver, Lawrence, Scheier, 1996; Carver & Scheier, 1998). Stated differently, attempting to avoid something often results in approaching

something else. In this article we focus primarily on approach loops, but it should be acknowledged that some of the situations we describe also have aspects that can be viewed in terms of avoidance.

Hierarchical Organization of Goals

Goals vary in several ways. One way, just mentioned, is between approach and avoidance. Goals also differ in level of abstraction. For instance, a person may have the goal of being healthy, which is at a high level of abstraction. At a lower level of abstraction, the same person might have the goal to exercise every day. The first goal mentioned is to be a particular kind of person, whereas the second goal refers to accomplishing a certain kind of action. Goals can be even more concrete, such as the goal of completing an hour of jogging. Such goals are closer to specifications of individual acts than the second goal mentioned, which was more of a summary statement about the desired outcome of intended action patterns.

The examples previously mentioned are useful in illustrating how goals are ordered in a hierarchy, such that very abstract goals subsume goals that are more concrete. Powers (1973) argued that behavior occurs via a hierarchical organization of discrepancy-reducing feedback loops. Since such loops imply goals, his argument assumed a hierarchical model of goals. He reasoned that the output of a high-level system consists of resetting reference values at the next lower level. In other words, higher-order systems “behave” by providing goals to the systems just below them. Thus, goals are more concrete at each lower level, and control at each level regulates a quality that contributes to that controlled at the next higher level. In this way, there is a “cascade” of higher-order abstract loops to lower-order concrete loops, as the elements of the higher-order goals are manifested in more and more specific pieces of action.

A simplified depiction of this hierarchy is shown in Figure 2. Lines are used to indicate only the links among the goals; the diagram omits the loops of feedback processes. The lines indicate that moving toward a particular lower goal contributes to the attainment of a higher one (or even several higher goals at once). Multiple lines to a given higher-order goal imply that several lower actions can contribute to its attainment. Again, there are goals to “be” a certain way and goals to “do” certain things (and at lower levels, goals to create physical movement).

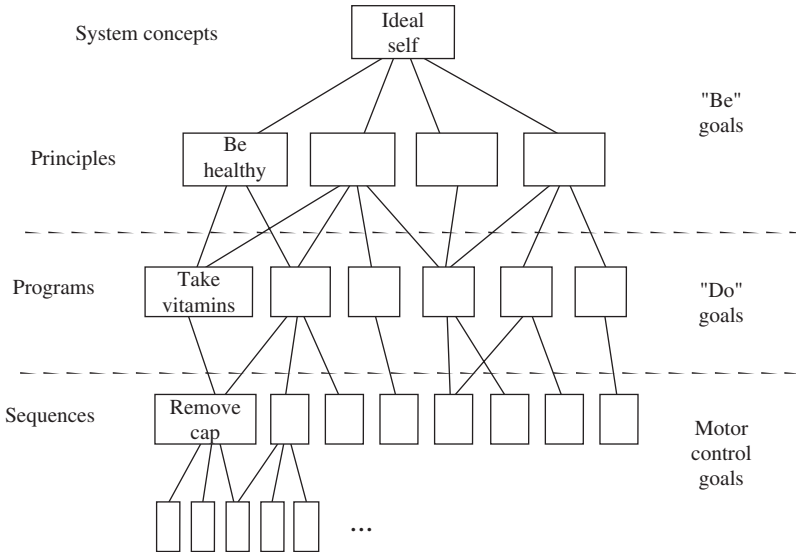


Figure 2

A hierarchy of goals (or of feedback loops). Terms on the left side of figure provide the labels that Powers (1973) used to identify the top levels of control in the specific hierarchy that he proposed. Lines indicate the contribution of lower level goals to specific higher-level goals. They can also be read in the opposite direction, indicating that a given higher-order goal specifies more concrete goals at the next lower level. The hierarchy depicted involves goals of "being" particular ways, which are attained by "doing" particular actions. (Adapted from Carver & Scheier, 1998).

Hierarchical models also have implications for several issues conceptualizing behavior (see Carver & Scheier, 1998, 1999). Goals at any given level can often be attained by several means at lower levels. In other words, there are many different pathways to achieve the same goal. For example, you can be productive (an abstract goal) by writing a manuscript, by cleaning your house, or by thinking through solutions to a complex problem. This allows the hierarchical approach to address the fact that people sometimes shift the way in which they are trying to reach a goal when the goal itself hasn't changed. The quality of the higher-order goal is implied by each of the lower-order activities.

Goals also vary in importance. The higher a goal is in the organization, the more it is tied to the sense of self. Thus, goals at higher levels tend to be more important than those at lower levels.

