

Negative Affects Deriving From the Behavioral Approach System

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Does the behavioral approach system (BAS) relate to the experience of any negative affects, or are all negative affects tied to the behavioral inhibition system (BIS)? In Study 1, self-reported Fun Seeking predicted reports of greater frustration and sadness after frustrative nonreward. In Study 2, self-reported Reward Responsiveness predicted reports of greater anger in response to scenarios. In Study 3, self-reported Drive predicted reports of greater anger after the terrorist attacks of September 11, 2001. In no case did BIS sensitivity contribute uniquely to these affects, though BIS predicted nervousness in Study 2 and fear in Study 3. Discussion focuses on the role of frustration and anger in effortful pursuit of goals and depressed affect in disengagement from goals.

In recent years, increasing interest in theoretical links from neurobiological systems to motivation, emotion, personality, and psychopathology has emerged (e.g., Carver, Sutton, & Scheier, 2000; Davidson, 1998; Depue & Collins, 1999; Depue & Zald, 1993; Fowles, 1993; Gray, 1994a, 1994b; Sutton & Davidson, 1997). It now is often argued that distinct aversive and appetitive motive systems underlie affective and behavioral response tendencies (Carver & White, 1994; Davidson, 1984, 1998; Gray, 1994a; Harmon-Jones & Allen, 1997; Henriques & Davidson, 1991; Konorski, 1967; Lang, 1995; Sutton & Davidson, 1997) and even dimensions of personality (Carver et al., 2000; Depue & Collins, 1999; Fowles, 1993; Gray, 1994a; Lucas, Diener, Grob, Suh, & Shao, 2000; Tellegen, 1985).

One of these systems is often called a *behavioral approach system*, or BAS (Gray, 1972, 1994a), or sometimes a *behavioral activation system* (Fowles, 1980, 1987), or a *behavioral facilitation system* (Depue & Collins, 1999). When activated by incen-

tive cues, it is responsible for approach and positive affect (Fowles, 1993; Gray, 1994a, 1994b). Electroencephalographic (EEG) and neuroimaging data indicate that approach of incentives tends to relate to higher relative activation in areas of the left prefrontal cerebral cortex, suggesting that the circuitry underlying approach is partially localized in these areas (e.g., Harmon-Jones & Allen, 1997; Sobotka, Davidson, & Senulis, 1992; Sutton & Davidson, 1997; for reviews and detail, see Davidson, 1992, 1998; Davidson, Jackson, & Kalin, 2000).

The other system is often called a *behavioral inhibition system*, or BIS (Gray, 1972, 1994a), or sometimes a *withdrawal system* (Davidson, 1992, 1998). When it is activated by the perception of threat, the result is inhibition or withdrawal behavior (Fowles, 1993; Gray, 1994a) and anxiety. EEG and neuroimaging studies indicate that the presence of threatening stimuli tends to relate to higher relative activation in areas of the right prefrontal cortex, suggesting that the circuitry underlying avoidance is partially localized in these areas (Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Sobotka et al., 1992; for reviews and detail, see Davidson, 1992, 1998; Nitschke & Heller, 2002).

People presumably vary in BAS sensitivity and (independently) in BIS sensitivity. Given cues of incentive, persons high in BAS sensitivity should have more transient positive affect (Carver & White, 1994) and engage in more approach behavior than those lower in BAS sensitivity. Given cues of threat, persons high in BIS sensitivity should have more tran-

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sient anxiety and avoid more than those lower in BIS sensitivity (Carver & White, 1994; Davidson, 1992, 1998; Gray, 1994a).

This family of theories has drawn the attention of many people whose core interests are not in neurobiology but in personality–social psychology. For example, Watson, Wiese, Vaidya, and Tellegen (1999) linked the Watson and Tellegen (1985) analysis of mood to such ideas. Cacioppo and Berntson (1994; Cacioppo, Gardner, & Berntson, 1999) used such ideas to probe the structure of attitudes. Higgins (1987, 1996, 1997) has proposed a model of approach and avoidance that has resonances to these core themes, as have Carver and Scheier (1998, 1999; Carver et al., 2000).

This article considers certain implications these theories have for affects. Theorists of this group concur that affects such as eagerness, excitement, and elation relate to approach. There is similar consensus that affects such as anxiety and guilt relate to withdrawal. Evidence tends to link these sets of affects to differential involvement of certain cortical areas outlined earlier. Indeed, one study has found that using biofeedback to change relative frontal activation caused changes in reported emotional reactions (Allen, Harmon-Jones, & Cavender, 2001).

Although the theories concur on the affect groups just named, they diverge regarding the source of other affects. For example, if a person is failing to attain an incentive, which system underlies negative feelings that arise? This question is the focus of this article.

Theoretical Divergence

Most of the theories just outlined are organized such that affects of one valence are tied to one system and affects of the other valence are tied to the other system. This is a view in which each system relates to a unipolar affect dimension, ranging from zero to intense. For example, Gray (1981, 1990, 1994b) holds that the BIS is engaged by cues of punishment and cues of frustrative nonreward. He thus views BIS as responsible for negative feelings in response to either cue. Similarly, he holds that BAS is engaged by cues of reward or of escape from (or avoidance of) punishment. BAS thus is responsible for positive feelings in response to such cues. Gray's view, then, is in which each system is responsible for affect of one hedonic tone (positive for BAS, negative for BIS).

Several personality–social theories also take this position. Watson et al. (1999) wrote,

... as our view of these dimensions has evolved, we increasingly have come to see them as truly unipolar

constructs that essentially are defined by their high poles ... we now view these dimensions as reflecting two basic biobehavioral systems of activation ... the low poles of these dimensions ultimately reflect the absence of a particular kind of activation rather than the presence of a certain affective state. (p. 827)

Cacioppo et al. (1999) took essentially the same position. The writings of Lang and colleagues (e.g., Lang, 1995; Lang, Bradley, & Cuthbert, 1990, 1992, 1998), though addressing the issue less explicitly, also appear consistent with a unipolar view.

In each of these models, the appetitive motivation system is responsible for the existence of positive but not negative feelings; the aversive motivation system is responsible for the existence of negative but not positive feelings. The pathway by which the affects come to exist appears simple: Greater engagement of a motivational system yields affect of higher intensity (with the valence of the affect determined by which system is engaged). Given the origin of the affects in these theories, there is no obvious way to predict affect of the opposite valence arising from either system.¹

¹ A distinction must be made here between affect and resultant action tendency. Cacioppo et al. (1999), noting that the “net predisposition” to act is inevitably bipolar (i.e., approach vs. withdraw), held that this action predisposition results from the merging of the two unipolar affective qualities that underlie it (Cacioppo et al., 1999, pp. 841, 845; see also Lang et al., 1992). This resultant action predisposition is the only respect in which their view is bipolar. However, that bipolarity does not pertain to the origin of affect per se, but to the direction of the behavior that results from overlaying of multiple affects. Thus, the bipolarity in that model is not relevant to the issue at hand.

This issue having been raised, let me point out that a conception of action that relies only on summation of various forces obscures what may be important distinctions. There is a considerable difference between giving up and stepping away from an incentive when one has no hope of its attainment (on the one hand) and an avoidance response to a feared stimulus (on the other), despite the topographic similarity (i.e., both involve withdrawal). Evidence bearing on this point is described shortly (see also Carver, 2001; Carver & Scheier, 1998; Higgins, 1996, 1997). There is a widespread and, I suspect, growing failure in the literature to make this distinction (e.g., Blascovich, Mendes, Hunter, & Salomon, 1999; Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001, p. 89). These two kinds of phenomena, despite having surface similarities, are created by different patterns of forces and should be distinguished from each other.

This model of two unipolar dimensions has gradually taken over the mainstream of thought on the dimensionality of affects. This is not to say that there remain no disagreements (see, e.g., Ekman & Davidson, 1994; Russell & Carroll, 1999a, 1999b); indeed, it should be noted explicitly that the assumption that affects form dimensions is not embraced by all emotion theorists (see, e.g., Izard, 1977; Levenson, 1994, 1999). However, those who do view affects in dimensional terms have widely adopted the position that was just outlined.

