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Responsiveness to Threats and Incentives, Expectancy of Recurrence, and Distress and Disengagement: Moderator Effects in Women With Early Stage Breast Cancer

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Models of neurobiological systems linking personality, motivation, and emotion can be integrated with the expectancy construct to suggest hypotheses about distress and giving up in response to adversity. In 220 women with breast cancer, threat responsiveness—sensitivity of the behavioral inhibition system (BIS)—and incentive responsiveness—sensitivity of the behavioral activation system (BAS)—and expectancies about cancer recurrence were measured. It was predicted and found that high BIS sensitivity interacted with recurrence expectancy to predict elevated distress and disengagement. Low BAS sensitivity (reward responsiveness) also interacted with expectancy of recurrence to predict elevated disengagement. In contrast, high BAS sensitivity (fun seeking) interacted with recurrence expectancy to predict elevated distress. Discussion centers on theoretical implications and possible applications.

Recent years have witnessed renewed interest in basic neurobiological systems and their links to personality, motivation, emotion, and psychopathology (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 there are distinct aversive and appetitive motivational systems, which are linked both to emotional and behavioral response tendencies (Carver & White, 1994; Gray, 1994b; Harmon-Jones & Allen, 1997; Henriques & Davidson, 1991; Sutton & Davidson, 1997) and to core dimensions of personality (Carver, Sutton, & Scheier, 2000; Fowles, 1993; Gray, 1994b; Tellegen, 1985).

The first of these neurobiological systems is usually called a behavioral inhibition system (BIS; Gray, 1972, 1994b), although it is sometimes called a withdrawal system (Davidson, 1992, 1998). The BIS responds to threat-related information (Gray, 1994b). When it is activated by the perception of threat, the result is inhibition (Fowles, 1993; Gray, 1994b) or withdrawal (Carver & White, 1994; Davidson, 1992) and subjective anxiety. There is evidence from electroencephalograph and neuroimaging studies that the neural substrate for threat responsiveness is localized partly in the right anterior portion of the cerebral cortex (e.g., Harmon-Jones & Allen, 1997; Sutton & Davidson, 1997; for reviews, see Davidson, 1992, 1998). People vary in this (presumably biologically based) BIS sensitivity. When threats occur, persons high in BIS sensitivity become more anxious, distressed, and avoidant than do persons lower in BIS sensitivity (Carver & White, 1994; Davidson, 1992, 1998; Gray, 1994b).

The second motivational system is usually called the behavioral approach system (BAS; Gray, 1972, 1994b), although it is also sometimes called an activation system (Fowles, 1980, 1987) or a facilitation system (Depue & Collins, 1999). The BAS processes incentive-related information (Fowles, 1993; Gray, 1994b). When the BAS is activated by incentives, positive affect and approach behavior ensue (Carver & White, 1994; Gray, 1994a, 1994b). Electroencephalograph and neuroimaging data suggest that the neural substrate for the BAS is localized partly in the left anterior cortex (e.g., Harmon-Jones & Allen, 1997; Sutton & Davidson, 1997). Just as people vary in BIS sensitivity, they vary in BAS sensitivity. When incentives occur, people high in BAS sensitivity experience more positive affect (Carver & White, 1994) and engage in more approach than do those lower in BAS sensitivity. Very low levels of BAS activity have been related to despondency and depression (Gray, 1994a; Harmon-Jones & Allen, 1997; Henriques & Davidson, 1991; Sutton & Davidson, 1997).

Although these neurobiological ideas are receiving increasing attention, they are not the only influential viewpoint on motivated behavior and affect. Another theme that is well represented in contemporary theory is the role of expectancies: confidence versus doubt. Theory and research hold that expectancies relate to both emotional and behavioral responses to adversity (e.g., Armor & Taylor, 1998; Bandura, 1986; Carver & Scheier, 1998; Carver et al., 1993; Carver, Sutton, & Scheier, 2000; Kuhl, 1984; Kukla, 1972; Litt, Tennen, Affleck, & Klock, 1992; Scheier & Carver, 1992; Wortman & Brehm, 1975; Wright & Brehm, 1989). People with confidence about the future respond to adverse experiences (as diverse as chronic illness, diagnoses of life-threatening diseases, natural disasters, and more) with efforts to move forward with their lives and with comparatively low levels of emotional

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distress. People who are doubtful about the future tend to experience a giving-up response when confronting adversity. They also experience deeper distress, as long as goal commitment remains.

