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## Affect and the Functional Bases of Behavior: On the Dimensional Structure of Affective Experience

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*Discussions of the dimensional structure of affect usually are based on results of factor analyses. Disagreements focus largely on issues of measurement and measurement error. I argue that the structure of affect is not discussed meaningfully without considering functional implications of affects. A functional analysis is outlined in which approach and incentive-related affects (both positive and negative) are managed by 1 self-regulatory system, and avoidance and threat-related affects (positive and negative) are managed by another self-regulatory system. In both cases, positive and negative affects are posited to convey information about whether the behavior being engaged in is going well or poorly. This view argues for the existence of 2 bipolar affective dimensions, the properties of which are informed by an understanding of both behavior and feelings.*

Transient affective experience is marked by a hedonic quality—a valence, a sense of positivity or negativity. How is this hedonic quality properly conceptualized? Is there a single bipolar dimension, ranging from positive to negative? Are there two distinct dimensions, one ranging from zero valence to a strong positive valence, the other ranging from zero to a strong negative valence? Are there two distinct dimensions, both of them bipolar?

A set of more basic questions lies behind the attempt to answer the ones just posed: How should researchers and theorists go about deciding what conceptualization is best? What criteria should be satisfied by a candidate model? The primary strategy over several decades has been to examine the factor structure of diverse affective qualities. In this article, I argue that that strategy is insufficient in itself, and it may even be misleading in some respects.

### Factor Analytic Research

The dimensional structure of affect reemerged as a topic of debate in recent flurries of articles in *Psychological Bulletin* (Russell & Carroll, 1999a, 1999b; Watson & Tellegen, 1999), *Psychological Science* (Green & Salovey, 1999; Tellegen, Watson, & Clark, 1999a, 1999b), and the *Journal*

*of Personality and Social Psychology* (Cacioppo, Gardner, & Berntson, 1999; Green, Salovey, & Truax, 1999; Russell & Feldman Barrett, 1999; Watson, Wiese, Vaidya, & Tellegen, 1999). As many of the points made were similar across exchanges, I focus here on the articles appearing in *Psychological Bulletin*. I begin by briefly summarizing the conceptual issues raised and conclusions reached.

Russell and Carroll (1999a) reviewed the history of the debate and raised issues regarding measurement and the use of zero-order correlations to assess relations between dimensions. One issue they raised was how the sampling of items to represent the domain of affect can have a large impact on the conclusions that emerge. For example, they argued that testing for bipolarity requires that semantic opposites be included in the item set, which is not always done. Another issue is how the format by which affects are assessed (bipolar vs. unipolar) can influence the results. Yet another issue is how methodological procedures can limit the possible size of a correlation, so that associations obtained may not be properly interpreted. This review and methodological analysis led Russell and Carroll to conclude that affective valence forms a bipolar dimension: one end positive, the other negative. Independent of that axis is a dimension of activation, which is involved in differentiating affective experiences of similar valence from one another.<sup>1</sup>

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<sup>1</sup>Throughout this article, I treat valence as the core of affect, consistent with the focus taken by Russell and Carroll (1999a, p. 3). The role of activation is taken up later. I focus here on the situational experience of affect, rather than affective tendencies in personality, clinical syndromes, or even the processes by which repeated affective experiences may yield patterns of associations over time. Although those issues are obviously important, they are (with one exception, discussed later) outside the scope of this article.

Watson and Tellegen (1999) concurred on several measurement issues and raised further ones. They also pointed out that in many cases negative-affect items fail to correlate with positive-affect items, which contradicts a bipolarity view, and instead fits a view in which positive and negative affects are independent. They went on to say, however, that the two dimensions that they now call positive and negative activation (formerly positive and negative affect) stand at an intermediate level in what is actually a hierarchy of affective experience. At a higher level of the hierarchy, a single bipolar dimension of happiness-to-unhappiness emerges. Thus, their model has a place for bipolarity, although their writings have generally emphasized independence.

In a rejoinder, Russell and Carroll (1999b) concluded from Watson and Tellegen's comments that there is agreement on most issues. Both agree that there is a kind of bipolarity, at some level. Both also agree that two axes are involved in affect-related experience. The camps differ on where to locate the axes and thus differ on what the "correct" axes are. To Russell and Carroll, activation is a dimension that stands orthogonal to valence. Watson and Tellegen instead incorporate activation into each of two differently valenced dimensions.

### Functional Analysis

It would be easy to come away from the *Psychological Bulletin* exchange (and, for that matter, the *Psychological Science* exchange and much of the Special Section of the *Journal of Personality and Social Psychology*) with the impression that how to view the structure of affective experience depends almost entirely on issues of measurement error, sampling of descriptors, and response formats. I think this would be a serious misimpression. To claim an understanding of the structure of affect requires using at least one additional criterion. It requires mapping affect onto the functioning of the organism in which the affect arises (see also Higgins, Grant, & Shah, 1999).

