Control Processes, Priority Management, and Affective Dynamics

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Abstract

Affective dynamics are discussed from the perspective of a view of origin and functions of affective valence based in control processes. This view posits that affect reflects the error signal of a feedback loop managing rate of progress at goal attainment or threat avoidance. Negative feelings signal doing poorly, demanding more effort. Positive feelings signal doing better than necessary, allowing coasting, which yields goal attainment without unnecessary resource expenditure. Given multiple simultaneous goals, these functions assist in moment-to-moment priority management, facilitating attainment of all.

Keywords
affect, control processes, feedback, priority

To address affective dynamics requires a viewpoint on the origins of affect. This article summarizes a viewpoint in which two layers of feedback loops manage two aspects of behavior, jointly situating behavior in time as well as space. One of the layers is posited to be responsible for affect, the evaluative core of emotions. Such an arrangement would facilitate both attainment of single goals and the handling of a life space in which multiple goals compete for attention. These variations in goal pursuit would also yield a constantly changing profile of affects.

Feedback, Action, and Affect

My starting point is the idea that behavior involves feedback loops (Miller, Galanter, & Pribram, 1960; Powers, 1973). In a discrepancy-reducing loop (Figure 1), existing conditions are compared to a desired or intended condition (a goal). Detection of a difference (an “error”) yields adjustment of output, aimed at moving the current condition closer to the comparison value (Powers, 1973). Put differently, action homes in on the goal. This is one way to construe approach behavior.

There also exist loops that enlarge deviations from the comparison point rather than decrease them. One class of phenomena that seems to display this pattern is responses to threats or dangers. If you perceive a threat (an alligator nearby; an impending social interaction that you fear will cause public embarrassment), you move away from it. Discrepancy enlargement typically is constrained by discrepancy-reducing processes. Thus, one can often avoid a threat by approaching a safe zone, sometimes literally (moving behind a barrier), sometimes figuratively (introducing safe topics into a conversation to prevent a distressing one from arising).

The idea that such feedback loops provide directionality (approach or avoidance of a comparison value) is a start, but it...
does not yet involve affect. To address affect, Carver and Scheier (1990, 1998, 2013) suggested that affect arises from a feedback loop that occurs simultaneously with, and in parallel to, the one guiding directionality (Figure 2). This second loop essentially checks on how well the first one is doing. Thus, the input for the second loop is a representation of the rate of discrepancy reduction in the action system over time.

In this view, the input (sensed rate) by itself does not define affect, because a given rate of progress can yield different affect in different circumstances. Rather, the input is compared to an acceptable or desired or intended rate (cf. Frijda, 1986, 1988), to check for conformity to it (Comparison A in Figure 2). Carver and Scheier (1990, 1998, 2013) proposed that error signals in this loop are manifested subjectively as affect—positive or negative valence. A rate below the criterion yields negative affect. A rate high enough to exceed the criterion yields positive affect. 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 (Carver & Scheier, 1998, Chapters 8 and 9). Evidence supporting the role of the velocity function in affect comes from several sources (reviewed by Carver & Scheier, 2013).

In this view, an attempt to approach a goal may be accompanied by affect of either valence. That is, affect can be positive, neutral, or negative, depending on how well or poorly the action is going. As you do unexpectedly well at your effort to revise an article, you feel happier. As you struggle and fall behind in the revision efforts, you feel distress. Both feelings, however, pertain to your approach effort.

**Two Kinds of Behavior, Two Dimensions of Affect**

Now consider avoidance. The view just outlined is not that positive feelings result from approach, but that positive feelings result when an action system is making rapid progress doing what it is organized to do. There is no obvious reason why this principle should not also apply to systems that avoid. If it is making sufficiently rapid progress at what it is organized to do,
there should be positive affect. If it is doing poorly, there should be negative affect.

Thus, the idea that two valences are possible for a given motivated behavior seems applicable to both approach and avoidance. Nonetheless, doing well at approach is not quite the same as doing well at avoiding threat. There may be differences between the two positives, and between the two negatives (Figure 3). Evidence indicates that approach efforts relate to such positive affects as eagerness, excitement, and elation when things are going well, but to such negative affects as frustration, anger, and sadness when they are not (Carver, 2004; Carver & Harmon-Jones, 2009; Higgins, 1996; Pettersson & Turkheimer, 2013). Avoidance efforts relate to such positive affects as relief and contentment when they are going well (Carver, 2009), and such negative affects as fear, anxiety, and guilt when they are not. Of course, because approach and avoidance efforts can be engaged simultaneously (e.g., avoiding a threat by approaching a safe zone), affective experiences can also be blended.