Not everyone has done so, however. A very different stance was taken by Carver and Scheier (1990, 1998, 1999), deriving from their position that human behavior reflects feedback processes (cf. MacKay, 1956, 1963; Miller, Galanter, & Pribram, 1960; Powers, 1973). They posit two classes of feedback processes as underlying approach and avoidance, respectively. That separation of approach from avoidance echoes the form of the biobehavioral models described earlier. Carver and Scheier's argument about the origin of affect is that another set of feedback loops monitors the *effectiveness* of movement toward incentives (and, separately, away from threats). These loops are assumed to compare a signal corresponding to rate of progress against a reference rate. The "error signal" from this comparison is manifest subjectively as affect. If the rate is too low, negative affect arises. If the rate is acceptable but no more, there is no affect. If the rate exceeds the criterion, positive affect arises. In essence, the idea is that positive feelings mean you are doing better than you need to, and negative feelings mean you are doing worse than you need to (Carver, 2003a; Carver & Scheier, 1998). Evidence fitting this "velocity" hypothesis has come from several studies (e.g., Affleck et al., 1998; Baumeister & Bratslavsky, 1999; Brunstein, 1993; Brunstein, Schultheiss, & Grässmann, 1998; Hsee & Abelson, 1991; Lawrence, Carver, & Scheier, 2002).

This view asserts that either type of motive—approach or avoidance—can give rise to either valence of affect—positive or negative—depending on how well the action serving the motive is going. Put differently, it asserts that affects of both valences exist for an approach system and (separately) for an avoidance system. The sense of this view is shown in Figure 1. Nor is this the only logical basis for a viewpoint in which there are two bipolar affect dimensions. Higgins (1996, 1997) has proposed a theory that similarly argues for two bipolar dimensions (see also Cloninger, 1988, p. 103; Depue & Zald, 1993; Frijda,

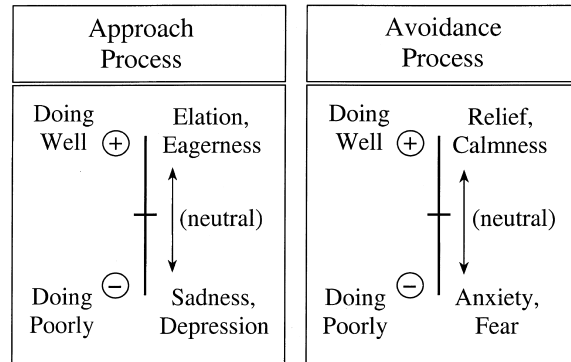


Figure 1. Bipolar affect dimensions in the Carver and Scheier (1998) model. In this view, approach yields affect qualities of sadness or depression when progress is inadequate; it yields eagerness, happiness, or elation when progress exceeds criterion. Avoidance or withdrawal yields anxiety or fear when progress is inadequate; it yields relief, calmness, or contentment when progress exceeds criterion. From *On the Self-Regulation of Behavior* by C. S. Carver and M. F. Scheier, 1998, New York: Cambridge University Press. Copyright 1998 by the Cambridge University Press. Adapted with permission.

1986; Johnson-Laird & Oatley, 1992; Ortony, Clore, & Collins, 1988; Roseman, 1984).

To summarize, several theories predict that the approach system relates to positive feelings but appear to have no basis for predicting that the approach system would underlie any negative feelings. Other theories predict instead that certain negative feelings, as well as positive feelings, are rooted in the approach system.

Approach and Sadness

There are several existing sources of evidence on this issue. One negatively valenced affect that Carver and Scheier (1998) linked to approach is sadness. Evidence regarding the foundations of sadness, or depression, can be found in both the literature of clinical psychology and the literature of social-personality psychology. In the clinical literature, there is considerable evidence that depression relates to the experience of loss and failure to attain incentives, whereas anxiety relates to the experience of threat (e.g., Ahrens & Haaga, 1993; D. A. Clark, Beck, & Brown, 1989; Dalglish & Watts, 1990; Finlay-Jones & Brown, 1981; Greenberg & Alloy, 1989; Greenberg & Beck, 1989; Mineka & Sutton, 1992; Strauman, 1989; Wickless & Kirsch, 1988; Young et al., 1996).

In the experimental social psychological literature, a good deal of work on the source and meaning of

sadness has been done by Higgins and his colleagues. In one particularly clear study (Higgins, Shah, & Friedman, 1997, Study 4), participants first received either an approach orientation to a task (try to attain success) or an avoidance orientation to the same task (try to avoid failing). They then worked at the task, in which they experienced either goal attainment or lack of attainment. After the outcome (which was manipulated), feelings were assessed. Among persons with an approach orientation, failure elevated sadness and success elevated cheerfulness. These effects did not occur, however, among persons with an avoidance orientation. They instead showed elevated calmness after success and elevated anxiety after failure. These results suggest a link between sadness and doing poorly at approach. The approach system is implicated by the nature of the instructional set that led (in combination with failure) to the feelings of sadness.

Another source of information is the literature of self-discrepancy theory (Higgins, 1987, 1996). Several studies have shown that dejection-related feelings such as sadness uniquely (i.e., controlling for anxiety) relate to discrepancies between people's views of their actual selves and their ideal selves. Ideals are qualities a person desires to embody—aspirations, hopes, positive wishes for the self. There is evidence that pursuing an ideal is an approach process (Higgins, 1996). Thus, this literature as a whole also suggests that sad affect stems from a failure of approach (see also Shah & Higgins, 2001).

Approach and Anger

Frustration and sadness are not the only negative feelings that might arise in approach. Another candidate is anger. There are sharply differing opinions about where anger falls in the emotional grand scheme. Some see a strong link between anger and fear.² For example, Russell and Feldman Barrett's (1999) circumplex model places anger very close to fear, with both being unpleasant and moderately activated. Tellegen, Watson, and Clark's (1999) examination of the dimensional structure of mood also placed anger and fear very close together, though not as close as Watson and Tellegen (1985) had placed them.

These placements of anger and fear very near to each other are consistent with the sense of the well-known phrase "fight or flight" response (Cannon, 1929). That phrase has several connotations. It implies that the two actions both involve mobilization of energy and thus have a common pathway at some level. The phrase also suggests that the two kinds of

actions are closely related, in the sense that a given situation might lead to either of them, depending on other factors (see, e.g., Berkowitz, 1993, p. 11; Lindsay & Anderson, 2000). In describing their evolutionary view of emotion, Lang et al. (1998, p. 1249) similarly held that fear and anger both arise from the aversive motivational system.³

Others have linked anger not with fear, but rather with the blockage or frustration of a desired goal, or the disruption of some condition the person believes ought to exist (e.g., Berkowitz, 1993; Depue & Zald, 1993; Dollard, Doob, Miller, Mowrer, & Sears, 1939; Ekman & Friesen, 1975; Frijda, 1986; Harmon-Jones & Allen, 1998; Izard, 1977; Ortony et al., 1988; Plutchik, 1980). This implies a different dynamic, one involving approach rather than avoidance (cf. Fox, 1991; Fox & Davidson, 1988). Indeed, a great deal of research on phenomena such as partial reinforcement has linked frustration to persistent effort to obtain incentives (Amsel, 1958, 1967). This general view also suggests that anger and fear are more distinct than the first group of theories imply them to be (see Lerner & Keltner, 2000, 2001; Mackie, Devos, & Smith, 2000, for evidence of their distinctiveness).

Several findings are consistent with the idea that anger stems from approach. In an early EEG study, Fox and Davidson (1988) examined 10-month-olds' facial expressions and EEG in situations involving mothers' approach and departure. A relation emerged between facial expressions of anger (in the absence of crying) and greater relative left frontal activation. Because the left frontal area is linked to approach (indeed, the same EEG pattern occurred with mothers' approach), the pattern suggests that anger relates to activation of the approach system. The sample was small, however, and there are several sources of am-

² Some have distinguished fear from anxiety (e.g., White & Depue, 1999), but that issue is beyond the scope of this discussion.