However, goals at lower levels aren't necessarily of equal importance. Rather, a lower goal that is central to attaining a valued abstract goal is more important than a goal that is less central to attaining the abstract goal. Further, one that contributes to attaining several higher-level goals at once thereby acquires greater importance (see also Carver & Scheier, 1999).

Affect

The model described to this point addresses goals and actions, but another important aspect to consider is emotional experience. We posit that the principle of feedback control also applies to feelings. That is, we believe that feelings arise via a second feedback process (for details, see Carver & Scheier, 1990, 1998, 1999). In brief, the argument is that this second feedback system is checking on how well the behavior system is doing at carrying out its job. Positive feelings mean you are doing better at something than you need to. Negative feelings mean you are doing worse than you need to. As in any feedback system, the input is compared against a reference value (cf. Frijda, 1986, 1988). The outcome of this comparison process is manifest in two ways: a hazy sense of expectancy, or confidence versus doubt, and affect—a sense of positivity or negativity.

Confidence and Doubt

As just mentioned, we think the experience of affect results from the same mechanism that also yields a hazy sense of confidence and doubt. We suggest that affect and expectancies are intertwined as behavior unfolds. As affect becomes more negative, doubts increase; as affect becomes more positive, favorable expectations and confidence also rise.

However, this contextual sense of confidence and doubt does not occur in a vacuum. When one's efforts at goal attainment are disrupted by adversity, distress emotions and doubt can result. At times, however, these immediate reactions are blended with or overridden by other information. When people experience adversity in trying to move toward goals, they periodically interrupt their effort and assess in a more deliberative way their likelihood of success (see Carver & Scheier, 1981, 1990, 1998). In other words, people suspend the behavioral stream, step outside it, and judge what is likely to

come. As part of this process, people presumably use memories of prior outcomes in similar situations and thoughts about other approaches to the problem and about other resources they might utilize (cf. Lazarus, 1966; MacNair & Elliot, 1992). They also may use attributions of prior events and social comparison information (e.g., Wills, 1981; Wood, 1989; Wood, Taylor, & Lichtman, 1985).

How are these thoughts linked to expectancies? Sometimes people retrieve chronic expectancies from memory. In this case, these summaries of products of previous behavior already are expectancies. For instance, a person who has had difficulties losing weight over multiple past attempts may find himself automatically expecting the worst from an upcoming weight loss program.

At other times, people think about possible changes to the situation. The person must evaluate the consequences for such possibilities to influence expectancies. Such an evaluation can be performed by playing behavioral scenarios through mentally (cf. Taylor & Pham, 1996). For example, a patient with cancer who is considering a new therapy may play through a scenario of undergoing the treatment, having limited side effects, and achieving an improvement in health. Playing through that scenario may help the patient derive a sense of confidence. Effective mental scenarios emphasize explicit processes needed to reach a goal, including the concrete steps that must be followed in order to get there (Taylor, Pham, Rivkin, & Armor, 1998; see also Cameron & Nicholls, 1998).

Efforts and Giving Up

Expectancies, no matter how they arise, have an important influence on behavior. If expectations are of success, the person renews effort. If expectations are of failure, the tendency is to disengage from effort and, potentially, from the goal itself. Thus, there is a great divide between these two classes of action. One set of responses involves continued efforts at moving forward, whereas the other set consists of disengagement and quitting (see also Klinger, 1975; Wortman & Brehm, 1975).

The notion that goals can vary in specificity also applies to expectancies (Armor & Taylor, 1998; Carver & Scheier, 1998). That is, expectancies also can range from the very general, to those about a particular domain of life, to the very concrete and specific. For example, a cardiac patient can be confident or doubtful about

regaining health and returning to work, about getting through another medical procedure, or about being able to climb a flight of stairs.

Which expectancies matter in what circumstances? Although the answer isn't entirely clear, we would venture to say that probably all of them matter. Expectancy-based theories often hold that behavior is best predicted when the specificity of the expectancy matches that of the behavior. Other times it is argued that prediction should take into account several levels of specificity. It also has been suggested that in novel and in multidetermined situations the person's generalized expectations are useful in predicting behavior and emotions (Scheier & Carver, 1985).

Generalized expectancies are those that pertain to very diverse outcomes. They pertain to both abstract and concrete goals. Hence, people who are generally optimistic believe that they will attain not just one higher-order goal but all of their higher-order goals, along with the subgoals that need to be attained to satisfy those higher-order goals.

OPTIMISM, PESSIMISM, AND REACTIONS TO HEALTH THREATS

The self-regulation model just reviewed has implications for understanding how people deal with threats to their health as well as experience positive health events such as the delivery of a healthy baby. Much of the research based on this model has focused on how variations in expectations influence adjustment when people confront health threats. The rationale behind this research runs as follows: Confronting adversity can create an eagerness to overcome the difficulties, or it can create doubts and giving up. Whether the person is optimistic or pessimistic affects what emotions follow. People who are optimistic should have a set of relatively positive feelings—even when things are difficult. People who are pessimistic should experience more negative feelings (Carver & Scheier, 1998; Scheier & Carver, 1992).