This view resembles one proposed for different reasons by Rolls (1999, 2005). He identified emotions in terms of occurrence of reinforcers and punishers, and omission or termination of reinforcers and punishers: The occurrence of a punisher yields fear and the omission of a reinforcer yields frustration and anger; the occurrence of a reinforcer yields elation and the omission of a punisher yields relief.

This view is dimensional in assuming a linearly varying property of system functioning (very well to very poorly). However, the affects that fall on that dimension of system functioning do not themselves form a linear dimension (Figure 4). Depression (when things are going very poorly) is not simply more intense frustration (when things are going less poorly). The affects are nonlinear consequences of linear variation in system functioning. Both anger and depression are potential consequences of approach going poorly. Which emerges depends on whether the goal seems lost or not (see also Rolls, 1999, 2005).

Also noteworthy in Figure 4 are the shifts in behavioral engagement that are postulated toward both extremes of the rate dimension. Begin at the criterion rate. Deviating slightly from the criterion yields continued effort to maintain that rate (if slightly above it) or regain that rate (if slightly below it). These two circumstances are associated with mild affect (positive or negative, respectively) but not much variation in engagement.

Greater deviation below the criterion leads to increased engagement, aimed at regaining the criterion rate, unless (as noted before) things are going so badly that effort seems fruitless. The latter perception induces a shift from effort to disengagement (a shift that may be gradual or abrupt, depending on circumstances; Carver & Scheier, 1998, 2013). Thus moderate negative deviation yields increased engagement, but more extreme negative deviation yields disengagement.

Greater deviation above the criterion also theoretically promotes a reduction in engagement, for a different reason. This deviation means outperforming the criterion. Recall, though, that affect is construed in this model as the error signal in a feedback loop. Positive affect is subjectively pleasant (it does, after all, mean doing better than necessary). But if this really is a feedback loop, this high rate is not the intended condition. There should be a tendency to return to the criterion rate. The simplest way to do that is to ease up, “coast” a little (Carver, 2003; Izard, 1977). Effort slacks a little and the positive feeling begins to fade.

Does positive affect (or making greater than expected progress) promote coasting? Louro, Pieters, and Zeelenberg (2007) found that when people were relatively close to a goal, positive feelings from surging ahead prompted decreased effort toward that goal and a shift of effort to an alternate goal. Another experience sampling study (Fulford, Johnson, Llabre, & Carver, 2010) similarly found that greater than expected progress toward a goal in one time block led to reduction in effort toward that goal in the next block.

This view predicts coasting in response to positive affect or greater than expected progress because of the nature of feedback control, but there are also other reasons to propose such a tendency. One is that it is maladaptive to expend energy needlessly (Brehm & Self, 1989; Gendolla & Richter, 2010; Nesse, 2000). Coasting prevents that.
Another reason is that people have multiple concerns at any given time (Atkinson & Birch, 1970; Carver, 2003; Carver & Scheier, 1998; Frijda, 1994). Given multiple concerns, people don’t optimize, but “satisfice” (Simon, 1953)—do a good-enough job on each 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 one goal would epitomize satisficing regarding that goal. That is, reducing effort would prevent attaining the best possible outcome for that goal. A tendency to coast would also promote satisficing for a broader array of goals. That is, if progress in one domain exceeds need, a tendency to coast in that domain (satisficing) would make it easier to devote energy to another domain. This would help ensure goal attainment in the other domain and, ultimately, across multiple domains (for detail see Carver & Scheier, 2013).

**Affect and Action Are Intertwined**

This two-layered viewpoint 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 an attempt to change the rate of that action. Thus, the affect loop acts through the associated action loop.

Some changes in rate output are straightforward. If you are lagging behind and feel distress, you push harder to go faster (Brehm & Self, 1989; Wright, 1996). Sometimes they are less straightforward. Rates sometimes are determined by choices among programs of action. For example, increasing your rate of progress on a work project may mean choosing to spend a weekend working on it rather than camping. Thus, adjustment in rate is often translated into terms such as concentration, or allocation of time and effort.