³ This discussion pertains to anger as an affect, rather than to aggression as an action. It is clear that aggression has several different motivational sources. Some aggression is motivated by anger, but aggression can also arise from fear (if aggression is the only apparent way to escape from the feared event). As Lang et al. (1992) put it, "While withdrawal is the primitive behavioral characteristic of aversive states, the tactical response . . . can be attack . . . as well as flight. . . . This analysis also implies that outwardly similar behaviors (e.g., predator aggression and defensive attack) can be driven by different motivational strategies." (p. 44)

biguity, including the fact that the data were asymmetry scores. This asymmetry could reflect increased left activation, decreased right activation, or both. Given these alternatives, anger might reflect greater approach or lesser avoidance (or both). In any case, however, this pattern does not fit a view in which anger relates to elevated BIS responses.

Two more recent EEG studies also bear on this idea. Harmon-Jones and Allen (1998) studied individual differences in trait anger. Higher levels of trait anger related to higher levels of left frontal activity (and to lower levels of right frontal activity). Again, this pattern suggests a link between anger and the approach system, and this time the issue of asymmetry does not arise. However, an important qualification is that this finding pertains to trait anger rather than state anger.

More recently, Harmon-Jones and Sigelman (2001) induced a state of anger in some persons but not others and then examined cortical activity. Consistent with the findings described thus far, they found elevations in relative left frontal activity, suggesting that anger relates to greater engagement of the approach system. However, this finding was an asymmetry effect, as in the Fox and Davidson (1988) study. This ambiguity aside, however, the data do not in any way support a view in which anger relates to elevated BIS responses.

Another source of indirect evidence on anger and approach is the fact that anger (as well as euphoria) is a central symptom of mania (American Psychiatric Association, 1994). Mania is a disorder that is believed by some to involve overactivation of the approach system (e.g., Depue & Iacono, 1989; Fowles, 1993; Johnson et al., 2000; for data consistent with this view, see Johnson et al., 2000; Lozano & Johnson, 2001; Meyer, Johnson, & Winters, 2001). Thus, the prominence of anger in mania also suggests a link between anger and the approach process.

Present Research

The evidence just described that BAS is involved in the creation of certain negative affects is important, but some of it is equivocal. Given the theoretical disagreement, more information is certainly desirable. Obtaining more information was the goal of the research reported here.

There are several ways in which roles of approach and avoidance might be investigated. One strategy is to manipulate the engagement of the approach and avoidance systems by experimental instructions (Higgins et al., 1997). A second strategy is to measure

activity at brain areas linked to approach and avoidance (Fox & Davidson, 1988; Harmon-Jones & Allen, 1998; Harmon-Jones & Sigelman, 2001). Another strategy relies on individual differences in BAS and BIS sensitivities (cf. Underwood, 1975): BAS and BIS sensitivities can be assessed and related (separately) to the affect. If the affect is BIS-driven, it should relate to individual differences in BIS sensitivity. If the affect is BAS-driven, it should relate to individual differences in BAS sensitivity.

The studies reported here used the latter method. The measure of individual differences was Carver and White's (1994) BIS/BAS scales. The BIS and BAS scales have been shown to predict reports of anxiety and happiness, respectively, in the presence of situational cues of impending threat and impending reward (Carver & White, 1994; Gable, Reis, & Elliot, 2000). They have also predicted greater responses to punishment and reward, respectively, in the context of conditioning (Zinbarg & Mohlman, 1998). Differences on these measures have also been related to differences in resting levels of cortical arousal (Harmon-Jones & Allen, 1997; Sutton & Davidson, 1997). In sum, the cumulative evidence suggests that the scales relate to the sorts of phenomena to which they should relate, if they are valid indices of individual differences in BAS and BIS sensitivity.

It is of particular importance here that the items of the BAS scales focus on affective and behavioral responses to incentive cues. More specifically, all BAS-related items describe *positive* emotional and behavioral reactions to three aspects of the possibility of obtaining incentives (being motivated to seek them, being persistent in pursuit of them, and having positive feelings when obtaining them). No BAS item refers in any way to an adverse event, nor is there any hint of negative affect in the content of any BAS-related item. The opposite is true of BIS items. Each references a threatening event and assesses emotional responsiveness to the threat. On the basis of the semantic content of the items, then, there should be a bias toward linking BIS items to reports of adverse affective experiences, contrary to my prediction.

Study 1: Frustrative Nonreward

Study 1 focused on a context in which theoretical views make clearly divergent predictions. It examined a stimulus condition that Gray (1990, 1994b) has contended should engage BIS activity: frustrative nonreward. Participants were led to believe that they would be able to obtain a reward if they performed well at a

laboratory task. However, they then failed to do so. Theories in which all negative feelings derive from the BIS would predict that negative affect in this situation would relate to BIS sensitivity. Theories in which specific negative feelings arise from each system would predict that negative affect arising from an inability to approach (in the absence of any threat of punishment) would relate to BAS sensitivity.

Method

Participants and procedures. Participants were 66 undergraduates (37 men, 29 women) from the University of Miami. Potential participants completed the BIS/BAS scales (described below) in group sessions at the start of the semester. Later they signed up for individual lab sessions. A requirement for participation was that this be the person's first research experience. Thus when they arrived, they had not yet earned any of the 6 research points required of them (this was verified by the experimenter).

Procedures were based on those of Carver and White (1994, Study 4), except that instead of reward cues, participants received cues of nonreward. Participants were met by an experimenter who was blind to the hypotheses of the study and the pretest scores of the participants. Participants were led to a laboratory room where they received a brief overview and gave their informed consent to participate. They then received orienting remarks in which the session was portrayed as part of a study on intuitive pattern recognition. Participants were told that ability to recognize patterns or sequences is related to intelligence, learning ability, and intuition, and that the project was aimed at getting a clearer idea of what variables influence the intuitive aspect of the process.

The experimenter then described the task that participants would be performing and illustrated it with two sample items. For each item, six characters were presented in a line on a computer screen. The first five were ostensibly the first five elements of a sequence; the final character either was or was not the next element in the sequence. The participant was to assess within 8 s whether it was or was not the next element and press either *Y* (for yes) or *N* (for no) on the keyboard. Except for the two sample items (used to illustrate one obviously correct sequence and one obviously incorrect sequence), the items were not real patterns but strings of numbers, letters, and characters designed to be ambiguous in that respect. Participants were told that forcing quick responses encourages the use of intuition instead of logic. They were told not to try to figure out the pattern logically, but to use their

intuitive judgment to decide whether the final item was correct or not.

Assessment of dependent measure. The experimenter continued by saying that many factors influence people's intuitive skills, including transient emotional states that the person may not even be particularly aware of. Because affect changes frequently over periods of even an hour, affect-relevant information would be collected periodically while the participant was working on the task. At two points during the experiment—after the explanation of the task, and at a stage that ostensibly was midway through the session—participants completed rating scales to assess their affects. The affects assessed in this study were feeling qualities believed related to the experience of frustrative nonreward: frustrated, annoyed, sad, depressed, and discouraged. The scales measuring these affects were embedded in items reflecting affects not of interest here. Initial ratings were made immediately after completion of the task instructions, just outlined, with the experimenter out of the room.

Incentive manipulation. When signing up, participants had been told that it would be possible to earn extra experiment-participation credits above and beyond the one earned by participating in the study. After the first set of affect ratings, the experimenter repeated this and explained that the extra credits would be awarded for especially good task performances. The experimenter indicated that people who are good at this type of task are able to get about 70% of the items correct. If the participants performed at that level or better, they would be rewarded. Participants' performance would be monitored by the computer across blocks of the task. For each block on which participants guessed correctly at the rate of 70% or better, they would receive 1 "point" toward extra credit (an extra experiment-participation credit would be awarded for every 2 "points" earned).