Two of the articles in the *Journal of Personality and Social Psychology* Special Section did speak to this issue (Cacioppo et al., 1999; Watson et al., 1999). In my view, however, some key points were obscured in those articles, due in part to the diversity of concerns the articles addressed. More important, the descriptions of functional models in those articles suggested far more theoretical consensus than actually exists. One issue on which consensus is lacking has distinct implications for how to view the dimensionality of affect.

In this section I briefly outline a functional model (drawing from several sources). I then point to an important area of disagreement among what are otherwise similar viewpoints and turn to some implications of that disagreement.

### Motive Models of Approach and Avoidance

A family of motive theories with roots in neuropsychology, psychopathology, and conditioning has become prominent in the past 15 years or so (however, see Buck, 1999, for a different view). The theories share the assumption that two systems underlie behavior (cf. Miller, 1944; Miller & Dollard, 1941).<sup>2</sup> One system manages appetitive, incentive motivation and approach behavior. It has been called a behavioral activation system (Cloninger, 1987; Fowles, 1980), behavioral approach system (Gray, 1981, 1987, 1990, 1994a, 1994b), and behavioral facilitation system (Depue & Collins, 1999). The other system manages aversive motivation and withdrawal or avoidance behavior. It is usually called a behavioral inhibition system (Cloninger, 1987; Gray, 1981, 1987, 1990, 1994b), but the label withdrawal system is also sometimes used (Davidson, 1984, 1988, 1992, 1995, 1998).

These two systems are widely believed to have different neural substrates and to exert distinct influences on action. A secondary theme of these theoretical models concerns affective experience: Specifically, the two motive systems are believed to be the sources of the affect qualities that are relevant to approach behavior and avoidance or withdrawal behavior, respectively.

### Affective States and Frontal Lobe Activation

Substantial evidence on that latter theme comes from work that focuses on neural substrates of emotional experience. Indeed, this work has tended to use affective experience as the vehicle to link the neural substrates back to motives and behavior (for reviews, see Davidson, 1995, 1998; Davidson & Sutton, 1995; see also Watson et al., 1999, pp. 829–831). Most of this work examines EEG activity (or functional neuroimaging). It involves assessing activation in areas of the cerebral cortex in response to affect-inducing stimuli (and assessing individual differences in activation patterns in parallel to individual differences in susceptibility to particular affects).

The findings include the following: Research participants showed relative elevations in *right* anterior cortical activation when exposed to repellant film clips (Davidson, Ekman, Saron, Senulis, & Friesen, 1990), confronted with threat of punishment (Sobotka, Davidson, & Senulis, 1992), and waiting to deliver a speech (Davidson, Marshall, Tomarken, & Henriques,

<sup>2</sup>Some of the models in question assume more than two systems (see Gray, 1987, 1994b; Newman et al., 1993). The points to be made here do not require addressing such complexities, however.

2000). Relatively higher levels of *left* anterior cortical activity have been seen among adults in response to incentives (Sobotka et al., 1992) and positive emotional adjectives (Cacioppo & Petty, 1980), and among 10-month-olds viewing their approaching mothers (Fox & Davidson, 1988).

On the basis of these and a variety of other conceptually compatible findings, Davidson (e.g., 1992, 1995, 1998) argued that portions of the specialized neural substrates for approach and withdrawal (and affects relevant to approach and withdrawal) are lateralized in the left and right anterior regions of the cerebral cortex, respectively. This general view on behavior—that approach and withdrawal and concomitant affects are managed by two distinct neural systems—has much in common with the ideas described just earlier. However, this body of work adds evidence that explicitly links those ideas about behavior to affective experiences.

### Affect as an Indicator of Effectiveness in Ongoing Action

The sources discussed thus far suggest two distinct systems that manage distinct aspects of behavior and create affects relevant to those aspects of behavior. To this picture I now add Carver and Scheier's (1990, 1998) argument about processes by which affect comes to exist. The sense of that argument is that certain feedback systems monitor and regulate the effectiveness with which people move toward incentives and move away from threats. These particular feedback systems are assumed to compare a signal corresponding to rate of progress against a reference rate. The "error signal" of these loops is manifest subjectively as affect. If the rate of movement is too low, negative affect arises. If the rate is high enough (exceeding the criterion), positive affect arises. If the rate is just acceptable but no more, no valence arises.

In essence, the argument is that positive feelings mean you are doing better at something than you need to, and distress or negative feelings mean you are doing worse than you need to (for broader discussion and a review of evidence, see Carver & Scheier, 1998, chapters 8 and 9). The importance of this argument at present is that it implies that any given action can potentially give rise to affect with either of two hedonic valences, depending on how well the action is going.

