

Goals and Emotion

Charles S. Carver and Michael F. Scheier

Not so very long ago, emotions were considered mysterious and irrational, aspects of the human experience that were outside the domain of logic or understanding. Today, emotions are seen instead to serve critical functions in the elaborate enterprise of negotiating a world that is both alluring and dangerous. Without emotions, that world would seem neither dangerous, nor alluring, nor satisfying.

This chapter describes a viewpoint in which emotions are intimately connected to other aspects of a systematic network of influences on behavior. This view of behavior is grounded in the common-sense goal concept, but with a bit of a twist. In this view, goals are seen as embedded in self-regulating systems of a particular kind. The systems act to regulate people's actions with respect to diverse kinds of goals (e.g., values, plans, strategies, intentions, and even whims), so that life's incentives are successfully approached and threats successfully avoided.

The viewpoint we take on self-regulation is one in which behavior reflects the outputs of feedback control processes. We propose that two layers of control manage two different aspects of behavior, jointly situating behavior in time as well as space. We argue that one of these layers is responsible for the existence of affect, the evaluative core

of emotions. We argue further that such an arrangement is useful both for the attainment of a single goal and for the handling of a life space in which multiple tasks compete for attention. More specifically, the system described in this chapter can help transform simultaneous concerns with many different goals into a stream of actions that shifts repeatedly from one goal to another over time.

Behavior as Goal Directed and Feedback Controlled

We begin by briefly describing a feedback-based view of action control, starting with the goal concept. The goal concept is prominent in today's psychology, under a wide variety of names (Austin & Vancouver, 1996; Elliot, 2008; Johnson, Chang, & Lord, 2006). The concept is broad enough to cover both long-term aspirations (e.g., creating and maintaining a good impression among colleagues) and the end points of very short-term acts (e.g., reaching to pick up a water glass without knocking it over). Goals generally can be reached in diverse ways, and a given action often can be done in the service of diverse goals—resulting in, potentially, vast complexity in the organization of action.

The goal concept has acquired a considerable foothold in personality psychology. People who think about goals as an organizing construct tend to assume that understanding a person means understanding that person's goals—indeed, that the substance of the self consists partly of the person's abstract goals and the organization among them (cf. Mischel & Shoda, 1995).

Feedback Loops

Our main point in this section actually is less about goals themselves than about the process of attaining them. Long ago we adopted the view that movement toward a goal reflects the functioning of a discrepancy-reducing feedback loop (MacKay, 1966; Miller, Galanter, & Pribram, 1960; Powers, 1973; Wiener, 1948). Such a loop involves the sensing of some present condition, which is compared to a desired or intended condition (as a reference value). If there is a discrepancy between the two, the discrepancy is countered by subsequent action to change the sensed condition. The overall effect of such an arrangement is to bring the sensed condition into conformity with the intended one (Powers, 1973). If the intended condition is thought of as a goal, the overall effect is to bring behavior into conformity to the goal—thus, goal attainment.

There also exist discrepancy-enlarging loops, which increase deviations from the comparison point rather than decrease them. The value in this case is a threat, an “anti-goal.” Effects of discrepancy enlargement in living systems are typically constrained by discrepancy-reducing processes. Thus, for example, people often are able to avoid something aversive by the very act of approaching something else. Such dual influence occurs in instances of what is called *active avoidance*: An organism fleeing a threat spots a relatively safe location and approaches it.

People sometimes infer from descriptions such as the preceding one that feedback loops act only to create and maintain steady states and are therefore irrelevant to behavior. In reality, some reference values (and goals) are static, but others are dynamic (e.g., taking a vacation trip across Europe, raising children to be good citizens). In the latter cases, the goal is the process of tra-

versing the changing trajectory of the activity, not just the arrival at the end point. The principle of feedback control applies easily to moving targets (Beer, 1995).

We bring to the conversation about goals (although we are not the first to have done so by any means) the idea that goal-directed action involves feedback control. Why this emphasis on feedback control? Many think of feedback as an engineering concept (engineers do use it), but the concept has older roots in physiology and other fields. Homeostasis, the processes by which the body self-regulates physical parameters such as temperature, blood sugar, and heart rate, is the prototypic feedback process (Cannon, 1932). The concept has been useful enough in many fields that it is sometimes suggested that feedback processes are some of the fundamental building blocks of all complex systems.

We believe there is merit in recognizing functional similarities between the processes that underlie behavior and those underlying other complex systems (cf. Ford, 1987; von Bertalanffy, 1968). Nature appears to be a miser and a recycler. It seems likely that an organizational property that emerges in one complex system will emerge over and over in other complex systems. For the same reason, it seems likely that principles embodied in physical movement control (which also rely, in part, on principles of feedback) have something in common with principles embodied in higher mental functions (Rosenbaum, Carlson, & Gilmore, 2001). For these reasons, we have continued to use the principle of feedback control as a conceptual heuristic over the years.

Levels of Abstraction

A couple more points about goals: The goal concept can seem a bit overwhelming because of the fact that goals exist at many levels of abstraction. You can have the goal of being socially responsible, but you can also have the goal of conserving resources—a more restricted goal that contributes to being socially responsible. One way to conserve resources is the process of recycling. Recycling entails other, more concrete goals: placing newspapers and empty bottles into containers and moving them to a pickup location. All of these are goals, val-

ues to be approached, but they exist at varying levels of abstraction.

It is often said that people's goals form a hierarchy (Powers, 1973; Vallacher & Wegner, 1987), in which abstract goals are achieved by attaining the concrete goals that help define them. Lower-level goals are attained by briefer sequences of action (formed from subcomponents of motor control; e.g., Rosenbaum, Meulenbroek, Vaughan, & Jansen, 2001). Some sequences of action have a self-contained quality, in that they run off fairly autonomously once triggered.