The experimenter then left the participant to work alone at the task. Participants received feedback from the computer at the end of each task block (10 items each), which was identical for all participants regardless of their responses. After each block, the computer presented a message on screen indicating that the participant had been successful at a level that fell below the criterion during that trial block and had thereby acquired no reward "points" toward additional credit. Also presented in each case was the total number of reward points accumulated to that point. By the end of the 8th block, participants had acquired no points.

At that stage, a message appeared indicating that there was a need to reassess mood, to control for shifts during the first portion of the session. The participant then made the second set of affect ratings. After the last rating was made, a message told the participant to leave the room and get the experimenter. The experimenter asked several questions to assess the participants' understanding of the events of the session and their suspicions regarding the various aspects of the task and study procedures. After this, the experimenter debriefed the participant, awarded research credit, and requested that the participant not discuss the experiment with his or her fellow students.

BIS/BAS scales. The BIS/BAS scales (Carver & White, 1994) were developed to measure dispositional sensitivities of the BIS and the BAS. Items are first-person statements, with response options ranging from 1 (*very false for me*) to 4 (*very true for me*). One scale (7 items) reflects BIS sensitivity, or threat responsiveness (e.g., "Criticism or scolding hurts me quite a bit," "I feel worried when I think I have done poorly at something important"). Three scales reflect aspects of BAS sensitivity, or incentive responsiveness: Fun Seeking (4 items, e.g., "I crave excitement and new sensations"), Drive (4 items, e.g., "I go out of my way to get things I want"), and Reward Responsiveness (5 items, e.g., "When I get something I want, I feel excited and energized"). Items of each scale are summed. Psychometric properties are reported elsewhere (Carver & White, 1994).

The three aspects of BAS sensitivity that are reflected in the three BAS scales derive from theoretical statements about ways in which BAS functioning should be reflected experientially. That is, high BAS sensitivity should cause people to seek new incentives, to be persistent in pursuing incentives, and to respond with positive feelings when incentives are attained. These functions are somewhat distinct from one another, as reflected in these three BAS-related factors, which typically are not strongly correlated with each other (average correlation in this sample was .36).

Results

Factor analysis of responses made to the target adjectives at the second assessment (using an oblimin rotation to permit correlations among factors) revealed two factors. The first had loadings at above .80 from "annoyed," "frustrated," and "discouraged;" the second had loadings at above .90 from "depressed" and "sad;" cross-loadings of all items fell below .15. An index of each factor was computed, as the mean of

the responses to the contributing items (factor scores correlated .36 at Time 1 and .42 at Time 2; index scores correlated .44 at each time point). These indices are hereafter labeled *frustration* and *sadness*. Internal reliability for frustration was .82 at Time 1 and .90 at Time 2; for sadness was .73 at Time 1 and .76 at Time 2.

Frustration increased considerably from the start of the session ($M = 2.35$, $SD = 1.60$) to the end of the session ($M = 5.36$, $SD = 2.25$), $t(65) = 11.22$, $p < .001$. Increase in sadness was more limited (initial $M = 2.52$, $SD = 1.60$; final $M = 3.08$, $SD = 1.81$) but also significant, $t(65) = 2.57$, $p < .02$.

BIS/BAS scales did not correlate significantly with either affect index at the start of the session (r s ranged from .00 to $-.08$, except for the association between Fun Seeking and frustration, $r = .21$, $p < .10$). At the end of the session, BIS scores correlated with the affect indices at .06 and .02 (*ns*), Fun Seeking correlated .31 with sadness ($p < .02$) and .39 with frustration ($p < .002$), but the other BAS scales were unrelated to either index (r s ranged from $-.07$ to .14). Partial correlations between personality scales and end-of-session affect, controlling for initial affect, revealed that Fun Seeking was a significant prospective correlate of both sadness ($r = .34$, $p < .01$) and frustration ($r = .29$, $p < .03$). Comparable partial correlations for BIS were .08 and .03.

These analyses were followed by two hierarchical regression analyses of the following form: The outcome was an end-of-session affect. The first variable entered was initial affect, followed by Fun Seeking and BIS scores. For frustration, the final equation included a significant effect of initial frustration ($\beta = .33$), $t(62) = 2.98$, $p = .004$, and a significant effect of Fun Seeking ($\beta = .33$), $t(62) = 2.91$, $p = .005$. The effect of BIS did not approach significance ($\beta = -.04$). The result for sadness was much the same: a significant effect of initial sadness ($\beta = .47$), $t(62) = 4.54$, $p < .001$, and a significant effect of Fun Seeking ($\beta = .30$), $t(62) = 2.79$, $p = .007$, with the effect of BIS not approaching significance ($\beta = .02$).⁴

As a more stringent test of comparative predictive ability, the beta weights for BIS and Fun Seeking were compared using the procedures described by Steiger (1980) for comparisons of nonindependent correlations. Because the predictions were so clearly

⁴ These findings were examined for gender differences in associations; none was found.

directional, one-tailed tests were used. These tests indicated that Fun Seeking was a significantly better predictor than was BIS of both end-of-session sadness, $T(63) = 1.73, p < .05$, and end-of session frustration, $T(63) = 1.71, p < .05$.

Discussion

Participants were led to expect the possibility of attaining a reward if they performed well at a task, but they failed to do so. In this situation of frustrative nonreward, participants experienced considerable annoyance, frustration, and discouragement, along with a smaller (but significant) increase in feelings of sadness and depression. This appears to indicate that the failure to attain the reward had the desired effect on affective experience.

The intensity of these feelings qualities related to participants' premeasured levels of Fun Seeking, a BAS-related scale. The experience of these feelings was not related to levels of BIS sensitivity. This pattern does not provide support for the view that negative feelings in a situation of frustrative nonreward arise from the BIS (e.g., Cacioppo et al., 1999; Gray, 1990, 1994b; Lang, 1995; Watson et al., 1999). It does, however, support a picture in which both positive and negative feelings can arise from the approach system (Carver & Scheier, 1998; Fox & Davidson, 1988; Harmon-Jones & Allen, 1998; Harmon-Jones & Sigelman, 2001; Higgins, 1996, 1997).

Study 2: Anger

In a second study, participants were exposed to stimuli intended to be anger-eliciting, and they made self-reports of transient anger responses. The participants had also completed the BIS/BAS scales. The question was how reports of anger would relate to BIS and BAS sensitivities. If anger and fear have the same origins, anger should relate to BIS sensitivity. If anger stems from thwarted approach, anger should relate to BAS sensitivity.

This study also explored the role of another aspect of personality in anger. That is, although the two-system view on behavior described earlier is widely discussed, many researchers do not view it as adequate to account for the full range of behavior. To provide further information on this issue as it pertains to the experience of anger, participants completed the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). This measure has a scale explicitly focused on aggression-hostility, which was also in-

cluded as a predictor of anger. The question of interest was whether this trait would absorb all the variance in prediction of anger.

Method

Participants and procedure. Undergraduates at the University of Miami completed the BIS/BAS scales and the other two measures described below in group sessions after giving informed consent verbally. Other scales, unrelated to this study, were also completed at the same time. Each measure relevant to the study was separated from the others by at least one other measure not relevant to the study.

The ZKPQ has an Infrequency scale, which is used to screen for inattentiveness and other response biases. The measure's authors (Zuckerman et al., 1993) recommend that respondents with scores above 3 on the Infrequency scale be regarded as invalid. However, Elliot and Thrash (2002) suggested that it is preferable to control for response bias of this sort. Data were examined in both ways; only the latter is reported here (omission of 35 high scorers on the Infrequency scale did not change the results materially). The full sample was 466 (289 women, 176 men, 1 not indicating gender).