In this article, we address the confluence of these two viewpoints on motivation. The idea that there are neurobiological systems for the management of incentive and threat responsiveness suggests that some people are biologically more prone to experience distress and despondency than other people, given the appropriate stimulus conditions. The idea that expectancies are partial determinants of behavioral engagement and emotional reactions suggests that doubt about the future also is an important determinant of distress and giving-up responses. Although these influences might simply stand in parallel to each other as main effects, of greater theoretical interest is the possibility that they may moderate each other's effects.

More specifically, the impact of having a sensitive BIS may be greater among people who are doubtful about being able to evade perceived threats than among those with greater confidence. In the same way, the risk for despondency and giving up that is experienced by people who have low BAS responsiveness may be more pronounced if the people are also doubtful about the future but may be more minimal if they are confident about the future.

This moderation can also be framed in the opposite way. Detrimental effects of doubt may be magnified in someone who is very responsive to threats but may be more minimal in a person who is not very threat-sensitive. Similarly, detrimental effects of doubt may be especially pronounced among people who lack the motivational push of a sensitive incentive-pursuit system but may be less noticeable among those who respond more strongly to incentives. This reasoning predicts statistical interactions between the dimension of confidence versus doubt and both BIS and BAS sensitivities. Such interactive hypotheses have not been investigated in any research thus far.

We chose to conduct the initial test of the hypotheses among a group of people who were experiencing a life threat of considerable magnitude. In particular, we studied these relationships in a sample of women who had recently been treated for early stage breast cancer.[1] This is a particularly relevant population for examining these questions because there is evidence that the giving-up response prospectively predicts poorer health outcomes in this population (Greer, Morris, & Pettingale, 1979; Greer, Morris, Pettingale, & Haybittle, 1990; Pettingale, Morris, & Greer, 1985).

Threat and Incentive in the Experience of Cancer

Receiving a diagnosis of breast cancer is a threatening and unsettling event (Derogatis, 1986; Holland & Rowland, 1987; Taylor, 1983). Patients face the prospect of dying or becoming permanently disfigured (Holland & Rowland, 1987). A host of difficult existential and pragmatic questions and concerns inevitably surface (Spencer et al., 1999): Has (or will) the cancer spread? Will my sense of femininity be irreparably damaged? Will friends and family react adversely? How will adjuvant therapy affect me? What will be the treatment's financial impact?

Some of these concerns reflect threats (e.g., threat of recurrence, threat of premature death). Others represent the potential loss of incentives (e.g., the loss of a particular sense of self, the loss of independence and self-sufficiency, the loss of opportunities to go places and do things). It seems reasonable to suggest, then, that both BIS sensitivity and BAS sensitivity may be relevant to the experiences of women who find themselves in this situation. This is another reason why these women seemed to be a good population within which to explore our conceptual analysis.

In the study reported here, we examined distress and giving-up reactions among women who had been treated for breast cancer within the past year. We hypothesized that these women would exhibit more distress and behavioral disengagement—a giving-up response—if they were threat-sensitive. Furthermore, we hypothesized that these reactions to threat would be magnified by doubt about remaining free of cancer in the future, which is the single greatest concern of these patients (Spencer et al., 1999). Thus, we predicted that BIS sensitivity and expectation of recurrence would interact in predicting both distress and disengagement, such that women who were threat-sensitive by nature and also believed the cancer would return would report disproportionately high distress and disengagement.

As we noted earlier, the cancer experience may also interfere with continued pursuit of incentives. Reactions pertaining to incentives should relate to BAS sensitivity. We reasoned that persons low in incentive responsiveness by nature would be more vulnerable to abandoning the pursuit of goals than would those higher in incentive responsiveness, and that this tendency to give up would be magnified by greater doubt. Thus, we predicted that BAS sensitivity and expectation of recurrence would interact in the prediction of disengagement, such that women who were both currently doubtful about the future and low in incentive responsiveness would display disproportionately high disengagement.