Viewed from the other direction, sequences can be organized into programs of action (Powers, 1973). Programs are more planful than sequences and require choices at various points. Programs, in turn, are sometimes (though not always) enacted in the service of principles—more abstract values that provide a basis for making decisions within programs and which suggest that certain programs be undertaken or not. What Powers (1973) called *principles* are roughly equivalent to what social psychologists call *values* (Schwartz & Bilsky, 1990; Schwartz & Rubel, 2005). Even that is not the end of potential complexity, though. Patterns of values can coalesce to form a very abstract sense of desired (and undesired) self or a sense of desired (and undesired) community.

All these classes of goals, from very concrete to very abstract, can in principle serve as reference points for self-regulation. When self-regulation is undertaken regarding a goal at one level, control presumably is simultaneously invoked at all levels of abstraction below that one. Control is not necessarily exerted at higher levels than that one, however. Indeed, it is even possible for a person to knowingly take an action that turns out to conflict with a higher-level goal, which creates problems when the person later thinks about that higher goal. This is an issue that can be very important in certain contexts, but it is outside the focus of this chapter.

Feedback Processes and Affect

Control of action provides a jumping-off point for addressing the focal concern of this chapter, which is affect or emotion. Two

fundamental questions about affect are what it consists of and where it comes from. It is often said that affect pertains to one's desires and whether they are being met (e.g., Clore, 1994; Frijda, 1986, 1988; Ortony, Clore, & Collins, 1988). But what exactly is the internal mechanism by which affect arises?

Some address this question at a neurobiological level, others at a cognitive level. We have proposed an answer that is neither of these, though we believe it to be compatible with both of them. The answer we posed (Carver & Scheier, 1990, 1998, 1999a, 1999b) focuses on some of the functional properties that affect seems to display in the person who experiences it. We used feedback control again as an organizing principle, but applied it somewhat differently than in the foregoing description. We suggested that the feeling properties that represent the core of emotions emerge from a feedback process that runs automatically, simultaneously with the behavior-guiding process, and in parallel to it. The easiest way to convey the sense of this second process is to say that it is checking on how well the first process (the behavior loop) is doing at reducing *its* discrepancies (we focus first on approach loops, then consider avoidance loops). Thus, the input for the second loop is some representation of the *rate of discrepancy reduction in the action system over time*.

An analogy may be useful. An action implies a change between states. Change in state is distance. Thus, behavior is analogous to distance. If the action loop controls distance, and if the affect loop assesses the action loop's progress, then the affect loop is assessing the psychological analogue of velocity, the first derivative of distance over time. To the extent that this analogy is meaningful, the perceptual input to the affect loop should be the first derivative over time of the input used by the action loop.

Input per se does not create affect (a given rate of progress has different affective implications in different circumstances). We believe that, as in any feedback system, this input is compared to a reference value (cf. Frijda, 1986, 1988). In this case, the reference is an acceptable or desired or intended rate of behavioral discrepancy reduction. As in other feedback loops, the comparison checks for deviation from the standard. If there is one, the output function changes.

We propose that the comparison in this loop yields an error signal (a representation of the discrepancy), which is manifested subjectively as affect—positive or negative valence. If the sensed rate of progress is below the criterion, affect is negative. If the rate is high enough to exceed the criterion, affect is positive. If the rate is not distinguishable from the criterion, affect is neutral. In essence, the argument is that feelings with a positive valence mean you are doing better at something than you need to, and feelings with a negative valence mean you are doing worse than you need to (for details, see Carver & Scheier, 1998, Chs. 8 and 9).

One implication of this line of thought is that, for any given goal-directed action, the potential for affective valence should form a bipolar dimension. That is, for any given action, affect can be positive, neutral, or negative, depending on how well or poorly the action is going. This is a point with several implications, to be addressed later.

What determines the criterion for this loop? When the activity is unfamiliar, the criterion is rather arbitrary and tentative. In those cases it is likely to shift easily. If the activity is familiar, the criterion is likely to reflect the person's accumulated experience, in the form of an expected rate (indeed, the more experience you have, the more you know what is reasonable to expect). Sometimes the criterion is a "desired" or "needed" rate of progress. Whether it is an expected rate or a desired rate doubtlessly depends on the context.

The criterion can also change, a phenomenon identified with the term *hedonic treadmill* (Brickman & Campbell, 1971). How fast the criterion changes depends on additional factors. The less experience the person has in a domain, the more fluid the criterion is likely to be; in a familiar domain, change is slower. Still, repeated overshoot of the criterion automatically yields an upward drift of the criterion (e.g., Eidelman & Biernat, 2007); repeated undershoots yield a downward drift. Thus, the system recalibrates over repeated experience in such a way that the criterion stays somewhere within the range of those experiences (Carver & Scheier, 2000). An ironic effect of recalibration would be to keep the balance of a person's affective experience in a given domain (positive to negative) relatively similar across

time, even when the rate criterion changes considerably.

Evidence

Evidence of the role of the velocity function in affective reactions to situations comes from several sources (see also Carver & Scheier, 1998). Initial support came from research by Hsee and Abelson (1991), who came to the velocity hypothesis independently. In one study, participants read descriptions of paired hypothetical scenarios and indicated which they would find more satisfying. For example, they chose whether they would be more satisfied if their class standing had gone from the 30th percentile to the 70th over the past 6 weeks, or if it had done so over the past 3 weeks. Given positive outcomes, they preferred improving to a high outcome over a constant high outcome; they preferred a fast velocity over a slow one; and they preferred fast small changes to slower larger changes. When the change was negative (e.g., salaries got worse), they preferred a constant low salary to a salary that started high and fell to the same low level; they preferred slow falls to fast falls; and they preferred large slow falls to small fast falls.

A later study conceptually replicated aspects of these findings, but with an event that was personally experienced rather than hypothetical (Lawrence, Carver, & Scheier, 2002). Success feedback was manipulated on an ambiguous task over an extended period. Subjects in a neutral condition received feedback of 50% correct on the first and last block, and 50% average across all blocks. Others experienced a positive change in performance, starting poorly and gradually improving to 50%. Others experienced a negative change, starting well and gradually worsening to 50%. The patterns of feedback thus converged, such that feedback on block 6 was identical for all subjects at 50% correct. All rated their mood before starting and again after block 6 (which they did not know ended the session). Those whose performances were improving reported mood improvement, those whose performances were deteriorating reported mood deterioration, compared to those with a constant performance.