ZKPQ. The ZKPQ (Zuckerman et al., 1993) was used because it has a scale that focuses explicitly on aggression and hostility as a personality trait. The ZKPQ was developed to measure an "alternative 5-factor model" of personality, which Zuckerman and colleagues have explored in psychobiological personality research. It has 89 content items, plus an Infrequency scale to identify carelessness or response bias. There are scales for Neuroticism (19 items), Sociability (17 items), Activity (17 items), Impulsive Sensation Seeking (19 items), and Aggression-Hostility (17 items). Items are statements that reflect behaviors, feelings, and thoughts presented in a true-false format. Scales are the sum of the total applicable items, after appropriate reversals in coding.

Zuckerman et al. (1993) described the items that make up the Aggression-Hostility scale as reflecting rudeness, vengefulness, spitefulness, and a readiness to engage in verbal aggression. Example items are "I have a very strong temper," "I can't help being a little rude to people I do not like," "If someone offends me, I just try not to think about it" (reverse scored), and "When I am angry with people I do not try to hide it from them." It will be apparent from the item content that these items reflect both a propensity to experience anger and a propensity to express anger openly.

Table 1
Correlations Among Individual-Differences Measures in Study 2

Measure	1	2	3	4	5	6	7	8	9	10
1. Drive	—									
2. Reward Responsiveness	.39	—								
3. Fun Seeking	.43	.33	—							
4. BIS	-.05	.27	-.05	—						
5. Sociability	.23	.18	.37	-.07	—					
6. Activity	.23	.18	.18	.02	.14	—				
7. Neuroticism	-.05	.09	-.02	.67	-.13	.00	—			
8. Impulsive Sensation Seeking	.31	.10	.65	-.18	.26	.09	-.03	—		
9. Aggression-Hostility	.27	.02	.17	.01	.14	-.04	.12	.23	—	
10. Infrequency	.13	-.06	-.02	-.26	-.03	.18	-.19	.03	-.01	—

Note. Correlations exceeding .12 are significant at the .01 level; those exceeding .17 are significant at the .001 level. BIS = behavioral inhibition system.

Scenarios. A set of hypothetical scenarios was created for this study, each describing a situation in which an anger response would be plausible (see Robinson & Clore, 2001, for evidence of the convergence of real and imagined reactions to emotional stimuli). Participants were instructed to try, as hard as they could, to imagine the events happening to them, then answer the questions that followed, by choosing the most accurate response—for *them*—from the options listed. Here is an example:

You rented an apartment 2 months ago with a friend, just as classes were starting. In the meantime, your friend has taken in 2 stray cats and a dog. Unfortunately, your apartment complex has a no-pets policy, and the manager has just found out about the animals. He came to your door this morning (your friend was out) and told you he's very upset, that having pets breaks the terms of your lease, that it's your responsibility because your name is the one that's on the lease, and that he's going to have you evicted.

A second scenario involved discovering people sitting on your new car in a parking lot, a third involved noisy roommates interfering with your work on a paper, the last involved being accused of cheating by someone who had copied from you on an exam.

Following each scenario were these questions: "If this happened, how *nervous or frightened* would you feel?" "If this happened, how *angry* would you feel?" These were to be answered from a scale with 1 labeled *not at all*, 2 labeled *a little*, 3 labeled *a medium amount*, 4 labeled *a lot*, and 5 labeled *quite a lot*. Mean response to the nervousness item (averaged across four scenarios) was 2.78 ($SD = 0.83$), slightly below the scale midpoint. Mean response to the anger item was 4.33 ($SD = 0.65$), between *a lot* and *quite*

a lot. Thus, the scenarios were clearly successful in eliciting appreciable anger, along with a fair amount of anxiety. Reports of nervousness and anger correlated .19.

Results

Associations among personality scales. Correlations among the personality scales are shown in Table 1.⁵ The BIS scale was relatively related to only one BAS scale: Reward Responsiveness. The BAS scales were moderately associated with one another, at levels comparable to those reported by Carver and White (1994). The pattern of relations among the ZKPQ scales shows substantial discrimination, with no correlation exceeding .25. These correlations are comparable to those reported by Zuckerman et al. (1993).

There was considerable convergence between the ZKPQ's Neuroticism scale and the BIS scale, and between the ZKPQ's Impulsive Sensation Seeking scale and the Fun Seeking scale of the BIS/BAS. Neither association is surprising, though the magnitude of the correlations is striking. In contrast, other associations were small to moderate. Of particular interest,

⁵ Gender differences emerged on some personality scales, men being higher than women in Aggression-Hostility and Impulsive Sensation Seeking and lower in Reward Responsiveness, BIS, and Neuroticism. These differences conform to patterns reported by Carver and White (1994) and Zuckerman et al. (1993). There was also a gender difference in responses to scenarios (to be described later), with women reporting higher levels of nervousness than men, but the genders not differing in reports of anger. The associations reported in the sections that follow were all tested for gender differences, but none emerged as significant.

the ZKPQ's Aggression-Hostility scale did not correlate strongly with any BAS scale. Thus, with the exception of two instances of very strong overlap, the measures appear to have different focuses.

Affective responses. Factor analysis of the emotional reactions (with oblimin rotation) yielded distinct factors for anger and nervousness. All ratings of anger loaded on the first factor at .62 and above, all ratings of nervousness loaded on the second factor at .67 and above, and cross-loadings exceeded .2 in only one instance (one rating of nervousness loaded $-.25$ on anger). Thus, anger and nervousness were averaged separately across scenarios ($\alpha_s = .66$ and $.65$). The correlation between factor scores was $.19$, as was the correlation between scale scores.

These affect responses to the scenarios then were related to the personality measures. As can be seen in Table 2, reports of nervousness related moderately positively to BIS and Neuroticism, weakly positively to Reward Responsiveness, and inversely to the other BAS scales and Impulsive Sensation Seeking. Reports of anger related positively to Reward Responsiveness, BIS, and Aggression-Hostility, and more weakly to Neuroticism.

Regression analyses were subsequently used to assess unique contributions made by specific personality qualities in predicting the two affective responses. The strong relations noted above between BIS and Neuroticism and between Fun Seeking and Impulsive Sensation Seeking create multicollinearity issues. For that reason, and because the focus of the study was on the roles of BIS and BAS sensitivities, Neuroticism and Impulsive Sensation Seeking were omitted from these regression analyses, whereas the BIS and Fun Seeking scales were retained.

Table 2
Bivariate Correlations Between Personality Measures and Affect Ratings in Response to Scenarios in Study 2

Measure	Nervous	Angry
Drive	$-.16^{**}$.06
Reward Responsiveness	$.13^{**}$	$.24^{***}$
Fun Seeking	$-.16^{**}$.08
BIS	$.44^{***}$	$.22^{***}$
Sociability	$-.12^*$	$-.01$
Activity	$-.09^*$.05
Neuroticism	$.39^{***}$	$.14^{**}$
Impulsive Sensation Seeking	$-.17^{**}$.04
Aggression-Hostility	$-.12^*$	$.21^{***}$
Infrequency	$-.11^*$	$-.15^{**}$

Note. BIS = behavioral inhibition system.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Predicting nervousness. The personality scales just indicated were entered into the regression equation as a group. The equation had an adjusted R -square of $.23$, $F(8, 457) = 18.66$, $p < .0001$. As would be expected, higher levels of BIS related to reports of greater nervousness ($\beta = .41$), $t(457) = 9.19$, $p < .001$. In addition, ZKPQ (Zuckerman et al., 1993) Activity related to less nervousness ($\beta = -.09$), $t(457) = 1.98$, $p < .05$, and Reward Responsiveness related to greater nervousness ($\beta = .12$), $t(457) = 2.50$, $p < .02$. It is clear, however, that most variance in nervousness was accounted for BIS sensitivity.