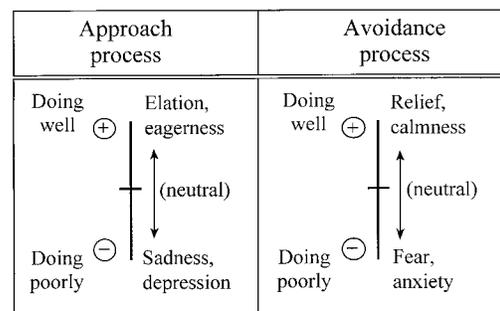
On the other hand, the idea that there are distinct approach and avoidance behavioral systems (and thus distinct approach and avoidance behaviors) suggests a basis for the existence of differences in affect qualities. That is, perhaps affects differ as a function of which system—approach versus avoidance—is managing the behavior and thus generating the affect.

Doing well at moving *toward an incentive* is not the same experience as doing well at moving *away from a threat*. Approach behavior and avoidance behavior both have the potential to induce positive feelings (by doing well). Both approach and avoidance also have the potential to induce negative feelings (by doing poorly). Yet the two positives may not be quite the same as each other, and the negatives may not be quite the same as each other.

Based on this line of thought, and drawing on insights from Higgins and his collaborators (e.g., Higgins, 1987, 1996; Strauman, 1989), Carver and Scheier (1998, 1999) argued for two bipolar dimensions of affect (Figure 1). One dimension relates to the system that manages approach of incentives; the other relates to the system that manages avoidance or withdrawal from threat. The affect dimension relating to the former system ranges (in its "purest" form) from elation, eagerness, and excitement to sadness and dejection. The affect dimension relating to the latter system ranges (in its "purest" form) from fear and anxiety to relief and serenity. Roseman (1984) has taken a similar view (see also Clark, Watson, & Mineka, 1994, p. 107; Cloninger, 1988, p. 103; Frijda, 1986, 1988; Ortony, Clore, & Collins, 1988).

### What Systems Underlie Calm and Sad Affect?

The idea that eagerness, excitement, elation, and so on should relate to an approach process is fairly intuitive. It is also fairly intuitive that fear, anxiety, and so on should relate to an avoidance process. Both of these relations are noted commonly (Cacioppo et al., 1999; Wat-



**Figure 1.** Two sorts of behavioral systems and poles of the affective dimensions held by Carver and Scheier (1998, 1999) to relate to the functioning of each. In this view, approach processes yield affective qualities of sadness or depression when progress is inadequate; they yield eagerness, happiness, or elation when progress exceeds criterion. Avoidance processes yield anxiety or fear when progress is inadequate; they yield relief, calmness, or contentment when progress exceeds criterion. From *On the Self-Regulation of Behavior* (p. 138), by C. S. Carver and M. F. Scheier, 1998, New York: Cambridge University Press. Copyright 1998 by Cambridge University Press. Reprinted with the permission of Cambridge University Press.

son et al., 1999). However, attention must also be given to the opposite poles of these two dimensions, which is done less often (however, see Clark et al., 1994, p. 107; Cloninger, 1988, p. 103).

### **Theoretical Divergence Among Functional Models**

There are, in fact, considerable differences of opinion about these opposite poles. In the view shown in Figure 1, failure to attain an anticipated incentive should lead to negative feelings (e.g., sadness). These negative feelings should be created by a part of the system that manages *approach*. In the view in Figure 1, failure of an anticipated punishment, or removal of a threat, should lead to positive feelings (e.g., relief, contentment, calmness). These positive feelings should be generated by a part of the system that manages *avoidance*.

Some who hold the broad sort of functional view under discussion take a very different position on the source of these two sets of affective experiences. For example, Gray (e.g., 1990, 1994b) held that the inhibition system is engaged not just by cues of punishment, but also by cues of frustrative nonreward. It thus is responsible for negative feelings in response to either sort of cue. Similarly, he held that the approach system is engaged not just by cues of reward, but also by cues of escape or avoidance of punishment. It thus is responsible for positive feelings in response to such cues.

Gray's (e.g., 1990, 1994b) view, then, seems to be one in which each system is responsible for the creation of affect of one and only one hedonic tone (positive in one case, negative in the other). This view yields a picture of two unipolar affective dimensions (running neutral to negative, and neutral to positive), each of which is linked to the functioning of a separate behavioral system. A similar position has been taken by Lang and colleagues (e.g., Lang, 1995; Lang, Bradley, & Cuthbert, 1990), Cacioppo and Berntson (1994; Cacioppo et al., 1999), and Watson et al. (1999).