Another early study that appears to bear on this view of affect, although not hav-

ing this purpose in mind, was reported by Brunstein (1993). It examined subjective well-being among college students over the course of an academic term, as a function of several perceptions, including perception of progress toward goals. Of greatest interest at present, perceived progress at each measurement point was strongly correlated with concurrent well-being.

More recently, Chang, Johnson, and Lord (2010) reported another pair of studies on this topic. The first was a field study of employees' job satisfaction. Participants rated various aspects of their current jobs with respect to existing and desired job characteristics. They also rated their perceptions of how quickly each job characteristic was changing to more closely approximate the ideal, and they rated the desired velocity of change for each job characteristic. Results indicated that velocity considerations play an important role in participants' job satisfaction. In a second study using a laboratory study, Chang and colleagues found that satisfaction with task performance was similarly affected by perceptions of velocity toward their performance goal.

Convergent Evidence

The plausibility of the general line of reasoning behind this theoretical model is indirectly supported by two other lines of work, one from neuropsychology and one from neurobiology. One of them concerns the existence of timing devices in the nervous system. Our view is predicated on the existence of an ability to assess change over time. Doing so requires some representation of time. Neural structures clearly do exist that represent time in some manner (e.g., Handy, Gazzaniga, & Ivry, 2003; Ivry & Richardson, 2002; Ivry & Spencer, 2004).

A second source of indirect support concerns consequences of the detection of discrepancies between actual and expected events. Our affect model rests on the assumption that discrepancies above and below a velocity criterion are detected. Recent reviews of dopamine function appear to point to an analogous function. Specifically, dopaminergic neurons respond to rewards that are expected; they respond even more intensely to unexpected rewards; and their responses diminish when a reward that

is expected fails to occur (Schultz, 2000, 2006). This pattern of response appears to indicate that dopamine neurons are involved in detecting when things are going better than expected or worse than expected (see also Holroyd & Coles, 2002). Though the evidence regarding dopamine is not directly supportive of our theory (which deals with progress rather than outcome), the pattern has a very strong parallelism to it.

Two Kinds of Behavioral Loops, Two Dimensions of Affect

The preceding discussion focused exclusively on discrepancy-reducing loops. Now consider discrepancy-enlarging loops. The view just outlined rests on the idea that positive feeling results when an action system is making rapid progress in *doing what it is organized to do*. There is no obvious reason why this principle should not also apply to systems that enlarge discrepancies. If that kind of a system is making rapid progress doing what it is organized to do, there should be positive affect. If it is doing poorly, there should be negative affect.

The idea that affects of both valences can potentially occur would seem comparable across both approach and avoidance systems. That is, both approach and avoidance have the potential to induce positive feelings (by doing well), and the potential to induce negative feelings (by doing poorly). But doing well at *approaching an incentive* is not quite the same experience as doing well at moving *away from a threat*. Thus, the two positives may not be quite the same, nor may the two negatives.

Based on this line of thought, and drawing as well on insights from Higgins (e.g., 1987, 1996) and his collaborators, we assume two sets of affects, one relating to approach, the other to avoidance (Carver & Scheier, 1998). The former reflect doing well versus poorly at gaining an incentive; the latter reflect doing well versus poorly at avoiding a threat. Thus, approach can lead to such positive affects as eagerness, excitement, and elation, and to such negative affects as frustration, anger, and sadness (Carver, 2004; Carver & Harmon-Jones, 2009a). Avoidance can lead to such positive affects as relief and contentment (Carver, 2009) and such negative affects as fear, guilt, and anxiety (for

application of this view to social relations, see Laurenceau, Troy, & Carver, 2005). The two sets of affects are assumed to have independent origins (see Figure 10.1). Given the fact that approach and avoidance functions can be engaged simultaneously, however, the affects that people subjectively experience are not always purely one or the other.

The view shown in Figure 10.1 is similar to the view proposed for different reasons by Rolls. Rolls's (1999, 2005) theory starts with reinforcement contingencies, identifying emotions in terms of the occurrence of reinforcers and punishers and the omission or termination of reinforcers and punishers. Consistent with our view, Rolls differentiated between the occurrence of a punisher (which yields fear) and the omission of a reinforcer (which yields frustration and anger). Similarly, he distinguished between the occurrence of a reinforcer (which yields elation) and the omission of a punisher (which yields relief).

Merging Affect and Action

The two-layered viewpoint described in the preceding sections implies a natural link between affect and action. If the input function of the affect loop is a sensed rate of progress in action, the output function must involve a change in rate of that action. Thus, the affect loop has a direct influence on what occurs in the action loop.

Some changes in rate output are straightforward. If you are lagging behind, you push harder (Brehm & Self, 1989; Wright, 1996). Sometimes the changes are less straightforward. The rates of many "behaviors" are defined not by pace or intensity of physical action but by choices among actions or entire programs of action. For example, increasing the rate of progress on a work project may mean choosing to spend a weekend working on it rather than camping. Increasing your rate of kindness means choosing to do an action that reflects that value when an opportunity arises. Thus, adjustment in rate must often be translated into other terms, such as concentration or allocation of time and effort.

The idea of two feedback systems functioning in concert with one another is something we more or less stumbled onto. It turns out, however, that such an arrangement is common in control engineering (e.g., Clark, 1996). Engineers have long recognized that having two feedback systems functioning together—one controlling position, one controlling velocity—permits the device in which they are embedded to respond in a way that is both quick and stable, without overshoots and oscillations (Carver & Scheier, 1998, pp. 144–145).