To differentiate the affects under study clearly from each other (cf. Higgins, 1987), the alternate affect (in this case, anger) was entered as an additional control in a final step in the regression analysis. This increased the adjusted R -square for the equation to $.25$. Anger made a significant contribution ($\beta = .14$), $t(456) = 3.14$, $p < .01$; Reward Responsiveness fell to only marginal significance ($\beta = .09$, $p < .07$), and ZKPQ Aggression-Hostility became significant ($\beta = -.11$, $p < .02$). The bulk of prediction still came from BIS, however ($\beta = .39$). Comparisons of the final betas (Steiger, 1980) confirmed that BIS was a significantly stronger predictor of nervousness than any BAS scale, smallest $T(463) = 5.72$, $p < .001$.

Predicting anger. The equation with the set of personality variables had an adjusted R -square of $.13$, $F(8, 457) = 9.72$, $p < .0001$. Four personality scales made contributions: Anger reports related to higher Reward Responsiveness ($\beta = .22$), $t(457) = 4.22$, $p < .0001$; higher ZKPQ Aggression-Hostility ($\beta = .24$), $t(457) = 5.21$, $p < .0001$; higher BIS ($\beta = .12$), $t(457) = 2.47$, $p < .02$; and lower Infrequency (the index of response bias; $\beta = -.11$), $t(457) = 2.32$, $p < .03$. Comparison of betas indicated that Reward Responsiveness was a significantly stronger predictor of anger than BIS, $T(463) = 1.82$, $p < .04$.

As in the previous analysis, the final step in the regression analysis (to maximally differentiate the affects) was to enter the alternate affect (nervousness). This increased the adjusted R -square to $.15$. Nervousness contributed significantly ($\beta = .16$), $t(456) = 3.14$, $p < .01$, whereas the contribution of BIS was reduced to being nonsignificant ($\beta = .05$, $p = .29$). The beta for Reward Responsiveness fell slightly to $.20$ and that of ZKPQ Aggression-Hostility rose slightly to $.25$. Comparison of the final betas confirmed that Reward Responsiveness again was a significantly stronger predictor of anger than BIS, $T(463) = 2.72$, $p < .005$.

Discussion

The results of this study are consistent with the position that anger derives at least in part from the approach system. These findings are consistent with those of Fox and Davidson (1988), Harmon-Jones and Sigelman (2001), and Harmon-Jones and Allen (1998), who measured activity in brain regions as a way of assessing the approach system. This convergence of results from such different methodologies bolsters the validity of all the findings.

It is also noteworthy that the findings of a relationship between reports of nervousness and BIS scores conceptually replicates findings reported by Carver and White (1994). The emergence of that finding makes even clearer the specificity of the associations between affect quality and dimension of personality. That is, the outcome of this study was that two different, yet related, negative affects were uniquely associated with different dimensions of personality, one relating to threat motivation, the other relating to incentive motivation.

Although the data indicated a role for BAS, BAS was not the sole predictor of anger. The Aggression-Hostility factor of the ZKPQ (Zuckerman et al., 1993) also did so. It appears, then, that anger involves a system beyond that concerning pursuit of incentives—perhaps a system that regulates the extent to which others are taken into account in the course of such pursuit. Consistent with this line of thought, Zuckerman et al. (1993) characterized Aggression-Hostility as being the obverse of Agreeableness from the five-factor model.

As noted earlier, in interpreting these findings it is particularly important to recall that the items of the Reward Responsiveness scale never mention (or even allude to) feelings of anger, or to anger-eliciting experiences, or to any negative experience whatsoever. All items deal with positive responses to attaining incentives. This makes it all the more remarkable that this scale predicted anger responses at all. Indeed, it is worth noting that the unique prediction made by this BAS scale was nearly as strong as that made by the ZKPQ's (Zuckerman et al., 1993) Aggression-Hostility factor, the items of which explicitly reference hostile feelings and actions.

Results do not strongly support the involvement of the BIS in creating feelings of anger. The scenarios elicited some anxiety along with anger, and BIS sensitivity did predict greater reports of nervousness. BIS sensitivity also related to greater reports of anger at the bivariate level and in the regression model using

only personality variables. However, when overlap between nervousness and anger was removed, BIS sensitivity did not significantly predict anger.

Study 3: Terrorism and Anger

Study 2 used scenarios of anger-inducing situations. Because the situations were hypothetical, there might be concern that participants' responses were not veridical (despite such evidence as that of Robinson & Clore, 2001). To diminish this concern, one further study was conducted, soon after the terrorist attacks of September 11, 2001, on the World Trade Center and the Pentagon. The attacks precipitated a good deal of anger among Americans. Given the considerable uncertainty about what was yet to come, there was also a good deal of fear. Participants completed a survey of reactions to the terrorist attack a week after its occurrence.

Method

Undergraduates at the University of Miami were invited to complete a brief survey of feelings about the attack on the World Trade Center in group sessions. In an effort to increase homogeneity regarding the attack's objective impact on respondents, this survey first asked whether they had lost someone to whom they were close in the attack or whether someone to whom they were close had lost someone. Data were retained only for those who had experienced no such losses. Of these, 96 (61 women, 25 men, 10 for whom gender was not available) had completed the BIS/BAS scales in group sessions approximately a month earlier. As in the earlier samples, BAS scales were not strongly correlated (average $r = .25$), and Drive and Fun Seeking scales were relatively unrelated to BIS (average $r = -.02$); Reward Responsiveness, however, was moderately strongly related to BIS ($r = .41$).

After the screening for loss of life, respondents were asked to report the feelings they had as they thought about the events of the day of the attack. Mixed with filler items were two items relating to fear ("As you think now about the events of that day, how afraid do you feel?" and "... how panicky do you feel?") and two items relating to anger ("... how angry do you feel?" and "... how enraged do you feel?"). Each affect report was made on a scale ranging from 1 (*not at all*) to 9 (*extremely*).

Results and Discussion

Affective responses. Factor analysis of these items (with oblimin rotation) confirmed that they

formed two factors. The fear items loaded on the first factor (at .90 or above), the anger items loaded on the second factor (also at .90 or above), and no cross-loading exceeded .2. Mean response to the fear items (averaged) was 5.01 ($SD = 2.34$), which was the scale's midpoint. Mean response to the anger items (averaged) was 6.25 ($SD = 2.30$), somewhat above the midpoint. Thus, participants reported fairly high levels of both anger and fear. Reports of anger and fear correlated .37 as scale scores and .36 as factor scores.

The affect ratings then were related to BIS/BAS scales. Fear correlated significantly with BIS ($r = .33, p < .002$), but not to any BAS scale (r s ranged from .14 to $-.06$). Anger correlated significantly with Drive ($r = .36, p < .001$), Reward Responsiveness ($r = .22, p < .04$), and BIS ($r = .26, p < .02$), but not with Fun Seeking ($r = .00$). As in Study 2, regression analyses were used to assess unique contributions made by the scales in predicting the affective responses. As in Study 2, in order to differentiate the affects clearly from each other, the alternate affect was entered as an additional control in a final step in the regression analysis.

Predicting fear. With respect to fear, the regression analysis was very straightforward, given that no BAS scale related to fear even at the bivariate level. The equation with all BIS/BAS scales entered had an adjusted R -square of .09, $F(4, 91) = 3.25, p < .02$. BIS was the only significant predictor of fear ($\beta = .32, t(91) = 2.88, p < .01$). When anger was entered, the adjusted R -square rose to .16. Anger accounted for significant variance ($\beta = .31, t(90) = 2.93, p < .01$), but BIS remained a solid predictor of fear ($\beta = .27, t(90) = 2.47, p < .02$). Comparison of final betas (Steiger, 1980) indicated that prediction of fear by BIS was significantly stronger than by any BAS scale, $T(93) = 1.68, p < .05$.