With respect to BAS sensitivity and distress emotions, we considered two possibilities. The first parallels the hypothesis just described for giving up: that the combination of low incentive responsiveness and doubt about the future should yield disproportionately high distress. However, there are also grounds for a very different hypothesis: that greatest distress may occur in people who are *highly* responsive to incentives but who are doubtful about reaching them. For example, Carver and Scheier (1998) argued that strong incentive responsiveness leads either to strong positive affect or to strong negative affect, depending on whether the situation fosters confidence or doubt about moving forward successfully. This line of thought seems to be consistent with a disjunction that has been observed between two sets of symptoms in depression (Watson, Weber, Assenheimer, & Clark, 1995). That is, anhedonic symptoms—loss of pleasure and loss of motivation (which resemble the giving-up response)—often occur separately from feelings of overt distress (negative affect). It may be that these two classes of symptoms have different underlying mechanisms. We posed these two possibilities regarding distress—that adverse expectancies would interact with BAS sensitivity in one of

[1] This is not the first clinically relevant sample to be studied with respect to BIS and BAS function, although it is the first to be studied with the operationalization of BIS and BAS function that we used. Depressed persons have been studied in several instances with respect to resting levels of brain activity (Allen, Iacono, Depue, & Arbisi, 1993; Gotlib, Ranganath, & Rosenfeld, 1998; Henriques & Davidson, 1991). However, those persons were not under any particular known stress, and the studies did not involve any measure of expectancies for the future.

two directions—as alternative hypotheses in prediction of emotional distress.

Method

Participants

Participants were 220 women in the greater Miami, Florida area who were diagnosed with early stage breast cancer: in situ carcinoma, $n = 10$; Stage I, $n = 133$; and Stage II, $n = 77$.[2] Participants at Stage II had an average of 1.88 positive lymph nodes ($SD = 3.11$). None of the participants had had prior cancer, and none had any major concurrent disease.

Ages ranged from 27 to 87 years ($M = 53.84$, $SD = 12.79$). One hundred fifty-two were married or had an equivalent relationship, 28 were separated or divorced, 26 were widowed, and 14 were single. Twenty-one were characterized as being of African American ethnicity, 142 as White–non-Hispanic, and 57 as Hispanic (29 were Cuban Americans, and the rest were a mixture of other Hispanic origins); 96 were employed full-time, 20 were employed part-time, and 104 were not currently employed. Participants had completed an average of 14.41 ($SD = 3.12$) years of education. All had undergone surgery 3 to 12 months before participation in the study, 76 by modified radical mastectomy, 9 by double mastectomy, and 135 by lumpectomy. Seventy-nine had subsequently undergone chemotherapy; 137 had undergone radiation treatment.

Procedure

Participants were recruited from a variety of sources, including two private physicians' offices and a hospital (the University of Miami's Sylvester Comprehensive Cancer Center). Potential participants were informed about the study by letters from their physicians or by fliers placed in offices and mailed by the local American Cancer Society. Interested women contacted the research group by phone, received more detailed information about what participating would entail, and completed an informed-consent form prior to participation. The final participation rate of women initially contacted by letters from their physicians was approximately 80% (no one refused to participate after making phone contact with the project, regardless of how that contact was initiated, though some required follow-up calls before they returned the questionnaire packets).

The data were collected by either phone interview or mail-out packets, according to the participants' stated preference. Interviews were conducted by female graduate students in clinical psychology who had been trained to develop empathy and elicit clear responses. The form of completion of the measures had no detectable influence on participants' responses. Each participant was paid $40 on completion of the measures. Given the nature of the recruitment process, it is apparent that this was not a random sample of patients; it was biased in favor of persons who were willing to make some effort to participate in research that had no direct benefit to them.

Measures

Sensitivities to threats and incentives. The BIS/BAS scales (Carver & White, 1994) were developed to measure dispositional sensitivities of the BIS and the BAS. There are four scales: One reflects BIS sensitivity, and three reflect aspects of BAS sensitivity (Drive, Fun Seeking, and Reward Responsiveness). These three aspects of BAS sensitivity derive from diverse theoretical statements about how BAS functioning should be reflected experientially—that is, high BAS engagement should cause people to seek out new incentives, to be persistent in trying to reach incentives, and to respond with positive feelings when incentives are attained. It appears that these three functions are somewhat distinct from one another, as reflected in these three BAS-related factors.

Items on the BIS/BAS scales are first-person statements, with response options ranging from 1 (*very false for me*) to 4 (*very true for me*). The scales have been shown to predict individual differences in such outcomes as anxiety and happiness in relevant situations (Carver & White, 1994), asymmetries in resting levels of cortical arousal (Harmon-Jones & Allen, 1997; Sutton & Davidson, 1997), and responses to rewards and punishments during conditioning (Zinbarg & Mohlman, 1998).