The combination of quickness and stability is valuable in the kinds of devices with which engineers deal, but its value is not limited to such artificial devices. A person

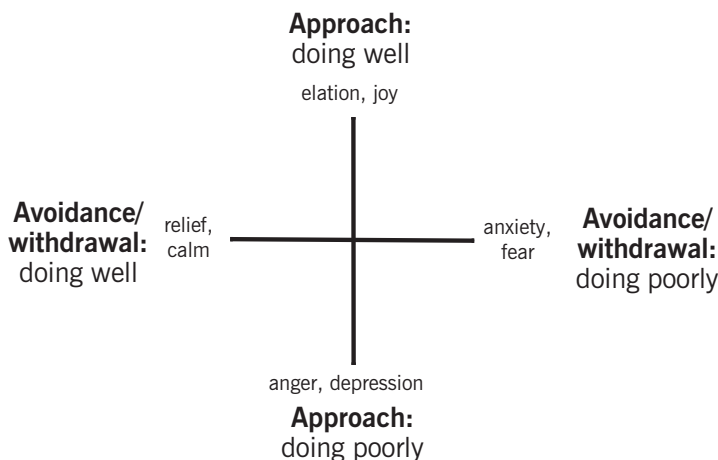


FIGURE 10.1. Carver and Scheier's (1998) view of two orthogonal dimensions of self-regulatory function and examples of the affects that can emerge from them.

who is highly reactive emotionally is prone to overreact to experiences and to oscillate behaviorally. A person who is emotionally unreactive is slow to respond even to urgent events. A person whose reactions are between these two extremes responds quickly but without undue overreaction and consequent oscillation.

For biological entities, being able to respond quickly yet accurately confers a clear adaptive advantage. We believe that the possibility of having the combination of quick and stable responding is a consequence of having both behavior-managing and affect-managing control systems. Affect causes people's responses to be quicker (because this control system is time-sensitive) and, provided that the affective system is not overresponsive, the responses are also stable.

Our focus here is on how affects influence behavior, emphasizing the extent to which they are interwoven. Note, however, that the behavioral responses that are related to the affects also lead to a *reduction of the affects*. Thus, in a very basic sense, the affect system is itself self-regulating (cf. Campos, Frankel, & Camras, 2004). Certainly people also make voluntary efforts to regulate emotions (Gross, 2007), but the affect system does a good deal of that self-regulation on its own. Indeed, if the affect system is optimally responsive, affect will generally not be intense, because the relevant deviations are countered before they become intense (cf. Baumeister, Vohs, DeWall, & Zhang, 2007).

Affect Issues

This theoretical model differs from others in several ways. At least two of the differences appear to have interesting and important implications.

Divergent Views of the Dimensionality Underlying Affect

One difference concerns relationships among various affects. A number of theories conceptualize affects as aligned along dimensions (though certainly not all do so). Our view fits that picture, in a sense. That is, we argue that affects have the potential to be either positive or negative, whether they are related to approach or to avoidance. Thus

we assume a *bipolar dimension of potential affective valence for each core motivational direction*.

Most dimensional models of affect, however, take a very different form. The most widely known dimensional models assume a view in which each core motivational system is responsible for affect of one valence only. This view yields *two unipolar dimensions, each of them linked to the functioning of a motivational system*. This is essentially the position that has been taken by Gray (e.g., 1990, 1994), Lang and colleagues (e.g., Lang, 1995; Lang, Bradley, & Cuthbert, 1990), Cacioppo and colleagues (e.g., Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1999), and Watson and colleagues (Watson, Wiese, Vaidya, & Tellegen, 1999).

What does the evidence say on this issue? There is not a wealth of information from studies targeting it, but there is some. Least studied is "doing well" in threat avoidance. Here are some examples of findings relevant to it. Higgins, Shah, and Friedman (1997, Study 4) found that having an avoidance orientation to a task (instructions to avoid failing) plus a good outcome led to elevations in reports of calmness. Calmness was not affected, however, with an approach orientation (instructions to succeed). Thus, calmness was linked to doing well at avoidance, not doing well at approach. Other studies have asked people to respond to hypothetical scenarios in which a threat was introduced, then removed (Carver, 2009). Reports of relief related principally to individual differences in threat sensitivity.

A larger accumulation of evidence links certain negative affects to "doing poorly" in approaching incentives; just a few are noted here (see Carver & Harmon-Jones, 2009b, for details). In the study by Higgins, Shah, and Friedman (1997) that was just described, people with an approach orientation who experienced failure reported elevated sadness. This did not occur with an avoidance orientation. This pattern suggests a link between sadness and doing poorly at approach.

The broader literature of self-discrepancy theory also makes a similar point. Many studies have found that sadness relates uniquely (controlling for anxiety) to discrepancies between actual selves and ideal selves

(see Higgins, 1987, 1996, for reviews). Ideals are qualities the person intrinsically desires: aspirations, hopes, positive images for the self. There is evidence that pursuing an ideal is an approach process (Higgins, 1996). Thus, this literature also suggests that sadness stems from a failure of approach.

Another study bearing on this question examined the situation of frustrative nonreward. Participants were led to believe that they could obtain a reward if they performed well on a task (Carver, 2004). All were told they had done poorly, however, and got no reward. Sadness and discouragement at that point related to sensitivity of the approach system, but not sensitivity of the avoidance system.

There is also a good deal of evidence linking the approach system to anger (for a review, see Carver & Harmon-Jones, 2009b). As one example, Harmon-Jones and Sigelman (2001) induced anger in some persons but not others, then examined cortical activity. They found elevated left anterior activity, which previous research (e.g., Davidson, 1992) had linked to activation of the approach system. In other studies (Carver, 2004), people reported the feelings they experienced in response to hypothetical events (Study 2) and after the destruction of the World Trade Center (Study 3). Reports of anger related to sensitivity of the approach system, whereas reports of fear and anxiety related to sensitivity of the avoidance system.