Although many individual difference variables might be invoked as determinants of the differences just described, the following review focuses on expectancies operationalized in terms of dispositional optimism, as described by Scheier & Carver (1985; see also Scheier, Carver, & Bridges, 1994). According to this perspective, persons high in optimism tend generally to expect positive outcomes

across various life domains. Persons who are dispositionally more pessimistic tend generally to expect outcomes that are more negative.

We should explicitly acknowledge that the review that we offer is not comprehensive, but it does provide a sense of the nature of the associations that have emerged involving optimism in the health domain. Our review includes, primarily, studies that measure psychological outcomes but a few that measure physical outcomes as well. All of the studies are prospective in nature.

Coronary Disease

Researchers have examined the effects of optimism on adjustment to the stress of heart disease and its treatment. One such study examined the effects of optimism on recovery in men undergoing and recovering from coronary artery bypass surgery (Scheier et al., 1989). Patients provided information at 3 points in time: (1) the day before surgery, (2) 6–8 days after the surgery, and (3) 6 months postsurgery. Questionnaires assessed their mood, reactions to surgery, coping strategies, and quality of life. The researchers statistically controlled for medical factors, including extensiveness of patient's surgery, severity of the patient's underlying CAD, and patient's standing on the major risk factors for coronary heart disease. Before surgery, those scoring higher on optimism reported lower levels of hostility and depression than pessimists. One week after surgery, optimists reported more happiness, relief, and greater satisfaction with their medical care compared to pessimists. Optimists also reported greater satisfaction with support received from friends. At 6 months, optimists were significantly more likely to have returned to vigorous physical activity and more likely to have a higher quality of life than pessimists. In a 5-year follow-up of these patients, optimists reported greater quality of life and subjective well-being (described in Scheier & Carver, 1992).

Fitzgerald and colleagues (1993) conducted another study on quality of life and optimism after coronary bypass surgery. They collected information from 49 patients 1 month before and 8 months after surgery; they also controlled for disease severity. Optimists were less likely to report presurgical distress and were more likely to report postsurgical satisfaction with life. Additionally, optimism was associated with perceived control over the course of the illness. Optimism was not significantly related to health locus of control before

surgery. Finally, additional analyses revealed that dispositional optimism seems to have been funneled into a greater confidence about the outcome of the surgery and thus into satisfaction with life in general.

In a study of women undergoing coronary artery bypass surgery, King and colleagues (1998) also found optimism to be beneficial. They collected data at 1 week, and 1, 6, and 12 months postsurgery. Their findings suggest that optimism is associated with positive moods and life satisfaction and is inversely related to negative moods. Also, optimism assessed at Week 1 was related to more positive and less negative moods at 1 month. Finally, optimistic persons were more likely to accept their situation and were less likely to use escapism.

Similar beneficial effects of optimism have been observed in another study focused on patients recovering from coronary artery bypass surgery (Mahler & Kulik, 2000). In this study, optimism was assessed two to three days following surgery. Additional psychosocial measures were administered at the same point in time, and again at 1, 3, 6, and 12 months after hospital discharge. Optimism was significantly associated with less pain during the earliest assessed recovery periods.

A final study (Matthews, Raikkonen, Sutton-Tyrell, & Kuller, 2004) explored the effects of optimism on progression of carotid atherosclerosis. Healthy middle-aged women, who were enrolled in a larger ongoing study of cardiovascular risk factors, underwent two carotid ultrasound scans to measure intima media thickness (IMT), considered to be an early indicator of atherosclerosis, at 10 and 13 years after study enrollment. Over the 3-year period between scans, optimists were less likely than pessimists to have an increase in carotid IMT, even when statistically controlling for possible biological, lifestyle, and medication covariates. Indeed, those who were optimistic exhibited virtually no increase in IMT over the time period.

Cancer

Researchers also have studied optimism in the context of adjusting to the diagnosis and treatment of cancer. One early study explored adjustment to treatment for early-stage breast cancer (Carver et al., 1993). Patients were interviewed at the time of diagnosis, the day before surgery, 10 days after surgery, and at 3-, 6-, and 12-month

follow-ups. Optimism at the time of diagnosis inversely predicted distress over time, above and beyond the effect of medical variables and the effects of earlier distress. In other words, the prediction of distress at 3, 6, and 12 months after surgery was significant even after controlling for distress level at the prior assessment point. Thus, optimism predicted lower initial distress as well as resilience to distress during the year following surgery. Indeed, a follow-up study of these women (together with other women participating in other studies by the same research group) found that greater optimism predicted lower distress even at 5–13 years after treatment (Carver et al., 2005).