An abbreviated version of the instrument was used here because the project from which the data were drawn involved a great many measures and high participant response burden. For each BAS scale, the two items with the highest factor loadings in a previous sample of 732 students (Carver & White, 1994) were used (e.g., for Drive, "I go out of my way to get things I want" [the two items had loaded .73 and .81 on Drive]; for Fun Seeking, "I crave excitement and new sensations" [the two items had loaded .81 and .73 on Fun Seeking]; and for Reward Responsiveness, "When I get something I want, I feel excited and energized" [the two items had loaded .74 and .69 on Reward Responsiveness]). For the BIS scale, the three items with the highest factor loadings were used (e.g., "Criticism or scolding hurts me quite a bit" [loadings had ranged from .68 to .72 on the BIS factor]). In another (archival) sample of 1,053 college students, these reduced scales correlated as follows with the corresponding full scales in which they were embedded: BIS = .88, Drive = .91, Reward Responsiveness = .76, and Fun Seeking = .89.

For purposes of this study, we averaged items of each scale (thus placing scale scores on the metric of the response options). Descriptive statistics for all of the measures from this sample are shown in Table 1. All alphas approximated or exceeded .50, which is regarded as acceptable for brief scales (Nunnally, 1978). Interscale correlations are also presented in Table 1. As one can see, the BIS scale was relatively unrelated to any of the BAS scales. Drive and Fun Seeking were fairly strongly related to each other, and both were more weakly related to Reward Responsiveness. The levels of association among scales are comparable to those reported by Carver and White (1994), except that Carver and White found a somewhat stronger relation between BIS and Reward Responsiveness ($r = .28$) and a slightly weaker relation between Drive and Fun Seeking ($r = .41$). The scale means closely approximated those of the student sample mentioned in the preceding paragraph, with the exception of Fun Seeking, which was higher among the students ($M = 3.04$, $SD = 0.72$).

Expectancy of recurrence. The measure of expectancy regarding recurrence was the same as that used by Carver, Harris, et al. (2000). It consisted of the following question: "To what extent do you believe that you will remain free of cancer in the future?" The response was made on a 9-point scale, where 9 was labeled *absolutely sure I won't get cancer again,* 5 was labeled *I don't know,* and 1 was labeled *not at all confident—I expect to get cancer again.* We used only a single item to assess expectancy of remaining cancer-free because of evidence that single-item reports are as informative as multi-item scales when the qualities being assessed are relatively intuitive to people (Burisch, 1984a, 1984b; see also Helgeson, 1992). We regarded the concept of expecting to remain free of cancer as relatively easy for participants to understand. The sample mean was near the point of maximum ambiguity (the modal response was 5), and responses spanned the full range of possibilities. Doubt about remaining free of cancer was related to BIS scores but was unrelated to any BAS scale scores.

Distress. Emotional distress was assessed with brief scales consisting of a series of descriptive adjectives. Respondents indicate the degree to which they have experienced each feeling "during the past week including

[2] This sample overlaps substantially with that used in two previous articles (Carver, Harris, et al., 2000; Spencer et al., 1999). However, neither of those articles included data or discussion bearing on BIS and BAS sensitivities. The sample of 220 women reported on here consists of all members of the cohort who completed all of the measures described in the *Measures* section; the number and composition of the sample thus differ slightly from other reports drawn from the same data set.

Table 1
Correlations Among Measures and Descriptive Statistics

Measure	1	2	3	4	5	6	7
1. Expectancy							
2. BIS	−.25**	(.55)					
3. Reward Responsiveness	−.03	.05	(.47)				
4. Drive	.09	−.09	.28**	(.72)			
5. Fun Seeking	.08	−.03	.27**	.56**	(.54)		
6. Distress	−.23**	.34**	−.09	.02	.08	(.89)	
7. Behavioral Disengagement	−.14*	.20**	−.13	−.18**	−.04	.27**	(.57)
M	5.58	2.97	3.75	3.02	2.68	1.85	1.23
SD	1.85	0.74	0.41	0.83	0.87	0.74	0.56
Range	1–9	1–4	2–4	1–4	1–4	1–4.9	1–4

Note. Alpha reliabilities are in parentheses along the diagonal. $N = 220$. BIS = behavioral inhibition system.
* $p < .05$. ** $p < .01$.

today." Response options range from 1 (*not at all*) to 5 (*extremely*). We used the scales that were used in earlier breast cancer research by Carver et al. (1993). We focused here on anxiety (tense, nervous, and anxious; $\alpha = .87$), depression (helpless, unhappy, worthless, and hopeless; $\alpha = .80$), and anger (angry, resentful, and grouchy; $\alpha = .78$). In a sample of 235 students, these brief scales correlated .87, .93, and .87, respectively, with the comparable scales from the Profile of Mood States (McNair, Lorr, & Droppelman, 1971). Because these scales were also strongly interrelated, a single distress index was created from all 10 items. We did so by averaging responses (thus placing distress scores on the metric of the response options).