On the other hand, there is also an accumulation of evidence that contradicts this position, locating all negative affects on one dimension and all positive affects on another dimension. This evidence, briefly summarized by Watson (2009), consists primarily of a large number of studies in which people reported their moods at a particular time or across a particular span of time. As Carver and Harmon-Jones (2009a) pointed out, however, an affective response to a particular event differs in important ways from a mood. Among other things, moods aggregate experiences over multiple events. It seems likely that different influences come into play in the creation or maintenance of moods than underlie focused affective responses to specific events.

We have devoted a good deal of space here to the issue of how affects might be organized. Why? This is an important issue

because of its implications with regard to a conceptual mechanism underlying affect. Theories postulating two unipolar dimensions appear to equate greater activation or engagement of a motivational system to more affect of that valence. If the approach system actually relates to feelings of both valences, such a mechanism is not tenable. A conceptual mechanism is needed that addresses both positive and negative feelings within the approach function (and, separately, the avoidance function). The mechanism that was described here does so.

One more word about dimensionality. Our view is dimensional in the sense that it is predicated on a dimension of system functioning (from very well to very poorly). However, the affects that fall on that dimension do not themselves form a dimension, apart from the fact that they represent two valences and a neutral point (Figure 10.1). For example, depression (which arises when things are going extremely poorly) is not simply a more intense state of frustration (which arises when things are going poorly, but less poorly). The affects themselves appear to be nonlinear consequences of linear variation in system functioning. Anger and depression are both potential consequences of approach going poorly; which one emerges appears to depend on whether the goal seems lost or not (see also Rolls, 1999, 2005).

Coasting When Exceeding Criterion

Another potentially important issue also differentiates this model from most other viewpoints on the meaning and consequences of affect (Carver, 2003). Recall the idea that affect reflects the error signal in a feedback loop. Affect thus would be a signal to adjust progress—and that would be true whether rate is above the criterion or below it. This is intuitive for negative feelings: Frustration leads to increase in effort. But what about positive feelings?

Here theory becomes counterintuitive. In this model, positive feelings arise when things are going better than they need to. But the feelings still reflect a discrepancy, and the function of a negative feedback loop is to minimize sensed discrepancies. If so, such a system “wants” to see neither negative nor positive affect. Either one would represent an “error” and lead to changes in

output that eventually would reduce it (see also Izard, 1977).

This view argues that exceeding the criterion rate of progress (thus creating positive feelings) automatically results in a tendency to reduce effort in this domain. The person “coasts” a little. This does not mean stopping altogether, but easing back, such that subsequent progress returns to the criterion. The impact on affect would be that the positive feeling is not sustained for very long. It begins to fade.

We should be clear that expending effort to catch up when behind, and coasting when ahead, are both presumed to be specific to the goal to which the affect is linked. Usually (though not always) this is the goal from which the affect arises in the first place. We should also be clear about time frames. This view pertains to the current, ongoing episode. This is *not* an argument that positive affect makes people less likely to do the behavior again later on. That obviously is incorrect. Emotions have important effects on learning, but those effects of emotion are outside the scope of this chapter (see Baumeister et al., 2007).

A system of the sort we are postulating would operate in the same way as a car’s cruise control. If progress is too slow, negative affect arises. The person responds by increasing effort, trying to speed up. If progress is better than needed, positive affect arises, leading to coasting. A car’s cruise control displays similar properties. A hill slows you down; the cruise control feeds the engine more fuel, speeding back up. If you come across the crest of a hill and roll downward too fast, the system restricts fuel and the speed drags back down.

The analogy is intriguing partly because both sides are asymmetrical in the consequences of deviation from the criterion. In both cases, addressing the problem of going too slowly requires expending further resources. Addressing the problem of going too fast entails only cutting back. A cruise control does not apply the brakes; it only reduces fuel. The car must coast back to the setpoint.

The effect of the cruise control on an excessively high rate of speed thus depends partly on external circumstances. If the downward slope is steep, the car may exceed the setpoint all the way to the valley below. In the same fashion, people generally do

not respond to positive affect by trying to dampen the feeling. They only ease back a little on resources that are devoted to the domain in which the affect arose. The feelings may stay for a long time (depending on circumstances), as the person coasts down the subjective hill. Eventually, though, the reduced resources would cause the positive affect to fade. In the long run, then, the system would act to prevent great amounts of pleasure as well as great amounts of pain (Carver, 2003; Carver & Scheier, 1998).

Does positive affect (or making greater than expected progress) lead to coasting? To test this idea, a study must assess coasting with respect to the goal underlying the affect (or the unexpectedly high progress). Many studies have created positive affect in one context and assessed its influence elsewhere (e.g., Isen, 1987, 2000; Schwarz & Bohner, 1996), but that does not test this question.

A few studies satisfy these criteria. Mizuruchi (1991) found that professional basketball teams in playoffs tend to lose after winning. It is unclear, however, whether the prior winner slacked off, the loser tried harder, or both. Louro, Pieters, and Zeelenberg (2007) explicitly examined the role of positive feelings from surging ahead in the context of multiple-goal pursuit. In three studies they found that when people were relatively close to a goal, positive feelings prompted decrease in effort toward that goal and a shift of effort to an alternate goal. They also found a boundary on this effect (it occurred only when people were relatively close to their goal).

Another more recent study used an intensive experience sampling procedure across a 2-week period (Fulford, Johnson, Llabre, & Carver, 2010). Participants made a set of judgments three times a day about each of three goals that they were pursuing over that period. The ratings they made included perceptions of progress for each time block, which could be compared to expected progress for that block. The data showed that greater than expected progress toward a goal was followed by reduction in effort toward that goal during the next time period.

Coasting and Multiple Concerns

The idea that positive affect promotes coasting, which eventually results in reduction of the positive affect, strikes some people as

improbable at best. Why should a process possibly be built into people that limits positive feelings—indeed, that reduces them? After all, a truism of life is that people are organized to seek pleasure and avoid pain.