Another study examined emotional adjustment of breast cancer survivors (Trunzo & Pinto, 2003). Patients who had completed treatment within 1 year prior to the study were eligible to participate. Optimism and mood were assessed at baseline and 6- and 12-month follow-ups. At each measurement point, optimism was a negative predictor of mood disturbance, suggesting that optimists were less vulnerable to emotional distress.

Similar beneficial effects of optimism were demonstrated among a group of men receiving radiation therapy for prostate cancer (Johnson, 1996). Optimism was assessed prior to the first radiation treatment, and mood was assessed throughout the treatment period and at 2 weeks and 1 and 3 months following the end of treatment. Optimism was a strong predictor of patients' emotional responses both during and after treatment, with less optimistic patients being more likely to experience negative moods.

Other Health Contexts

Although the majority of research relating optimism to well-being has focused on heart disease and cancer, there also is research focusing on other health domains. The findings are consistent with those just reviewed. For instance, Taylor and colleagues (1992) studied optimism and adjustment among a sample of men at risk for developing Acquired Immunodeficiency Syndrome (AIDS). Greater optimism was associated with lower levels of subsequent distress.

Research linking optimism to positive health outcomes has not only focused on health threats. Other studies have examined the influence of optimism on adjustment in the context of reproductive

issues. Studies have had women complete measures of optimism and depression before and after childbirth (Carver & Gaines, 1987; Fontaine & Jones, 1997). In both studies, optimism predicted lower levels of depressed affect both during pregnancy and postpartum.

Similar points were made in a study that examined psychological adjustment of women during pregnancy (Park, Moore, Turner, & Adler, 1997). Women at their first prenatal visit were invited to participate. Optimism was assessed at this time, when the women were approximately 2 months pregnant. Several other measures were obtained during the 3rd trimester of pregnancy. Optimism during the initial months of pregnancy predicted less perceived stress, anxiety, and substance use during the 3rd trimester of pregnancy.

Another project studied prenatal psychosocial predictors of infant birth weight (Rini, Dunkel-Schetter, Wadhwa, & Sandman, 1999). In this study, women completed psychosocial measures during the 3rd trimester of their pregnancy; birth outcomes, such as gestational age at delivery and birth weight, were collected from medical charts after delivery. Women higher in optimism, mastery, and self-esteem gave birth to larger babies. These variables were significant predictors of birth weight even after controlling for psychosocial stress, length of gestation, marital status, maternal age, income, education, and ethnicity.

OPTIMISM, PESSIMISM, AND COPING

It is apparent that optimism is beneficial when people experience a threat to their health. That is, optimists experience better outcomes, such as less distress, compared to pessimists. Why do these differences exist? An idea from folklore and the popular media is that optimists are simply more cheerful than pessimists. This explanation is less plausible, though, when considering studies in which differences in distress emerged even when previous distress was statistically controlled. Another possibility that has gained substantial empirical support is that optimists and pessimists cope differently with adversity.

Space limitations prevent a thorough overview of the coping literature. However, we think it is important to provide brief consideration of how optimists and pessimists differ in the strategies they use to cope with health threats and to link those differences to the

differences in distress that have emerged. We reemphasize an important theme explored earlier: expectations play a pivotal role in behavioral responses to adversity. People who are confident about the future exert continuing effort, even when dealing with serious adversity. In contrast, people who are doubtful about the future tend to withdraw effort. They are more likely to pull away or try to escape the adversity by wishful thinking, and they are more likely to seek temporary distractions that don't help to solve the problem. Sometimes they even give up completely.

These differences in coping have been examined in a number of studies on optimism and distress, exploring whether differences in coping mediate differences in well-being. Many of the studies were conducted with cancer patients. For example, Stanton and Snider (1993) followed a group of women undergoing breast biopsy. Measures of optimism, mood, and coping were obtained the day before biopsy in all participants. Women who received a cancer diagnosis were then reassessed 24 hours before surgery and 3 weeks after surgery. Women with a benign diagnosis also completed a second assessment. Pessimists used more cognitive avoidance in coping with the upcoming diagnostic procedure than did optimists. This contributed to distress prior to biopsy and also predicted postbiopsy distress among women with positive diagnoses.

In a study described earlier (Carver et al., 1993), women diagnosed with early-stage breast cancer were followed for the 1st year after treatment. Optimism, coping (with the diagnosis of cancer), and mood were assessed the day before surgery. Coping and mood also were assessed 10 days postsurgery, and at three follow-ups during the next year. Both before and after surgery, optimism was associated with a pattern of reported coping strategies that involved accepting the reality of the situation, placing as positive a light on the situation as possible, trying to relieve the situation with humor, and (at presurgery) taking active steps to do whatever there was to be done. Pessimism was related to denial and behavioral disengagement (giving up) at each measurement point.