Behavioral disengagement. The Brief COPE (Carver, 1997), an abbreviated version of the COPE Inventory (Carver, Scheier, & Weintraub, 1989), was also in this data set. The Brief COPE measures 14 distinct responses, with each scale consisting of two items. Instructions for this sample were to consider the entire range of difficulties that were experienced in connection with being diagnosed with and treated for breast cancer (cf. Carver et al., 1993). A situational frame was used to inquire about coping responses since surgery. Response options ranged from 1 (*I haven't been doing this at all*) to 4 (*I've been doing this a lot*). As in the other measures, we averaged responses across items.

We focused here on the response assessed by the scale termed *Behavioral Disengagement* ("I've been giving up trying to deal with it" and "I've been giving up the attempt to cope"). It should be clear from the item content that this operationalization of disengagement represents a giving-up or resignation response, rather than an attempt to blunt the stressor's impact.

Results

The first step in data analysis was to assess the need for control variables. Variables examined in that respect included age, ethnic group, time since surgery, surgical procedure, stage of disease, chemotherapy status, radiation status, reconstruction status, employment, education level, children (yes vs. no and number of children), and family history of breast cancer. Two variables related to distress: age (with less distress among older women) and ethnicity (with higher distress among Hispanics than among African Americans or non-Hispanic Whites, who did not differ from each other). Two variables related to reports of behavioral disengagement: radiation as an adjuvant therapy (such that having had radiation related to lower levels of disengagement) and ethnicity (with more disengagement among Hispanics than among African Americans or non-Hispanic Whites, who did not differ from each other). We included these variables as controls, respectively, in analyses of distress and disengagement described below. Radiation status was coded dichotomously, as was Hispanic versus non-Hispanic ethnicity; age was used as a continuous variable.

Descriptive Statistics, Correlations, and Analytic Strategy

Table 1 displays simple correlations between BIS/BAS scales and expectancies of recurrence as related to distress and behavioral disengagement. Women who expected the cancer to return tended to report more distress and disengagement than those who did not expect the cancer to return. Those with higher levels of BIS tended to report more distress and disengagement than those with lower levels of BIS. Women with high Drive scores tended to report less disengagement than those with lower Drive scores. Overall, the magnitudes of these associations were moderate to small. Two of three BAS scales—Reward Responsiveness and Fun Seeking—were unrelated to either distress or disengagement.

Our main interest was not in these main effect associations but in interactions between BIS/BAS scales and expectancies as predictors of distress and disengagement. We conducted hierarchical multiple regression analyses to examine these potential interactions. Because of issues of potential multicollinearity among BAS scales as predictors and because this study was exploratory in nature, we tested each potential interaction separately and then constructed more complex models from interactions that emerged as significant individually.

In each case, psychosocial predictors were centered to reduce collinearity between main effect and interaction terms (Aiken & West, 1991). In Step 1, relevant control variables were entered. Both main effect predictors contributing to a given interaction were entered jointly in Step 2, followed by their interaction in Step 3. We explored the meaning of each significant interaction that emerged by testing conditional regressions of one predictor at high and low levels of the other (one standard deviation above and below the mean; Aiken & West, 1991; Darlington, 1990).

Interactive Prediction of Distress

We began by testing the prediction of distress, with controls for Hispanic ethnicity and age. These control variables accounted

for 8.9% of the variance; main effects of expectancies and BIS added 12.8%; the interaction between BIS and expectancy of recurrence was also significant, $\beta = -.15$, $t(214) = 2.49$, $p < .02$, adding another 2.2% of the variance. We explored the form of the interaction in two ways: by examining the effect of expectancies at high and low levels of BIS and by examining the effect of BIS at high and low levels of expectancies. At high levels of BIS, recurrence expectancy related significantly to distress, $B = -.12$, $\beta = -.29$, $t(214) = 3.41$, $p < .01$; women with high BIS scores who expected recurrence reported more distress than women with high BIS scores who did not expect recurrence (see Figure 1A). At low levels of BIS, the relation of recurrence expectancies to distress was near zero, $B = .00$, $\beta = .01$, $t(214) = 0.09$, $p = .91$. We also examined BIS scores as a predictor of distress at high and low levels of expectancy of recurrence. Among those women who expected cancer to return, BIS related strongly to distress, $B = .48$, $\beta = .48$, $t(214) = 5.00$, $p < .001$. Among those women who expected to remain cancer-free, the link between BIS and distress was weaker, $B = .18$, $\beta = .17$, $t(214) = 2.19$, $p < .04$.