This view and the view represented in Figure 1 share the assumption that there are distinct approach and withdrawal systems. However, the two views differ in which system is taken as the source of affect arising in response to nonattainment of an incentive and affect arising in response to successful avoidance of a threat. This difference between these two functional models has important implications regarding the dimensionality of affect. An important question, then, is what evidence exists regarding the source of these affects?

### **Evidence Regarding Affect From Successful Threat Avoidance**

With respect to affective responses to "doing well" in threat avoidance, I know of two sources of evidence.

The first is research in which people worked at a laboratory task, experiencing either goal attainment or lack of attainment (Higgins, Shah, & Friedman, 1997, Study 4). Participants in this research were first given either an approach orientation to the task (try to attain success) or an avoidance orientation (try to avoid failing). After the task outcome (which was manipulated), several feeling qualities were assessed. Among persons who had taken an avoidance orientation, success caused an elevation in calmness and failure caused an elevation in anxiety. These effects on calmness and anxiety did not occur, however, among those who had an approach orientation. This pattern suggests that calmness is linked to doing well at avoidance, rather than doing well at approach, consistent with Figure 1.

The other source is data reported many years ago by Watson and Tellegen (1985). In their analysis of multiple samples of mood data, they reported "calm" to be one of the 10 best inverse markers of negative affect, in the majority of the data sets they examined (Watson & Tellegen, 1985, Table 2, pp. 226–227). In contrast, "calm" never emerged as one of the best markers of positive affect. This suggests that these feelings are linked to the functioning of a system of avoidance, again consistent with Figure 1.

### **Evidence Regarding Affect From Nonattainment of Incentives**

With respect to the momentary experience of sadness, I can point to four sources of information, among them the two projects just described. First is the study by Higgins et al. (1997), in which participants were given either an approach orientation or an avoidance orientation to a task and then experienced either success or failure. The conditions I focused on previously were those that led to feelings of calmness and anxiety. However, the study also provided data on sadness. Among persons with an approach orientation, failure caused elevated sadness and success caused elevated cheerfulness. These effects did not occur, however, among participants who had an avoidance orientation. The pattern suggests a link between sadness and doing poorly at approach, rather than doing poorly at avoidance, consistent with Figure 1.

The second source of evidence is the data reported by Watson and Tellegen (1985). They reported "sad" to be one of the 10 best inverse markers of positive affect in the majority of the data sets they examined (Watson & Tellegen, 1985, Table 2, pp. 226–227), whereas it never emerged as one of the top markers of negative affect in those data sets. This pattern suggests a link between sad feelings and the functioning of a system of approach, as in Figure 1. It should be noted that there is an important qualification on this point, which is taken up in detail in a later section. Specifically, "sad" usually relates even

more strongly to the negative affect factor (despite not being among the best indicators of that factor) than it does to the positive affect factor.

A third source of evidence on sadness is a laboratory study (Carver, 2001), in which participants were led to believe they could obtain a desired reward if they performed well on a task. The situation involved no penalty for doing poorly—just the opportunity of reward for doing well. Participants had been preassessed on a self-report measure of the sensitivity of their approach and avoidance systems, a measure that has been validated with regard to both affective responses to cues of impending incentive and threat (Carver & White, 1994) and asymmetries in cortical activity (Harmon-Jones & Allen, 1997; Sutton & Davidson, 1997). Participants were given false feedback indicating they had not done well, and they thus failed to obtain the reward. Reports of sadness and discouragement at that point related significantly to premeasured sensitivity of the approach system, but not to sensitivity of the avoidance system.

A fourth source of information is somewhat less direct. A number of studies stemming from self-discrepancy theory have shown that feelings of depression are uniquely (controlling for anxiety) related to discrepancies between participants' views of their actual selves and their ideal selves (see Higgins, 1987, 1996, for reviews). *Ideals* are qualities a person intrinsically desires to embody— aspirations, hopes, positive wishes for the self. There is evidence supporting the view that pursuing an ideal is an approach process (Higgins, 1996). Thus, this literature also suggests that sad affect stems from a failure of approach.

### Approach, Avoidance, and Depression

Indirect evidence on the question of what system is involved in sadness also can be derived from studies of clinical depression. Such studies must be approached especially cautiously, because they deal not with moment-to-moment affect but rather with diagnostic categories, in which far more is involved than mood disturbance. Nonetheless, some findings are worth noting, as they suggest bases for distinguishing between depression and anxiety that are relevant to this discussion.

There is considerable evidence that depression and anxiety have different antecedents and cognitive concomitants. Finlay-Jones and Brown (1981) found that diagnosis of depression related uniquely to loss and nonattainment events and that diagnosis of anxiety related uniquely to threat events. Clark, Beck, and Brown (1989) found (in psychiatric patients) that depression levels related uniquely to thoughts of loss and failure to attain rewards, whereas anxiety levels related uniquely to thoughts of harm and danger (threat). Conceptually similar evidence has been reported by several other research groups (e.g., Ahrens & Haaga, 1993; Dalgleish &

Watts, 1990; Greenberg & Alloy, 1989; Greenberg & Beck, 1989; Mineka & Sutton, 1992; Strauman, 1989; Wickless & Kirsch, 1988; Young et al., 1996). This accumulated evidence thus links feelings of depression with the experience and perception of loss of incentives, not with threat, consistent with Figure 1.