The idea of two feedback systems functioning in concert with one another together—one controlling position, one controlling velocity—permits the device in which they are embedded to respond with both quickness and stability (Clark, 1996). This dual control thus confers adaptive advantage.

The interweaving of affect and action also has another side, which is critical to affective dynamics. The actions that follow from the affects (or from the processes underlying the affects) also lead in most cases to reduction of the affects. Thus, in a very basic sense, the affect system (in concert with the action system) is self-regulating (cf. Campos, Frankel, & Camras, 2004). Though people also make voluntary efforts to regulate emotions (Gross, 2007), the system does most of that on its own. Indeed, if the affect system is highly responsive in output, affect generally will never be intense, because deviations are countered before they become large (cf. Baumeister, Vohs, DeWall, & Zhang, 2007). There are, of course, individual differences in the rate at which affect returns to baseline, which have been termed variations in affective inertia (e.g., Kuppens, Oravecz, & Tuerlinckx, 2010; Kuppens et al., 2012).

**Priority Management as a Core Issue in Self-Regulation**

The idea that coasting helps people to deal with multiple concerns implicates positive affect in a very broad function: priority management across time (Dreisbach & Goschke, 2004; Shallice, 1978; Shin & Rosenbaum, 2002). This function, often overlooked, deserves closer examination. Humans usually pursue many goals simultaneously, but only one has top priority at a given moment. People attain their many goals by shifting among them, changing over time which goal has the top priority. How are those changes managed?

Many years ago Simon (1967) 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 while pursuing the top-priority goal create problems for a lower priority goal. Indeed, the mere passing of time can create a problem for it, because passing of time can interfere with its attainment. If the lower priority goal is also important, an emerging problem for its attainment must be taken into account. If a threat to that goal arises, a mechanism is needed for changing priorities, so that the second goal replaces the first as focal.

**Affect and Reprioritization**

Simon (1967) proposed that emotions are calls for reprioritization. He suggested that emotion with respect to a goal outside awareness eventually induces people to interrupt what they are doing and give the neglected goal a higher priority than it had. The stronger the emotion, the stronger the assertion that the unattended goal should have a higher priority. Simon did not address negative affect regarding 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 effort in that focal goal than is now being made.

Simon’s analysis applies easily to negative feelings, 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. Carver (2003) raised that possibility, suggesting that positive feelings represent a cue to reduce the priority of the goal to which the feeling pertains. This seems consistent with the sense of Simon’s analysis, but suggests that the prioritizing function of affect pertains to both valences. Positive affect regarding avoidance (relief or tranquility) indicates that a threat has dissipated and can now assume a lower priority. Positive affect regarding approach (happiness, joy) indicates that an incentive is being attained, and that you could temporarily withdraw effort from this goal, because you are doing so well.

What follows if a currently focal goal falls in priority? This situation is less directive than that of a nonfocal goal demanding higher priority. What happens here depends partly on what else is waiting in line and whether the context has changed during effort at the focal goal. Opportunities for incentives sometimes appear unexpectedly, and people put aside their plans to take advantage of them (Hayes-Roth & Hayes-Roth, 1979). 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 if an unanticipated opportunity for foraging has appeared (cf. Kahn & Isen, 1993).

On the other hand, sometimes neither of these conditions exists. In such cases, 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.

Priority Management and Depressed Affect

One more important aspect of priority management is that goals sometimes are unattainable. As Figure 4 indicates, sufficient doubt about goal attainment is associated with sadness and reduction of effort toward the goal. Does this contradict Simon’s (1967) position that negative affect is a call for higher priority?

There is an important difference between two classes of approach-related negative affects, which forces another elaboration of Simon’s thinking. Inadequate movement forward (or no movement, or movement backward) first yields frustration and anger. These feelings (or the mechanism that underlies them) prompt more effort, so as to overcome obstacles and enhance progress. This fits the priority management model of Simon (1967).

Sometimes, however, continued effort does not produce adequate movement forward. Indeed, sometimes movement forward is precluded because the goal is lost. When failure is assured, the feelings are sadness, depression, grief, and hopelessness. Behaviorally, this is paralleled by disengagement from active effort toward the goal (Klinger, 1975).