There are at least two potential bases for this tendency. One is that it is adaptive for organisms not to spend energy needlessly (Brehm & Self, 1989; Gendolla & Richter, 2010). Coasting is a mechanism that works against that. A second basis stems from the fact that people have multiple simultaneous concerns (Atkinson & Birch, 1970; Carver, 2003; Carver & Scheier, 1998; Frijda, 1994). Given multiple concerns, people do not optimize performance on any one of them, but rather “satisfice” (Simon, 1953)—do a good-enough job on each concern to deal with it satisfactorily. This permits the person to handle many concerns adequately, rather than just one (see also Fitzsimons, Friesen, Orehek, & Kruglanski, 2009; Kumashiro, Rusbult, & Finkel, 2008).

A tendency to coast with respect to a given goal would virtually define *satisficing* regarding that goal. That is, reducing effort would prevent the attainment of the best possible outcome for that goal. A tendency to coast would also promote satisficing regarding a broader array of goals. That is, if progress toward goal attainment in one domain exceeds current needs, a tendency to coast in that particular domain (satisficing) would make it easier to devote energy to another domain. This would help ensure satisfactory goal attainment in the other domain and, ultimately, across multiple domains.

In contrast, continued pursuit of one goal without letup can have adverse effects. Continuing a rapid pace in one arena may sustain positive affect pertaining to that arena, but by diverting resources from other goals it also increases the potential for problems elsewhere. This would be even truer of an effort to *intensify* the positive affect, which would further divert resources from other goals. Indeed, a single-minded pursuit of yet-more-positive feelings in one domain can even be lethal, if it causes the person to disregard threats looming elsewhere.

A pattern in which positive feelings lead to easing back and an openness to shifting the focus of one’s energies would minimize such problems. It is important to realize that this view does not require a shift in goals, given positive feelings. It simply holds that

openness to a shift is a consequence—and a potential benefit—of the coasting tendency. This line of thought would, however, begin to account for why people do eventually turn away from pleasurable activities.

Priority Management as a Core Issue in Self-Regulation

This line of argument begins to implicate positive emotion in a broad organizational function within the organism. This function is priority management across time: the shifting from one goal to another as focal in behavior (Dreisbach & Goschke, 2004; Shallice, 1978; Shin & Rosenbaum, 2002). This basic and very important function is often overlooked, but it deserves closer examination. Humans usually pursue many goals simultaneously, but only one can have top priority at a given moment. People attain their many goals by shifting among them. Thus there are changes over time in which goal has the top priority. An important question is how those changes are managed.

What we regard as an extremely insightful view of priority management was proposed many years ago by Simon (1967). He noted that although goals with less than top priority are largely out of awareness, ongoing events still can be relevant to them. Sometimes events that occur during the pursuit of the top-priority goal create problems for a goal with a lower priority. Indeed, the mere passing of time can sometimes create a problem for the goal with the lower priority, because passing of time may make its attainment less likely. If the lower-priority goal is also important, an emerging problem for its attainment needs to be taken into account. If a serious threat to that goal arises, a mechanism is needed for changing priorities, so that the second goal replaces the first one as focal.

Feelings and Reprioritization

Simon (1967) proposed that emotions are calls for reprioritization. He suggested that emotion arising with respect to a goal that is outside awareness eventually induces people to interrupt what they are doing and give that goal a higher priority than it had. The stronger the emotion, the stronger is the claim being made that the unattended goal

should have a higher priority than the goal that is currently focal. Simon did not address negative affect that arises with respect to a currently focal goal, but the same principle seems to apply. In that case, negative affect seems to be a call for an even greater investment of resources and effort in that focal goal than is now being made.

Simon's analysis applies easily to negative feelings, cases in which a nonfocal goal demands a higher priority and *intrudes* on awareness. However, another way in which priority ordering can shift is that the currently focal goal can *relinquish its place*. Simon acknowledged this possibility obliquely, noting that goal attainment terminates pursuit of that goal. However, he did not address the possibility that an as-yet-unattained goal might also yield its place in line.

Carver (2003) expanded on that possibility, suggesting that positive feelings represent a cue to *reduce* the priority of the goal to which the feeling pertains. This view appears consistent with the sense of Simon's analysis, but suggests that the prioritizing function of affect pertains to affects of both valences. Positive affect regarding an act of avoidance (relief or tranquility) indicates that a threat has dissipated, that it no longer requires as much attention as it did and can now assume a lower priority. Positive affect regarding approach (happiness, joy) indicates that an incentive is being attained. Even if it is not yet attained, the affect is a signal that you could temporarily withdraw effort from this goal, because you are doing so well.

What follows from a reduction in priority of a currently focal goal? In principle, this situation is less directive than the situation that exists when a nonfocal goal demands higher priority. What happens next in this case depends partly on what else is waiting in line and whether the context has changed in important ways while you were absorbed with the focal goal. Opportunities to attain incentives sometimes appear unexpectedly, and people put aside their plans to take advantage of such unanticipated opportunities (Hayes-Roth & Hayes-Roth, 1979; Payton, 1990). It seems reasonable that people experiencing positive affect should be most prone to shift goals at this point if something else needs fixing or doing (regarding

a next-in-line goal or a newly emergent goal) or if an unanticipated opportunity for gain has appeared.

On the other hand, sometimes neither of these conditions exists. In such a case, no shift in goal would occur. That is, even with the downgrade in priority, the focal goal still has a higher priority than the alternatives. Thus, positive feeling does not *require* that there be a change in direction. It simply sets the stage for such a change to be more likely.

Apart from evidence of coasting per se (discussed earlier), there is also other evidence consistent with the idea that positive affect tends to promote shifting of focus to other areas that need attention (for a broader discussion, see Carver, 2003). As an example, Trope and Neter (1994) induced a positive mood in some people but not others, gave them all a social sensitivity test, then told them that they had performed well on two parts of the test but poorly on a third. The participants then indicated their interest in reading more about their performances on the various parts of the test. Those in a positive mood showed more interest in the part they had failed than did controls, suggesting that they were inclined to shift their focus to an area that needed their attention. This effect was conceptually replicated by Trope and Pomerantz (1998) and Reed and Aspinwall (1998).