Research on brain function also implicates the left frontal cortex (the region associated with the approach system) in clinical depression. For example, there is evidence that lesions to the left frontal area result in subsequent depression (reviewed by Robinson & Downhill, 1995). Studies of cerebral activation also provide information, although the data are not without ambiguity. Henriques and Davidson (1991) reported that clinically depressed persons had lower activation in left anterior areas (the areas related to approach) than did nondepressed persons. In contrast, there was no difference in right anterior activation (areas related to avoidance). The general form of this pattern has been replicated by two other research groups (Allen, Iacono, Depue, & Arbisi, 1993; Gotlib, Ranganath, & Rosenfeld, 1998). Together, the findings suggest that clinical depression relates to low engagement of the approach system, rather than to the functioning of the avoidance system (see also Henriques & Davidson, 2000).

The conclusion I draw from these studies (the conclusion also drawn by the authors of the studies) highlights an important difference between the view taken here and the one taken by Watson et al. (1999). Specifically, we differ on whether the data support a role for left hemispheric underactivation in depression or a role for right hemispheric overactivation in depression. These are not the same. Watson et al. said that the data consistently show that happy persons show resting elevations in left prefrontal activity, whereas dysphoric and dissatisfied persons show elevations in right prefrontal activity, citing Tomarken and Keener (1998) as the source for that conclusion. However, Tomarken and Keener actually focused more on the notion of left-frontal *underactivation*, though frequently hedging on that point by incorporating the phrase “relative to the right hemisphere.”

The hedge is reasonable, given the form of much of the data, but it is also problematic. There is in fact a serious problem in this literature, clouding interpretation. In studies of frontal activation, it is very difficult to isolate the contributions of left versus right hemispheric activity. “Asymmetry” effects (which constitute most of the literature) are inherently ambiguous, because an asymmetry can reflect elevated activation in one hemisphere or deactivation in the other (Schmidt, 1999). Another methodological problem in this particular context is the need to attend to comorbidity of anxiety with depression (e.g., Bruder et al., 1997; Heller & Nitscke, 1998; Reid, Duke, & Al-

len, 1998). That is, when anxiety is also present, theory clearly suggests the involvement of elevation in the right frontal areas. Thus, if one wishes to investigate depression as distinct from anxiety, any activation of right frontal areas that stems from anxiety per se must be controlled in some fashion.

Not many studies of frontal activity and depression have reported data on the two hemispheres separately. Henriques and Davidson (1991), Allen et al. (1993), and Gotlib et al. (1998), described earlier (none of which was cited by Watson et al., 1999), all did so. These studies appear to make a case that a role in depression is played by underactivation of the approach system, rather than overactivation of the avoidance system. Such a pattern would be consistent with the model in Figure 1, in implying that neural circuitry in the approach system is involved in depression.

### Section Summary

There are several sources of evidence that implicate an avoidance motivational system in the experience of calmness and an approach system in the experience of sadness. Some of these sources are more ambiguous than others, and I certainly would not claim that the evidence is definitive. Studies are needed that permit a clearer determination of the distinct roles of the two hemispheres in depression (and sad affect). Indeed, evidence on the sources of both calmness and sadness is quite limited overall. This set of questions represents an area of work that begs for further research. At present, however, there is at least some evidence that fits the view illustrated in Figure 1—certainly enough that it would be premature to discount it.

### What Is the Role of Activation?

Another issue that should be addressed is the role of activation in affective experiences. In one factor analytically-based model, activation is a variable independent from valence that moderates the impact of valence on subjective experience (Russell, 1980; Russell & Carroll, 1999b). In contrast, Watson and Tellegen (1999) raised the issue of activation by way of discussing how varying the descriptors of positive and negative affect can vary the relations obtained between pairs of descriptors. They held that the key issue in whether a positive affect quality correlates inversely with a negative affect quality (or instead is relatively poorly related to it) is whether the affects incorporate high activation—“... the level of activation systematically influences the degree of bipolarity between pairs of oppositely valenced mood states” (p. 602).

Why should activation be so critical a variable? To read Russell and Carroll (1999b) and Watson and Tellegen (1999), the answer seems largely psychometric. The dimensions emerging from factor analysis, and the placement of specific affects on those dimensions, seem to reflect variations in activation. The functional model, however, suggests another interpretation (the substance of which was also described by Watson et al., 1999). This interpretation adds psychological meaning that is otherwise absent.