The differences in coping between optimists and pessimists also related to distress. Positive reframing, acceptance, and the use of humor were all inversely related to distress at pre- and postsurgery. Denial and behavioral disengagement were positively related to distress at all measurement points. At the 6-month follow-up, another kind of avoidance coping, self-distraction, was related positively to distress.

Findings indicated that the effect of optimism on distress was largely indirect through coping, particularly at post-surgery.

Research also has examined the link between coping and distress among patients undergoing coronary artery bypass surgery. One study assessed the use of attentional-cognitive strategies as ways of dealing with the stress produced by the surgery and recovery (Scheier et al., 1989). Prior to surgery, optimists were more likely than pessimists to report they were making plans for their future and setting goals for their recovery. Optimists also tended to report being less focused on their physical symptoms and their distress than pessimists. After surgery, optimists were more likely to seek out and request information about what the physician would be requiring of them in the months ahead (reflecting greater engagement in the recovery process). Finally, optimists were less likely to report trying to suppress thoughts about their physical symptoms. Further analyses revealed that the positive impact of optimism on quality of life 6 months postsurgery occurred partly through the indirect effect on differences in coping.

The study of women undergoing coronary artery bypass surgery described earlier (King et al., 1998) also examined coping. Optimists displayed more positive thinking during the week following surgery, engaged in more attempts at finding meaning at 1 month, and employed less escapism at 12 months. Finding meaning and escapism partially explained the relation between optimism and negative mood.

Finally, in the study concerning maternal adjustment to pregnancy (Park et al., 1997), optimists had higher scores than pessimists on a measure of constructive thinking. That is, they gave evidence of thinking about and solving daily problems in an effective way. Optimism and constructive thinking also correlated negatively with later anxiety and positively with later positive states of mind. Further, the link between optimism and each of these markers of psychological adjustment was mediated through the tendency of optimists to engage in constructive or problem-focused thinking.

The research reviewed here indicates that optimists tend to use more problem-focused coping strategies than do pessimists, and when problem-focused coping is not feasible, optimists turn to adaptive emotion-focused strategies (i.e., acceptance, humor, positive reframing). Pessimists tend to use such strategies as overt denial and mental and behavioral disengagement from the goals with which the

stressor is interfering. Furthermore, the findings are consistent with the idea that these differences in coping are at least partially responsible for differences in emotional well-being, and, possibly, physical well-being, between optimists and pessimists. The findings thus implicate elements of self-regulation models in coping with chronic illness and other threats to physical health.

While the literature generally seems to indicate that active coping and persistence are good for a person's emotional well-being and that the use of denial and avoidance strategies are detrimental, we wonder if this is *always* the case. Some goals are simply unattainable. It seems reasonable that disengaging from such goals may be beneficial in effective self-regulation. Certainly, an important area for future research is to consider the possibility that giving up might not always be bad and that persisting might not always be good. In the next section, we shift our focus and consider more carefully the self-regulatory processes that are involved in the holding on and letting go of goals.

GOAL ADJUSTMENT AND QUALITY OF LIFE

Clearly, people sometimes experience difficulty with goal attainment. In many situations, such difficulty can be overcome if a person invests more effort, strengthens the psychological commitment toward, or finds an alternative path to realizing the threatened goal (e.g., Bandura, 1997; Heckhausen & Schulz, 1995). At times, however, it may not be possible to make further progress towards a desired goal because the goal itself is unattainable.

Goals may be unattainable for different reasons. For example, a person may select an unrealistic goal that will never be attained (e.g., a 57-year old man becoming a quarterback in the NFL). In addition, goals that were realistic and attainable at some point in a person's life may become unattainable over time. This may be caused by the occurrence of critical life events or age-related declines in the opportunities to attain a goal. For example, an accident, unemployment, or growing older may render impossible the pursuit of a given goal—for example, staying in good health, buying a house, or having your own children. Finally, there are situations in which a person can no longer pursue a goal because the person needs to focus time and energy on the pursuit of other more important and resource-intensive goals. For example, a person may not be able to pursue

valuable leisure goals any longer (e.g., seeing friends, going to the movies, exercising), because he or she has to invest all available time and energy in the pursuit of certain higher-order goals (e.g., establishing a career, taking care of a sick child; Wrosch, Scheier, Carver, & Schulz, 2003).