Predicting anger. With respect to anger, the equation with all BIS/BAS scales entered had an adjusted R -square of .16, $F(4, 91) = 5.46, p < .001$. The Drive scale made a significant contribution to prediction of anger ($\beta = .36, t(91) = 3.56, p < .002$), and the contribution of BIS was marginally significant ($\beta = .20, t(91) = 1.87, p < .07$). When fear was entered, the adjusted R -square rose to .22. Fear made a significant contribution ($\beta = .28, t(90) = 2.83, p < .01$). The effect of Drive remained significant ($\beta = .32, t(90) = 3.25, p < .002$), but the effect of BIS did not ($\beta = .11, p > .30$). Comparison of final betas yielded a marginally significant difference be-

tween predictive effects of Drive and BIS, $T(93) = 1.54, p < .07$.

As in Study 2, the results are consistent with the position that anger derives, at least in part, from the approach system. Once again, results did not strongly support the involvement of the BIS in feelings of anger, though once again BIS did predict reports of fear. In summary, as in Study 2, two different negative affects related most strongly to different dimensions of personality, one pertaining to incentive motivation, the other pertaining to threat motivation.

General Discussion

The studies reported here are unequivocal in indicating that feelings relating to the approach system are not always positive. In that important respect, the findings contradict the view that dominates discussions of affect dimensionality (Cacioppo et al., 1999; Gray, 1981, 1994a, 1994b; Lang et al., 1990, 1998; Watson et al., 1999). A limitation on this set of findings is that they all relied solely on self-reports of affect as dependent measures. However, these three studies are not the only ones to support the idea that feelings related to approach are sometimes negative. Rather, they join with findings from several other projects reviewed earlier in the article, some of which used other types of measures as outcomes. By using methods that differ from those of prior studies, the research reported here adds to the convergence of evidence on the point.

Combining Studies: Caveats

The findings of the studies reported here are subject to three further caveats. First, although the individual-differences approach appears to be a useful strategy in this domain, this strategy is inherently unable to confirm cause and effect. Although the findings converge nicely with others reviewed earlier, this limitation should be acknowledged. A second caveat is that the effects were only moderately strong. There obviously is a good deal of variance left unaccounted for in the experience of these affects.

Another caveat is that only one of the BAS-related scales related to the affects in each study, and it was not the same scale across studies. Effects of frustrative nonreward occurred through Fun Seeking (as was true of a different distress finding reported by Carver, Meyer, & Antoni, 2000). The effect of anger-eliciting stimuli in Study 2 occurred through Reward Responsiveness (which played a role in findings reported by Carver & White, 1994, and Zinbarg & Mohlman,

1998). The anger response in Study 3 occurred through Drive.

Why did different aspects of BAS sensitivity predict the negative affects in different contexts? A possible reason is suggested by the fact that the three BAS scales focus on different aspects of the approach process. Respectively, they assess sensitivity to potential new incentives, persistence in pursuit of incentives, and positive responses to attaining incentives. Similarly, the studies focused on different kinds of incentive-related experience. Study 1 involved the possibility of gaining a not-yet-obtained incentive. This may account for the relevance of Fun Seeking—eagerness for new incentives—as a predictor of distress when the incentive never came. The other studies, in contrast, used contexts with no new incentives, rendering Fun Seeking less relevant.

In general, the scenarios in Study 2 portrayed situations in which already acquired incentives were now in danger of being lost. Perhaps the implicit sense of prior attainment increased the relevance of Reward Responsiveness to emotional responding. Study 3 examined a context in which a desired sense of normalcy (among other things) had been lost. However, the situation in Study 3 differed from the scenarios of Study 2 in that the events set in motion by the terrorist attacks were far from over. Perhaps the “in progress” aspect of that situation rendered variations in Drive most relevant to emotional responding.

Obviously these interpretations are speculative. An important task for the future is to determine when and how different aspects of the approach process come into play. However, the fact that these aspects of incentive sensitivity do not correlate strongly, and the fact that each of them played a role in one context but not the others, suggest that the mechanism behind the approach process is not unitary. The findings thus argue strongly that the separate functions—eagerness for new incentives, diligence in their pursuit, and positive responses to their attainment—should be examined separately in future research, to create a more differentiated picture of the separate roles they play in emotional and other outcomes.⁶

Indeed, this discussion also raises a parallel issue concerning the avoidance process. Carver and White (1994) generated their BIS and BAS items from a variety of theoretical statements on the functions of these systems. BAS items were quite diverse, but BIS items were less so. As a result, the BIS items formed one scale, with most items reflecting anxiety or distress in anticipation of punishment. Perhaps that measure should similarly be broadened to incorporate

more aspects of avoidance: vigilance for cues of threat, persistence in trying to avoid or escape threat, as well as distress when threat is imminent. Perhaps these aspects of the avoidance process are also distinct from each other and behave differently in different threat-related contexts. This is another question that deserves future attention.

Implications for Circumplex Models of Affect

The findings of Studies 2 and 3 seem to raise a question for circumplex and circular models of affective experience (e.g., Feldman Barrett & Russell, 1998; Watson & Tellegen, 1985): If anxiety and anger exist at nearly the same point on the familiar circular maps, why do they relate to different behavior-regulation systems? (see also Lerner & Keltner, 2001; Mackie et al., 2000; Zuckerman et al., 1993). If the two feelings relate to distinct behavior-regulation systems, what is the meaning of the fact that they are so close to each other in this semantic affective space?

One way to address their co-occurrence in human experience is as follows: Many situations that disrupt pursuit of an incentive simultaneously create a threat of harm (cf. Lindsay & Anderson, 2000). With the possibility of harm, BIS engages and anxiety arises. If a situation evenly blends potential loss of incentives with threat of harm, the result would be a blend of anger and anxiety that was linked to the same stimulus situation. Thus the two affects would co-occur in time and space. This reasoning goes beyond the circular representation of affective space, however. It suggests that circumstances that induce mixed motivations induce a covariation between these affects.

I should note that the issues addressed in this article differ slightly from those addressed in at least some of the literature bearing on the circular mapping. The Watson and Tellegen (1985) model was a descriptive account of mood rather than an account of the genesis of affect. Though that model is often generalized beyond mood to other affective experiences (Tellegen et al., 1999; Watson et al., 1999), its central focus is

⁶ A further indication of the diversity among components of the approach process stems from Study 2's finding that Fun Seeking correlates substantially with Impulsive Sensation Seeking from the ZKPQ (Zuckerman et al., 1993). This, together with other evidence pertaining to sensation seeking (Patrick, Curtin, & Tellegen, 2002), suggests that Fun Seeking blends sensitivity to incentives with an impulsiveness in action that goes beyond that mere sensitivity (see also Carver, 2003b).

mood (Watson, 2000). Mood as a construct is not identical to affect, despite their commonalities. The arguments made in this article are aimed explicitly at the origins of affective experience, not at mood. To the extent that these categories of phenomena differ from each other, the issues they confront also differ. It may not be entirely appropriate to generalize from the one to the other.

Nonetheless, many people seem to take the factor analyses underlying circumplex and circular models of mood as a gold standard concerning the organization and meaning of affects in human experience, and thus in neurobiological underpinnings (though it also bears noting that some people see the circular map as reflecting affect representations rather than affects). As a guide to the meaning and function of affects, however, they should perhaps be regarded more properly as one source of information among many (for discussions of other problems with circumplex models, see Remington, Fabrigar, & Visser, 2000; Watson et al., 1999).

Diversity Among Approach-Related Affects

Another issue that demands further attention is raised by the fact that the negative feelings related to the approach system here included both anger and sadness. What should be made of this? In the Carver and Scheier (1998, 1999) view on affect, the BAS-related dimension usually is described as ranging from elation to depression (see Figure 1, earlier in the article). That depiction accounts for feelings of sadness, but it ignores anger. In reality, however, although Figure 1 conveys the sense that approach-related affect can be either positive or negative (or absent), it has only a rough fit to the model it was intended to reflect. I consider that model in more detail using Figure 2, which is adapted from the left panel of Figure 1. I focus on the lower portion of the figure, in which rate is below the criterion (for discussion of the upper portion, see Carver, 2003a).