Consider the poles of the two dimensions in Figure 1. Fear is an energized affect; relief and contentment are not. Elation, joy, eagerness, and enthusiasm are energized; sadness is not. In each case, the activated pole is at the “business end” of the corresponding behavioral system. It is at the pole where action of a sort relevant to that system is focused. Activation in an approach system occurs when the person is in hot pursuit of an incentive—when the situation invites pouncing. Activation in an avoidance system occurs when one is near a danger—when the situation invites panic and fleeing (cf. Riskind, Kelley, Harman, Moore, & Gaines, 1992). Pouncing and fleeing are the primary purposes of these two systems (see also Cacioppo et al., 1999). This asymmetry in activation thus is consistent with the idea that the two affect dimensions arise from functioning of behavioral systems with different purposes (see also Idson, Liberman, & Higgins, 2000; Watson et al., 1999).

It is of some interest that these observations about the activation at the extremes of engagement of the behavioral tendencies are also in accord with the form of the well-known approach and avoidance gradients of Miller and Dollard (1941; Miller, 1944). In those gradients, the approach tendency is strongest close to the incentive (where the approach system is most fully engaged) and the avoidance tendency is strongest close to the threat (where the avoidance system is most fully engaged). Presumably these action tendencies are also paralleled by the affects that are experienced in those situations—eagerness and fear, respectively. Indeed, evidence discussed by Watson et al. (1999) suggested a basis for the fact that avoidance gradients have steeper slopes than approach gradients. Perhaps this difference reflects differences in the urgency of the responses that are made to threats versus incentives. That is, responses to threat have an emergency character that is generally lacking in responses to incentives (Clark & Watson, 1988).

From this point of view, however, high versus lower activation per se is not the key issue. Activation is a concomitant of engagement of the motivational-behavioral system to which the affect relates. Why do positive and negative affects with high activation typically not correlate strongly inversely? Because situations that invite pouncing on incentives sometimes

(although not always) incorporate threats as well, thereby arousing both eagerness and anxiety simultaneously (cf. Lazarus & Folkman, 1984). Indeed, Erikson (1968) used the label “crisis” to refer to the confluence of great opportunity (which prompts a sense of challenge and eagerness) and great potential for harm (which prompts a sense of threat and anxiety) and made this idea a cornerstone of his view of human development. Such co-occurrences between challenge and threat experiences would weaken the negative association between the high-activation affects reflecting fear and eagerness.

### **Does the Concept of Affect Imply High Activation?**

Must an experience have high activation to qualify as an affect? This appears to be the position that was taken by Watson et al. (1999, esp. p. 827), echoing an earlier statement by Zevon and Tellegen (1982, p. 112). Watson et al. wrote that they “increasingly view [the dimensions] as truly unipolar constructs that essentially are defined by their high poles” (p. 827). They continued, “we now view these dimensions as reflecting two basic biobehavioral systems of activation. As such, the activated, high ends of the dimensions fully capture their essential qualities” (p. 827).<sup>3</sup>

I believe this view of the nature and functions of the approach and avoidance systems is too limited. The most salient function of the approach system is certainly to obtain desired incentives. However, another function of this system is to respond adaptively when effort to approach an incentive turns out to be futile. Some incentives are better abandoned—disengaged from—and I believe that the process by which this disengagement occurs involves the approach system (cf. Klinger, 1975). The experience of sadness would seem to be part of the process (or a subjective manifestation of the process) of putting one incentive aside, preparatory to opening oneself to the potential of another one. Indeed, Nesse (2000) has proposed a similar function for clinical depression.

In the same way, it is clear that the primary function of the withdrawal system is protecting the organism from potentially deadly threats. However, the experience of relief, of safety and serenity, also has a function. It is part of the process (or a subjective manifestation of the process) of regrouping, restoring one’s access to energy supplies (cf. Muraven, Tice, & Baumeister, 1998), preparatory to turning to some new activity (see also Carver, in press).

I believe it is a mistake to treat the low-activation ends of these dimensions as trivial. It seems clear that giving up the pursuit of the unattainable is an important consideration in life (Carver & Scheier, in press). It also seems clear that successful escape or avoidance of a threat is an important event. I believe that the affects that are associated with these experiences, despite being low in activation, are also important.

### **Factor Analytic Studies Reconsidered**

As described in a previous section, Watson and Tellegen (1985) found that “sad” was a good indicator of positive affect and that “calm” was a good indicator of negative affect across many data sets, whereas neither was among the best indicators of the opposite factor. My point there was that these feeling qualities do have links to the motivational dimensions portrayed in Figure 1.