Phenomena such as these have contributed to the emergence of the view that positive feelings represent psychological resources (see also Aspinwall, 1998; Fredrickson, 1998; Isen, 2000; Tesser, Crepaz, Collins, Cornell, & Beach, 2000). The idea that positive affect serves as a resource for exploration resembles the idea that positive feelings open people up to noticing and turning to emergent opportunities, to being distracted into enticing alternatives—to opportunistic behavior.

Indeed, there is some evidence that fits this idea more directly (Kahn & Isen, 1993). Kahn and Isen (1993) gave people opportunities to try out choices within a food category. Those who had been put into a state of positive affect beforehand switched among choices more than did controls. Isen (2000, p. 423) interpreted this as showing that positive affect promotes "enjoyment of variety and a wide range of possibilities," which sounds much like opportunistic

foraging. In the same vein, Dreisbach and Goschke (2004) found that positive affect decreased perseveration on a task strategy and increased distractibility. Both of these findings are consistent with the reasoning presented in this section.

Priority Management and Dysphoria

One more important aspect of priority management should be addressed here. It concerns the idea that goals sometimes are not attainable and are better abandoned. Sufficient doubt about goal attainment creates an impetus to reduce effort to reach the goal and even to give up the goal itself (Carver & Scheier, 1998, 1999a, 1999b). This sense of doubt is accompanied by sadness or dysphoria. The abandonment of a goal reflects a decrease in its priority. How does this sort of reprioritization fit into the picture just outlined?

At first glance, this outcome seems to contradict Simon's (1967) position that negative affect is a call for higher priority. After all, sadness is a negative affect. However, we think that there is an important difference between two classes of approach-related negative affects, which forces an elaboration of Simon's thinking. As noted earlier, our view on affect rests on a dimension that ranges from doing well to doing poorly (Figure 10.1), though the affects themselves do not form a true continuum (e.g., depression is not more intense anger). We would argue that inadequate movement forward (or no movement, or loss of ground) gives rise initially to frustration, irritation, and anger (Figure 10.2). These feelings (or the mechanism that underlies them) serve to engage effort more completely, so as to overcome obstacles and enhance progress. This case clearly fits the priority management model of Simon.

Sometimes, however, continued effort does not produce adequate movement forward. Indeed, if the situation is one of loss, movement forward is precluded because the goal is gone. When failure is (or seems) assured, the feelings are instead sadness, depression, dejection, despondency, grief, and hopelessness (cf. Finlay-Jones & Brown, 1981). Behaviorally, this is paralleled by disengagement from active effort toward the goal (Klinger, 1975; Lewis, Sullivan, Ram-

say, & Alessandri, 1992; Mikulincer, 1988; Wortman & Brehm, 1975).

Despite this reduction of effort, this goal may not immediately have assumed a lower priority, although in adaptive functioning it will eventually do so. People often ruminate about the source of their dysphoria (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Watkins, 2008). The rumination, which keeps that goal in, or at least close to, consciousness, implies that the goal thus far retains a relatively high priority. Ceasing of rumination, which generally (though not inevitably) comes with time, is a sign that the goal's priority has now fallen.

Two additional points about the portion of Figure 10.2 to the right of the vertical criterion line are worth noting. First, this part of the figure has much in common with several other depictions of variations in effort when difficulty in moving toward a goal gives way to loss of the goal (for details, see Carver & Scheier, 1998, Ch. 11). Perhaps best known is Wortman and Brehm's (1975) integration of reactance and helplessness. They described a region of threat to control, in which there is enhanced effort to regain control, and a region of loss of control, in which efforts diminish. Indeed, the figure they used to illustrate those regions greatly resembles the right side of Figure 10.2. Another view with the same character is Brehm and Self's (1989) subsequent refinement of that model.

Another point concerns the fact that the right side of Figure 10.2 is drawn with a rather abrupt shift from anger to sadness (which is also true of the Brehm & Self, 1989, view). The degree of abruptness of the transition in this figure is arbitrary. There likely are cases in which the transition is abrupt and also cases in which it is not. These two sets of cases may be distinguished by the relative importance of the goals involved. Importance as a variable has largely been ignored in this discussion, but it obviously must play a very large role in determining the intensity of affective and motivational experiences (cf. Pomerantz, Saxon, & Oishi, 2000).

We reemphasize that the two kinds of negative feelings we have been discussing here both have adaptive properties for the contexts in which they arise. In the first situation—when the person falls behind, but

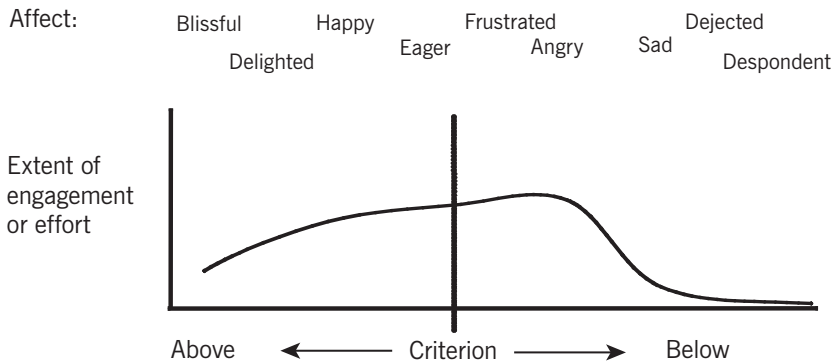


FIGURE 10.2. Hypothesized approach-related affects as a function of doing well versus doing poorly compared to a criterion velocity. The vertical dimension depicts the degree of behavioral engagement posited to be associated with affects at different degrees of departure from neutral. Based on Carver (2004).

the goal is not identified as lost—feelings of frustration and anger accompany an increase in effort, a struggle to gain the goal despite setbacks. This struggle is adaptive (and thus the affect is adaptive) to the extent that the struggle fosters goal attainment. And it often (though not always) does so.