Independent of the specific reasons for goal constraints, having an unattainable goal creates problems. A person who cannot make progress toward a desired goal is likely to experience declines in subjective well-being (Carver & Scheier, 1990). In addition, the negative psychological consequences resulting from the experience of unattainable goals may further influence a person's physical health (Wrosch, Miller, Scheier, & Brun de Pontet, 2005). Research indicates that low levels of subjective well-being can modify biological processes in the endocrine and immune systems in ways that increase vulnerability to disease (Heim, Ehlert, & Hellhammer, 2000; Segerstrom & Miller, 2004). It can also relate to a variety of self-reported health problems (e.g., constipation or asthma; Afari, Schmalzing, Barnhart, & Buchwald, 2001; Garvey, Noyes, & Yates, 1990), including rendering people more susceptible to the common cold (Cohen, Doyle, Turner, Alper, & Skoner, 2003). Thus, having unattainable goals may compromise not only people's subjective well-being but also their physical health.

We have argued that people can avoid the negative psychological and physical consequences resulting from the experience of unattainable goals if they engage in adaptive self-regulation (Carver & Scheier, 1990; Wrosch et al., 2003, 2005). More specifically, people thrive if they can adjust their goals in situations where prior goals have become unattainable. We suggest that goal adjustment involves two processes. First, we propose that a person needs to disengage from the unattainable goal. To disengage successfully, he or she needs to withdraw effort and commitment from pursuing that goal (Wrosch, Scheier, Miller, et al., 2003). Goal disengagement should be adaptive because it removes the person from the negative emotional consequences of repeated goal failure (for beneficial effects of disengagement, see also Brandtstädter & Renner, 1990; Carver & Scheier, 1990, 1998; Heckhausen & Schulz, 1995; Klingler, 1975; Nesse, 2000). Second, we suggest that this person needs to reengage goal-directed efforts elsewhere. To reengage successfully, a person needs to identify, commit to, and start to pursue alternative goals (Wrosch, Scheier, Miller, & Carver, 2003). Goal reengagement

should help a person maintain a sense of purpose in life and buffer the negative emotions associated with the inability to make progress towards a desired goal.

In support of this argument, research has shown that abandoning unattainable goals may help preserve a person's subjective well-being (see research on parents of handicapped children, partnership separation, or women who were past the age for having their own children, Heckhausen, Wrosch, & Fleeson, 2001; Tunali & Power, 1993; Wrosch & Heckhausen, 1999, respectively). Although these studies document that abandoning unattainable goals can be adaptive, it is important to note that the work has focused on very specific, concrete goals. However, people doubtlessly also vary more generally in their ability to adjust to unattainable goals.

We have argued for the existence of such individual differences in people's general goal-adjustment tendencies. We have further proposed that such individual differences can predict a person's quality of life (Wrosch, Scheier, et al., 2003; Wrosch, Miller, et al., 2005). Stated differently, some people might have an easier time disengaging from unattainable goals and reengaging in alternative goals than other people, regardless of the specific nature of the goals in question. People who are better able to abandon unattainable goals and to reengage in other meaningful activities should experience greater subjective well-being and better physical health than people who have a more difficult time adjusting to their unattainable goals.

To start examining the influence of goal-adjustment tendencies on quality of life, we developed a self-report instrument (Wrosch, Scheier, Miller, et al., 2003), with 10 items that measure how people usually react if they have to stop pursuing an important goal. Four items measure the tendency to disengage from unattainable goals (e.g., "It's easy for me to reduce my effort towards the goal") and six items measure the tendency to reengage in other new goals (e.g., "I start working on other new goals"). These scales have shown predictive validity in a number of studies (Wrosch, Scheier, Miller, et al., 2003; Wrosch et al., 2005). Notably, the effects of this variable have been statistically independent of other coping constructs (e.g., assimilation and accommodation; Brandtstädter & Renner, 1990) and the personality traits of the Five-Factor Model (Goldberg, 1992). This supports the premise that individual differences in goal adjustment are a meaningful and independent predictor of quality of life.

A first set of studies addressed the influence of goal disengagement and goal reengagement on indicators of subjective well-being. One study examined undergraduate students making the transition to college (Wrosch, Scheier, Miller, et al., 2003, Study 1). As this transition involves multiple potential losses such as leaving friends and family and an increased potential for failure experiences related to academic pursuits, students often find that some of their previously valued goals have become unattainable. This study showed that a capacity to withdraw effort and commitment from unattainable goals related to lower levels of perceived stress and intrusive thoughts and high levels of self-mastery. In addition, students who were able to reengage in alternative goals reported lower levels of perceived stress and intrusive thoughts as well as higher levels of purpose in life and self-mastery. Further, there was an interaction between goal disengagement and goal reengagement in predicting indicators of subjective well-being. Among students who reported difficulty disengaging from unattainable goals, those with a higher capacity to reengage reported greater self-mastery and less perceived stress than those less able to reengage. This pattern suggests that goal reengagement can buffer the negative effects of inability to disengage on subjective well-being.