However, there is an important qualification to that point: “Sad” usually relates even more strongly to negative affect than to positive affect in this type of study (e.g., Zevon & Tellegen, 1982). Why, then, was it never one of the best indicators of negative affect in the samples Watson and Tellegen (1985) examined? The answer may be that the item sets had an abundance of indicators of negative affect, particularly the anxiety-related feelings around which this factor usually coalesces. Thus, “sad” never made it to the best-indicator list, despite loading heavily on the negative affect factor.

Why does sadness often relate strongly to anxiety? I offer two responses.

### **Co-occurrence of Threat and Failure**

One response is based on the fact that life is a complex enterprise. Laboratory settings can be arranged to isolate a specific set of contingencies (e.g., failure to attain an incentive conjoined with an absence of punishment), but events outside the lab usually have implications for many motives and goals. Outside the lab, an impending punishment often implies simultaneously the creation of impediments to attaining desired goals (Carver, Meyer, & Antoni, 2000; Carver & Scheier, 1998, 1999). For example, being fired from a job makes it harder to buy groceries. Collecting too many traffic tickets can cause the loss of driving privileges and make it hard to engage in desired pursuits. A threatening medical diagnosis leading to potentially painful and damaging medical procedures also implies the possibility of losing access to activities that one enjoys. Thus, feelings of sadness and anxiety can be expected to coincide in many contexts of adversity,

<sup>3</sup>As an aside, it is hard for me to imagine that sadness is not an affect; it is also hard for me to imagine sadness as involving much activation.

despite (from my point of view) having different self-regulatory roots. Evidence consistent with this reasoning has been reported by Finlay-Jones and Brown (1981).<sup>4</sup>

Despite the fact that sadness and anxiety often co-occur, it should also be stressed that they are distinguishable from each other as feelings. Higgins and his colleagues (Higgins, 1987, 1996) have shown that despite the strong correlations between them, feelings of depression are uniquely (controlling for anxiety) related to what seems to be a purely approach process, whereas feelings of anxiety are uniquely (controlling for depression) related to what seems to be at its core an avoidance process (cf. Carver, Lawrence, & Scheier, 1999). Other findings indicating a lack of convergence between depression and anxiety have been reported by Burns and Eidelson (1998).

### What Does Factor Structure Mean?

My second response is that I think circumplex models can be misleading. They place a set of items into a two-dimensional space on the basis of similarities among ratings made on the items. However, similar ratings can occur for many reasons. Some bases for similar ratings are especially salient, others less so. Valence is certainly a salient basis for making similar ratings, and a good case can be made that activation is another. If salient similarities drive the empirical associations, the factor structure will be dictated by what is salient. That does not imply, however, that the resulting factor structure is fully informative about what the affects actually mean.

One way in which I think the circumplex can be misleading concerns the dimension typically labeled activation or engagement (Figure 2). This axis is fundamental to Russell (1980), whereas it is secondary to Watson and Tellegen (1985). To treat engagement as a dimension of affective experience, however, begs the question of what is being engaged. The indicators of high engagement (“aroused,” “astonished,” “surprised” in the Watson & Tellegen circumplex) have no directionality. It appears, then, that in the circumplex, engagement equals engagement—whether it entails an approach response or an avoidance response. This appears to contradict the evidence that approach and



Figure 2. Circumplex model of affect, showing some of the affects placed at each octant. From “Toward a Consensual Structure of Mood,” by D. Watson and A. Tellegen, 1985, *Psychological Bulletin*, 98, p. 221. Copyright 1985 by the American Psychological Association. Adapted with permission.

withdrawal are managed by two distinct biobehavioral systems, discussed earlier. From a functional view, the very concept of engagement has little meaning without knowing whether it is an approach or an avoidance system that is engaged.

This issue seems to represent a larger conceptual problem for Russell’s (1980) model than Watson and Tellegen’s (1985) model. From the latter view, it presumably would be argued that the pole of strong engagement represents the case in which both approach and withdrawal systems are fully engaged. There is no dominant valence at that point in the circumplex, because the two valences are evenly matched.

Another, more important case in which the circumplex can be misleading concerns the fact that items with negative valence all tend to pile up in the same region of the evaluative space. If one were to assume that circumplex models reflect salient surface similarities, this would come as no surprise. Does it also mean that these affects are all more or less the same, functionally? Not necessarily.

Anxiety is the prototypic affect relating to the withdrawal system (Gray, 1990, 1994b), which is the system that Watson et al. (1999) described as being responsible for negative affect. In the circumplex, anger falls virtually on top of anxiety. That is, “hostile” is in the same location as “fearful” and “nervous” in Watson and Tellegen’s (1985) version; “anger” is right next to “nervous” in Russell’s (1980) version.