In the second situation—when effort appears futile—feelings of sadness and depression accompany reduction of effort. Sadness, depression, and despondency imply that things cannot be set right, that effort is pointless. Reducing effort in this circumstance is also adaptive (Carver & Scheier, 2003; Wrosch, Scheier, Carver, & Schulz, 2003; Wrosch, Scheier, Miller, Schulz, & Carver, 2003): It conserves energy rather than waste it in pursuit of the unattainable (Nesse, 2000). If reducing effort also helps diminish commitment to the goal (Klinger, 1975), it eventually readies the person to take up other goals in place of this one.

Clinical Implications

The ideas presented in this chapter were intended to focus on the realm of normal experience, but they also have clear relevance for a number of areas of clinical psychology. The clearest relevance is to mood disorders, both depression and mania. In this section we briefly consider how the ideas have been applied to those topics.

Clinical Depression

Although clinical depression involves a great deal more than the affective experience of sadness, sadness is generally part of the picture. The experience of clinical depression is both similar to, and different from, the preceding description of sadness as an affect. One similarity is that the experience of clinical depression is partly a feeling of being unable to move forward to attain desired goals. Along with this comes the sense that even tasks that objectively are easy to accomplish require great effort (Brinkmann & Gendolla, 2008).

One salient difference between the experiences is that normal states of sadness diminish relatively quickly, in part because of diminishing commitment to the goal that seems out of reach. Life entails a good many adjustments of that sort, in which one goal is abandoned and others are taken up. Vulnerability to clinical depression, in contrast, often seems characterized by a relative inability to abandon what seem to be unattainable goals (Carver & Scheier, 1998, Chs. 12–13). It has been suggested that this vulnerability reflects a continuing attempt to demonstrate a condition of self-worth (Rothbaum, Morling, & Rusk, 2009). Whereas it may be easy to reduce one's commitment to goals that are not deeply embedded in the self, it is far harder to give up on the goal of self-worth. Thus, being committed to demonstrating one's self-worth creates problems in the face

of failure (Crocker & Park, 2004). As the person tries to hang on to something that is perceived as being out of reach, the result is continuing negative affect (Pyszczynski & Greenberg, 1992).

Mania

Mania is a period of positive or irritable mood, accompanied by symptoms that include increased psychomotor activation, extreme self-confidence, pressured speech, racing thoughts, and pursuit of rewarding activities without attention to risks. Based on a hypothesis suggested by Depue and Iacono (1989), evidence has accumulated that mania is linked to oversensitivity of a general approach system (Alloy & Abramson, 2010; Fowles, 1988; Johnson, 2005; Johnson, Edge, Holmes, & Carver, 2012; Urošević, Abramson, Harmon-Jones, & Alloy, 2008). There is evidence that people vulnerable to mania engage greater effort on difficult tasks than other people (Harmon-Jones et al., 2008). Of particular interest at present, there is also evidence that positive emotions are more persistent among people vulnerable to mania than among other people (Gruber, 2011).

Why are positive emotions more persistent among persons vulnerable to mania? Evidence from one recent study tested the hypothesis that people vulnerable to mania are less likely than other people to coast after having made unexpectedly high progress toward their goals. This study (Fulford et al., 2010) was mentioned earlier in the chapter as providing evidence of coasting—reducing effort—after making better than expected progress toward daily life goals. What was not mentioned earlier is that this study examined both healthy controls and people with bipolar disorder. The pattern of reduced effort emerged for both groups, but it was significantly less pronounced among people with bipolar disorder than among healthy controls. This finding suggests that one problem underlying bipolar disorder may be a failure of this normal homeostatic function.

Summary and Conclusion

In this chapter we have sketched the outlines of a theoretical view of the origin and

some of the functions of affect, based on the organizing principle of feedback control processes. This is a functional analysis, in which affect serves the purpose of regulating degree of engagement in goal pursuit across time. The general structure of the model is applicable to any organism that is goal directed and experiences greater or lesser urgency in reaching those goals. Although we have described the model in terms of affective experience—subjective valence—it is not at all clear that consciousness per se is required for the processes we have described to take place. We construe this mechanism as a set of functions that occur simultaneously with the functions that create action, in parallel to them, constantly, automatically, and unbidden. We take no position on the question of whether it is the affects themselves, or the mechanisms that underlie them and create them, that are responsible for the functions that follow.

This is not a biological model. However, it clearly incorporates implicit assumptions about neural processing. It assumes the existence of brain structures that evaluate changes in the relative favorability of situations. This requires both structures that can recognize incentives and threats and also structures that map experience over some range of time. Although these are assumptions, the assumptions appear plausible.

This is not really a cognitive model, either. It does not deal with appraisals, except in the limited sense that perceptions regarding the rate of goal-related progress are appraisals. However, it is relatively easy to integrate this view with the overall sense of appraisal models. Appraisal models all assume that an important property of emotions is that they pertain to events that are valenced. The strength of appraisal models is the nuance they provide *within* the categories “bad” and “good.” Our model has no such nuances. But our analysis can be inserted in place of “bad outcome” and “good outcome” in appraisal models, thereby adding to those models the reminder that emotions arise during the flow of experiences, not just at the end.

It is also worth noting that this model ties the creation of information specifying valence to some experience regarding an incentive or a threat. Once information that specifies valence has become attached

to other information in memory, it can of course be reevoked by activation of that memory. But in the first cases—those in which affect emerges online—it has to come from somewhere, created via some mechanism. We argue for a particular mechanism. It is a general-purpose mechanism, in the sense that doing poorly with respect to desired goals of great diversity leads to affect of negative valence. Is there modularity within it, with different classes of goals yielding negative affect of slightly different flavor when things are going poorly? We are generally agnostic on that issue.

This view of affect can be brought to bear on one of the most obvious but least examined aspects of human behavior: the fact that people pursue multiple goals over a given period of time, but shift repeatedly from one to another. Affect probably is not the only influence on priority management, but it is an important one. Apart from the role of emotion in learning, its role in priority management may turn out to be its most important function.

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