Another study examined goal adjustment in an inescapable situation that could be expected to constrain important life goals (Wrosch, Scheier, Miller, et al., 2003, Study 3). Parents of physically healthy children were compared with parents of children who had been diagnosed with cancer. It was expected that the parents whose children had been diagnosed with cancer might have to redefine how they evaluated success in life. In such a situation, goal disengagement and goal reengagement may be very important since the parents are forced to abandon certain goals and plans they had for themselves and their families in order to direct resources to this immediate challenge (e.g., giving up on career goals to spend more time with the sick children). In support of our reasoning, goal disengagement and goal reengagement tendencies were associated with fewer depressive symptoms, particularly among parents of children with cancer (Wrosch, Scheier, Miller, et al., 2003). In fact, among those parents of children with cancer who were better able to adjust to unattainable goals, depression scores were almost as low as the scores of parents of healthy children. These results support the idea that goal-adjustment tendencies become particularly important in regulating

well-being in the midst of stressors that are likely to interfere with established goal-directed activities.

Related research by the Leventhals and their colleagues (H. Duke, Leventhal, Brownlee, & E. Leventhal, 2002) has also documented the beneficial effects of goal reengagement. They studied a group of older adults, some of whom were having to abandon their physical activities because of health-related problems. Persons who replaced lost activities with new activities had higher positive affect one year after the onset of their illness than those who did not replace the activities. Interestingly, the tendency to replace lost activities was facilitated by social support and dispositional optimism.

In another recent study, Bauer and Wrosch (2004) examined the association between unattainable goals, goal adjustment tendencies, and subjective well-being in a sample of adults. The participants were asked to report all the goals that were important to them and that became unattainable during the past 5 years. Unattainable goals turned out to be a common experience. On average, participants reported almost five goals that had become unattainable over the past 5 years. In addition, a higher frequency of unattainable goals exerted a cumulative effect on subjective well-being: as the number of unattainable goals increased, individuals reported lower levels of well-being. The study further found a significant interaction effect between one's capacity to disengage and the frequency of unattainable goals on indicators of well-being. More specifically, having a high number of unattainable goals related to higher levels of perceived stress, depressive symptoms, and negative affect, but only among those individuals who experienced difficulty disengaging from unattainable goals.

Another set of studies examined whether goal-adjustment tendencies can also influence indicators of physical health. To start examining this hypothesis, in a heterogeneous and cross-sectional study of adults, we related the number of reported physical health problems (e.g., eczema, migraine headaches, constipation) to participants' goal disengagement and goal reengagement tendencies (Wrosch et al., 2005, Study 1). Participants who were better able to let go of unattainable goals reported fewer health problems than those who had more difficulty disengaging from unattainable goals. Goal reengagement, by contrast, did not relate to physical health problems. The results were also consistent with the assumption, noted earlier, that subjective well-being can mediate the link between goal adjustment

and physical health. Adaptive goal disengagement related to lower levels of depressive symptoms and depressive symptoms predicted participants' physical health problems. Importantly, when the effect of goal disengagement on physical health was controlled for depressive symptomatology, goal disengagement no longer significantly predicted participants' physical health problems.

The associations between goal adjustment tendencies and physical health were further examined in another sample of adults (Wrosch et al., 2005, Study 2). This study included an assessment of participants' diurnal rhythm of cortisol secretion, a biological process that is widely thought to be a "gateway" through which distress increases vulnerability to medical illness. Persons facing severe and long-term stressors exhibit a flattened diurnal rhythm, characterized by low morning output and/or the failure to reduce secretion as the day progresses (e.g., Heim et al., 2000; Miller, Cohen, & Ritchey, 2002). There is also evidence that flattened diurnal cortisol rhythms are prognostic of severe physical health outcomes (Heim et al., 2000; Sephton, Sapolsky, Kraemer, & Spiegel, 2000; Smyth et al., 1997). On the basis of these findings, we expected that participants who are better able to let go of unattainable goals and reengage in alternative goals would show a more normative (i.e., steeper) slope in diurnal cortisol secretion than those who have more difficulties adjusting to unattainable goals.

The results partly confirmed our hypotheses. Adaptive goal-disengagement tendencies were tied to a steeper slope of cortisol secretion over the day. As in the previously discussed study, goal reengagement did not relate to indicators of physical health. Further analyses found that differences in cortisol secretion as a function of goal disengagement occurred in the day and evening hours and not the morning hours. Our theoretical perspective holds that individual differences in goal adjustment tendencies should be particularly influential when people confront unattainable goals. Thus, it is not surprising that the influence of these tendencies is not large during the early morning hours before people start their normal activities. As the day progresses, however, and people try to do what they set out to do, they may encounter situations in which goal attainment is difficult or impossible. Thus, unattainable goals are more likely to emerge later in the day, and differences in goal-disengagement tendencies become important only then.