Although the circumplex links anger closely to anxiety (which is rooted in the withdrawal system), other evidence links anger instead to the *approach* system. Anger has been found to produce activation in the left anterior cortical region, the region that has been tied to

<sup>4</sup>Unlike “sad,” “calm” does not usually have a strong cross-loading on the alternate factor (i.e., positive affect). This may suggest an asymmetry in co-occurrences. That is, incentive attainment and threat avoidance may co-occur less often than do the two kinds of adverse outcomes (although clearly they do occur sometimes; cf. Carver & Scheier, 1998, pp. 51–55). Although bad events can have a cascade effect on other bad events, a similar cascade among positive experiences may be less common (though see Sheldon & Houser-Marko, 2001, for evidence that it does occur sometimes).

the approach system (Harmon-Jones & Sigelman, 2001). Anger responses have also been found to be predicted by individual differences in self-reported sensitivity of the approach system (Carver, 2001). In neither of these studies was there evidence that activation (or sensitivity) of the avoidance system was involved in the anger response, as would be expected if there were a close functional relation between anger and anxiety.

These findings raise a very interesting question about why anger and fear reside in the identical location (or nearly identical locations) in the circumplex models. Perhaps it is because the two affects have surface similarities, rather than because they have similar functional properties.

The circumplex model has been a useful descriptive tool. However, I do not believe it should be viewed as a “gold standard” regarding the nature and underpinnings of affects (for discussion of other problems with these models, see Remington, Fabrigar, & Visser, 2000; Watson et al., 1999). Other criteria are also important, and the use of such alternative criteria can lead to different answers than come from factor analyses.

### **Conceptualizing Affect: What to Conclude?**

How should affective experience be dimensionalized? I pose this question in two senses: by what criteria and into what kinds of dimensions. With regard to criteria, I have argued the merits of using a functional approach to the meaning of affects as a criterion for the plausibility of a given model. There are several ways to implement such a criterion, two of which were alluded to in the previous section. One strategy is to determine what cortical regions are active during affective states, interpreting the results by reference to an information base linking two areas of cortical activation to engagement of approach and withdrawal systems, respectively. Another strategy is to use a measure of dispositional sensitivity of approach and avoidance systems and see which persons are the most responsive to carefully structured situations. Both strategies provide an angle on the function of affects that differs from the one coming from factor analytic work.

Although many will agree that the functional criterion is an important one, it is just as important to recognize that functional models are not all alike. As described earlier, some such models imply two unipolar affect dimensions, whereas at least one functional model implies two bipolar dimensions. These two sets of functional models thus make some competing predictions. Further testing of these competing predictions should be an important focus for affect research.

Such tests will have potentially far-reaching implications for conceptualizing the nature of the process by which affect comes to exist. For example, suppose that evidence were to accumulate that affects of both valences arise from approach processes and that affects of both valences arise from avoidance processes (as in Figure 1). This would seem to imply the need for a functional mechanism that could somehow create affective deviations in both directions from neutral. One such mechanism has been proposed (Carver & Scheier, 1990, 1998), and other possibilities may well exist. If, instead, evidence were to accumulate that affects of one valence arise from approach processes and affects of the other valence arise from withdrawal processes, a different type of mechanism would be needed.

The view presented here came not from psychometric arguments, but from examining functional properties of approach and withdrawal systems and evidence linking specific types of affects to those systems. Using this criterion leads to a substantive position on dimensionality of affect that resembles that of Watson and Tellegen (1985, 1999) more than it does that of Russell (1980; Russell & Carroll, 1999a). The analysis presented here suggests that affects are best viewed as organized around two dimensions, one of them linked to the approach system, the other linked to the avoidance system. However, I regard each dimension as incorporating two valences, whereas Watson and colleagues (1999) regarded each as unipolar.<sup>5</sup>

This view also speaks indirectly to the alternative model (Russell, 1980; Russell & Carroll, 1999a). It argues that relief, calmness, and contentment differ from eagerness and excitement (although all are positive feelings) in ways that are more complicated than the mere degree of activation that accompanies them. Similarly, it addresses the fact that sadness differs from fear (although both are negative feelings) in ways that are more complicated than the mere degree of activation that accompanies them (see also Burns & Eidelson, 1998). It argues that these differences among feelings are grounded in differences in the nature of the core motives to which they pertain—approach and avoidance.

<sup>5</sup>A related but distinguishable area of discussion is Cacioppo and Berntson's (1994) position that the evaluative space of attitudes is two-dimensional, corresponding to the dimensions of the Watson and Tellegen model (see also Cacioppo et al., 1999). As Russell and Feldman Barrett (1999) noted, that is less a model of affective experience than a model of evaluative reactions to specific stimulus classes. Cacioppo and Berntson made the assumption that each dimension is unipolar. From my point of view, a complex attitude should be able to incorporate not just two affect qualities (positive and negative), but (at a minimum) feelings of eagerness, sadness, fear, and contentment—all poles of the dimensions in Figure 1.

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