Despite reduction of effort, this goal may not immediately assume a lower priority. People often ruminate about the source of dysphoria (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Watkins, 2008). The rumination, which keeps that goal in consciousness, implies that it retains a relatively high priority. Ceasing of rumination, which generally comes with time, signals that the goal’s priority has fallen and it can now be disregarded. Thus, feelings of depression also have a place in priority management, though their story is a complicated one.

Certainly rumination is easier to fall into, and is sustained longer by some people than others (Koval, Pe, Meers, & Kuppens, 2013). This might be viewed as indicating that dysphoria represents an attractor zone in an affective state space for people vulnerable to depression (see Wichers, Wigman, & Myin-Germeys, 2015). It might also suggest that inability to disengage is an important part of that vulnerability.

Issues

Space limitations preclude much theoretical comparison. However, a couple of points should be made about relations between this viewpoint and other prominent ideas.

A number of theorists place affects on dimensions (e.g., Russell & Carroll, 1999, argued for bipolarity crossed by arousal; Watson, Wiese, Vaidya, & Tellegen, 1999, and others, argued for unipolar positive and negative activation). As noted earlier, the view described here also has a sort of dimensionality, but one quite different from the others (see Carver & Scheier, 2013, for broader discussion). In particular, it assumes two bipolar dimensions, one linked to each core motivational tendency (approach and avoidance).

Why does this difference matter? It matters because it has implications concerning what mechanism might underlie affect. For example, theories postulating two unipolar dimensions (e.g., Watson et al., 1999) appear to equate greater activation or engagement of a motivational system to more affect of the valence they postulate as tied to that system. If the approach system actually relates to feelings of both valences, however (as indeed it appears to), such a mechanism is not tenable. A conceptual mechanism is needed that addresses both positive and negative feelings within approach (and, separately, avoidance). The mechanism described here does so.

A second issue concerns the “naturalness” of affects. The viewpoint described here does not postulate “basic emotions,” each evolved to solve an adaptation problem (Izard, 2007). Nor does it postulate social or psychological construction of emotions from a set of ingredients (Barrett, 2006; Russell, 2003). Nonetheless, it does have some implications for the issues of naturalness and distinctness. It postulates one sort of negativity reflecting imminent punishment and another reflecting difficulty moving toward an incentive. It postulates one sort of positivity reflecting imminent reward and another reflecting avoidance of punishment. Thus, this view argues (for example) that frustration and fear are distinguished by their motivational origins, not their construction.

This view has very little nuance, but it can easily be joined to other views that provide nuance. Since incentives differ from each other, it is likely that the affects associated with their attainment or loss will have different overtones, sometimes very different. The same logic applies to threats. This view can be inserted in place of “bad outcome” and “good outcome” in appraisal models, thereby adding to them (in part) the reminder that emotions arise during the flow of experiences, not just at the end.

What this viewpoint adds to discussions of emotional experience is an idea about the initial source of affect, which seems underspecified in many viewpoints. Surely attributions play a role in subjective experience, but the valence they operate on must have a source. Certainly it is possible for affect to have sources other than perceptions pertaining to incentives and threats (Russell, 2003, pp. 154–155), but surely most affect does derive from those sources.

Conclusion

This article describes a conception of the origin and functions of affects. The overall picture is one in which multiple goal values are under pursuit at any given time, juggled so that all the important ones receive attention at one time or another. Positive
affect is a signal that an important outcome is occurring faster than expected; negative affect is a signal of unexpected or undesired interference with the outcome’s occurrence. As affect arises, adjustments occur in behavior (Figure 4), which in turn reduce the affect.

With respect to the topic of this issue, the argument is that one contributor to affective dynamics is the constantly shifting landscape of real-time priority management, which keeps us afloat in our sea of goals. Affects remind us that things which matter to us must be obtained, affirmed, secured, and sometimes avoided (Frijda, 1994). Sometimes being very responsive to one thing that matters simultaneously creates problems for something else that matters. The result is a flow of varying affects over time and experience.

Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Note
1 Which of these is the criterion at any given time, and how the criterion can change, are two of many additional issues that are beyond the scope of this brief article (for broader discussion, see Carver & Scheier, 2013).

References
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