The hypothesis that goal adjustment can predict indicators of physical health was further tested in a longitudinal design, following a group of college students over the course of a semester (Wrosch et al., 2005, Study 3). The study assessed goal adjustment tendencies at the beginning of the term and predicted self-reported physical health indicators (e.g., health symptoms, cold symptoms, sleep problems) at the end of the term. In addition, emotional well-being and life satisfaction were measured at the beginning and the end of the semester. Consistent with the previous studies, adaptive goal-disengagement tendencies were associated with fewer health symptoms and better sleep efficiency at the end of the semester. In addition, there was evidence of a buffer effect of goal reengagement, in that goal reengagement reduced the negative consequences of failure to disengage on participants' cold symptoms. Finally, the study provided further support for the mediating role of subjective well-being. Adaptive goal-disengagement tendencies related to fewer declines in emotional well-being across the course of the semester, and the effects of goal disengagement on changes in emotional well-being statistically explained the associations between goal disengagement and indicators of physical health.

Together, these studies demonstrate that individual differences in goal-disengagement and goal-reengagement tendencies can influence a person's quality of life. People who are better able to disengage from unattainable goals and reengage in alternative goals report higher levels of subjective well-being than people who have more difficulty adjusting their unattainable goals. In addition, the studies show that adaptive goal-disengagement tendencies are tied to high levels of physical health. Further, goal-reengagement tendencies may buffer the negative effects on physical health of failure in goal disengagement. Finally, the studies suggest that the associations between goal-adjustment tendencies and physical health can be partly explained by individual differences in subjective well-being.

PUTTING THINGS TOGETHER (A BIT): OPTIMISM AND GOAL ADJUSTMENT

In conducting our research on goal disengagement processes, we have not been terribly concerned about tying that work on disengagement to our other line of work (reviewed previously) on

optimism and pessimism. Rather, we have been more concerned about documenting that disengagement from goals that are perceived as unattainable can be beneficial. In spite of the relative independence of these two lines of work to date, we do have some thoughts and a little data regarding the potential interplay between optimism and goal-adjustment processes.

How might optimism and goal adjustment be linked? Although we think that optimism and goal adjustment are separate facets of an individual's personality, it is reasonable to assume that there may be associations between both constructs. For example, people who generally have an easier time adjusting to unattainable goals may be more optimistic about their future because they know that they are capable of managing difficulties and creating new purpose in life. Alternatively, optimists may be better able than pessimists to adjust unattainable goals because they expect good things to happen in the future and may recognize more easily valuable alternatives that can replace a goal that has become unattainable.

Although the evidence is somewhat scanty, the evidence that does exist suggests that optimism may, in fact, be linked to certain aspects of goal-adjustment processes. For example, research by Duke et al. (2002) suggests that optimism may be implicated in the ability to reengage in substitute goals. In a similar vein, Aspinwall and Richter (1999) have shown that viable alternatives facilitate faster disengagement from unsolvable tasks among optimists but not among pessimists.

Our own data drawn from a sample of 115 college students support the findings by others by demonstrating a significant correlation between optimism and goal reengagement but not between optimism and goal disengagement (a finding that we replicated on an additional, independent sample of 488 college students). These findings suggest that optimists have an easier time identifying and engaging in new goals than pessimists. Subsequent analyses in the first sample of undergraduates also showed that optimism was associated higher levels of subjective well-being, explaining 15% of the variance in purpose of life. However, if taking goal-reengagement tendencies into account, 60% of the effect of optimism on purpose in life (i.e., 9% of the 15%) could be explained by individual differences in goal reengagement tendencies. These results indicate that the beneficial effects of optimism on a person's quality of life may, in part, be due to the ability of optimists (compared to pessimists) to reengage in

new activities when valuable goals have become unattainable. While more research is being conducted, future work should focus on exploring dispositional optimism and the dual aspects of goal adjustment along with the possible influences of these variables on psychological and physical well-being.

CONCLUDING COMMENT

The purpose of this article was to explore implications of self-regulatory models of human action for understanding how people deal with threats to their health and well-being. We focused on how specific aspects of a general behavioral self-regulation model—variations in positive and negative expectations—are reflected in a line of research on psychological and physical responses to several different types of health problems and illness threats. We then explored a second line of work examining the importance of goal adjustment on physical and psychological well-being. From the research reviewed, it is apparent that both dispositional optimism and goal adjustment are important for general subjective well-being and psychological adjustment. Positive expectations and goal adjustment play a role in determining physical health as well. Although research tying these two areas together has only recently begun, the available data suggests that optimists tend to reengage in new goals when other valued goals have become unattainable. Future investigations should further examine the relations between optimism and goal adjustment, as well as how these processes influence mental and physical health. Such research will enrich our understanding of the processes involved in adaptive self-regulation.

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