The theory holds that falling behind—progress below the criterion—creates negative affect, as the incentive seems to be slipping away. Inadequate movement forward (or no movement, or reverse movement) gives rise to feelings such as frustration, irritation, and anger (for the present purpose I do not distinguish among these, though I am sure there are important differences among them). The lagging of progress, or the affect thereby created, is assumed to prompt enhanced exertion, in an effort to catch up. Thus, the function of these feelings (or of the mechanism that underlies them) is to engage effort more

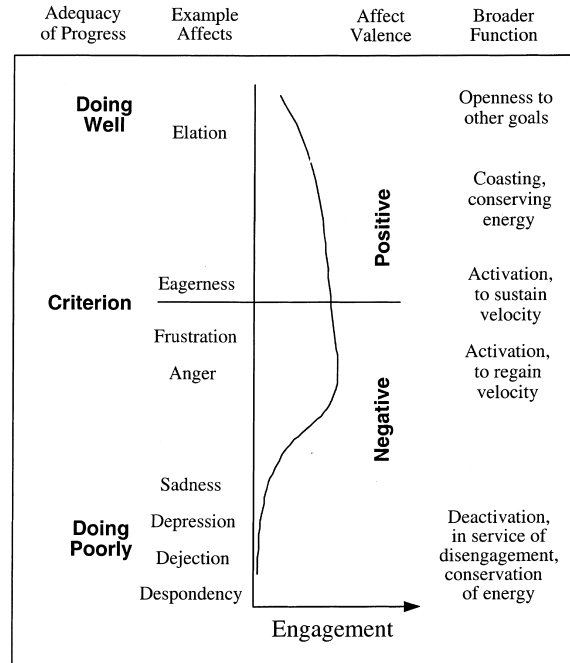


Figure 2. Approach-related affects as a function of doing well versus doing poorly, building on the left panel of Figure 1. Additional affects are named here, and a second (horizontal) dimension indicates the degree of behavioral engagement associated with affects at different degrees of departure from neutral. The verbal descriptions to the right indicate the functions that are served by the affects at the various ranges of the vertical dimension.

completely, to overcome obstacles and reverse the inadequacy of current progress (for findings that fit this, see Harmon-Jones, Sigelman, Bohling, & Harmon-Jones, 2003; Lewis, Sullivan, Ramsay, & Alessandri, 1992; Mikulincer, 1988). If the situation is one in which more effort (or better effort) can improve progress, such effort allows the person to move toward the incentive at an adequate rate, and attaining the incentive seems likely.

Sometimes, however, continued efforts do not produce adequate movement forward. Indeed, if the situation involves loss, movement forward is precluded, because the incentive is gone. When the situation is one in which failure seems (or actually is) assured, the negative affect has a different tone. Here the feelings are sadness, depression, despondency, dejection, grief, and hopelessness (recall that Finlay-Jones & Brown, 1981, and others have linked loss to depression). Accompanying behaviors also differ in this case. The person tends to disengage from—give up on—further effort toward the incentive (Klinger,

1975; Wortman & Brehm, 1975; for supporting evidence, see Lewis et al., 1992; Mikulincer, 1988).

At least two previous studies have found patterns of emotions consistent with this portrayal (Mikulincer, 1994; Pittman & Pittman, 1980). In these studies, participants received varying amounts of failure experience, and their emotional responses were assessed. In both studies, reports of anger were most intense after small amounts of failure and lower after larger amounts of failure. Reports of depression were low after small amounts of failure and intense after larger amounts of failure.

As just described, BAS-related negative feelings in these two kinds of situations are presumed to relate to two very different shifts in ongoing action. Both effects on action seem to have adaptive properties. In the first situation—when the person falls behind, but the goal is not seen as lost—negative feelings of frustration and anger accompany an increase in effort, a struggle to gain the incentive despite setbacks. Consistent with this view, Frijda (1986, p. 429) has argued that anger implies having the hope that things can be set right (see also Harmon-Jones & Allen, 1998). This struggle is adaptive (thus, the affect is adaptive) because the struggle fosters goal attainment.

In the second situation—when effort appears futile—negative feelings of sadness and depression accompany a *reduction* of effort. Sadness and despondency imply that things cannot be set right, that further effort is pointless.⁷ Reduction of effort in this circumstance may also have adaptive functions (cf. Wrosch, Scheier, Carver, & Schulz, 2003). For one, it serves to conserve energy rather than waste it in futile 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 pursuit of another incentive in place of this one. That is, it is hard to turn to a new goal until one disengages from the unattainable goal and is no longer preoccupied by it.

The variations in effort described here are also portrayed in Figure 2. This portrayal 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 detail, see Carver & Scheier, 1998, Chapter 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 and fade away. Indeed, the figure they

used to illustrate those regions greatly resembles the lower portion of Figure 2, rotated 90°.

Implications Regarding Underlying Emotion Mechanisms

This article has considered whether the behavioral approach system is involved in creating only positive feelings (a unipolar view), or whether instead it is involved in creating both negative and positive feelings (a bipolar view). Theories that are otherwise similar diverge sharply on this issue. The existing evidence that was reviewed and the new data that were presented argue for the bipolar view.

Why does this issue matter? Its importance lies in the fact that the two sets of theories rely on different sorts of mechanisms to account for creation of affect. Theories that argue for unipolar dimensions appear to assume that greater activation of a system translates directly to more affect of that valence (or greater potential for affect of that valence). If the approach system instead relates both to positive and to negative feelings, this direct transformation of activation to affect is not tenable. How, then, can theories assuming such a transformation account for the negative affects related to approach?

What is needed is a conceptual mechanism that naturally addresses both positive and negative feelings within the approach function. One such principle is that identified by Carver and Scheier (1990, 1998, 1999). There may be others. However, this one has certain advantages. Its mechanism fits the fact that feelings occur throughout the attempt to reach an incentive, not just at the point of its attainment. Indeed, feelings rise, wane, and change valence, as progress varies from time to time along the way forward (as any sports fan can attest).

⁷ This line of thought about the divergent functions of these two negative BAS-linked affects also receives indirect support from a recent finding in person perception. Tiedens (2001) found that a stimulus person who expresses anger is conferred greater status by observers, whereas expressing sadness leads to less status. This pattern suggests that merely expressing anger (in America, at least) leads to gains in certain incentives, whereas expressing sadness removes the person from the same incentives. If anger does imply a kind of confidence, as Frijda (1988) argued, this pattern would make perfectly good sense: The angry person is seen as someone likely to overcome obstacles, whereas the sad person is seen as accepting a loss.

This view also suggests an interesting vantage point on the idea that affect and action are inextricably linked. In this view, one system controls “position” and another controls “velocity.” In this joint action, the action-related loop (position) handles what is sometimes called the directional function of motivation (choosing specific actions from among many options, keeping the action on track), and the affect-related loop (velocity) handles the intensity function (the vigor, enthusiasm, effort, concentration, or thoroughness with which the action is pursued).

A two-system arrangement has proven useful in control engineering, where it is used to produce fast-yet-stable responses in mechanical devices (R. N. Clark, 1996; Ogata, 1970). The responsiveness of the velocity loop is key to both the speed and the stability of the overall device. If the velocity loop is unresponsive, the overall device responds sluggishly to any perturbation, moving to its goal slowly. If the velocity loop is very labile, the overall device responds quickly but overcompensates, overshoots its goal, then oscillates around it, gradually closing in on it. The ideal is between these: a fairly rapid response with little or no overshoot. We have argued that these differences parallel the effects of individual differences in emotional reactivity (Carver & Scheier, 1998). This argument is speculative, but it illustrates some of the linkages and spin-off ideas suggested by this mechanism.

There may well be an entire family of models that address the bipolarity of the affects that relate to the approach process. Perhaps alternative models also will have unexpected and interesting implications. The main point, however, is this: To the extent that research evidence implicates the approach system in negative as well as positive feelings, an adequate theory must include some mechanism for the creation of affects of both valences.

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