We used a similar hierarchical procedure to test for interactions between expectancies and the BAS scales. No interaction emerged between expectancies and Drive or Reward Responsiveness. With BAS Fun Seeking, however, a different picture emerged. Control variables accounted for 8.9% of the variance, main effects of Fun Seeking and expectations added 5.1%; adding the interaction term added another 2.1%, $\beta = -.16$, $t(214) = 2.30$, $p < .03$ (see Figure 1B). At high levels of Fun Seeking, expectancies of recurrence related to distress, $B = -.14$, $\beta = -.35$, $t(214) = 4.18$, $p < .001$; high fun seekers who expected to remain cancer-free were less distressed than those who expected cancer to return. At low levels of Fun Seeking, in contrast, the relation of recurrence expectancies to distress was near zero, $B = .00$, $\beta = .01$, $t(214) = 0.03$, $p = .97$. We also examined the interaction the other way, testing the relation of Fun Seeking scores to distress at high and low levels of recurrence expectations. Among those women who were confident of remaining cancer-free, Fun Seeking was unrelated to distress, $B = -.10$, $\beta = -.11$, $t(214) = 1.10$, $p = .27$. Among those women who expected recurrence, Fun Seeking related positively to distress, $B = .20$, $\beta = .24$, $t(214) = 2.42$, $p < .02$.

We then examined the independence of these interactions by testing a model in which we entered the control variables; the main effects of BIS, Fun Seeking, and expectancies; and all interaction terms involving these three variables (which is summarized in Table 2). Both the Fun Seeking × Expectancy interaction and the BIS × Expectancy interaction emerged as uniquely significant. Thus, the two interactions were independent of each other.

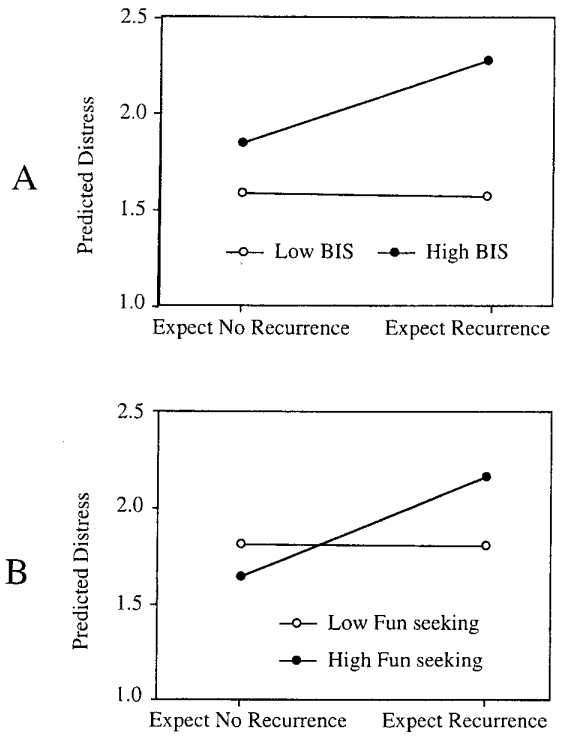

Figure 1. Predicting emotional distress: (A) interaction between behavioral inhibition system (BIS) sensitivity and expectancy of recurrence, and (B) interaction between Fun Seeking sensitivity and expectancy of recurrence.

Interactive Prediction of Disengagement

We then turned to analyses in which behavioral disengagement served as the outcome variable, with controls for Hispanic ethnicity and radiation status. We first examined BIS and expectancies. In this analysis, control variables accounted for 9.4% of the variance, main effect predictors added 3.6%, and the interaction added another 4.4%, $B = -.09$, $\beta = -.21$, $t(214) = 3.37$, $p < .001$. At high BIS levels, recurrence expectations related to behavioral disengagement, $B = -.09$, $\beta = -.30$, $t(214) = 3.29$, $p < .01$, such that those who doubted they would remain cancer-free reported greater disengagement than those who expected to remain cancer-free (see Figure 2A). This relation did not obtain at low BIS levels, however, $B = .04$, $\beta = .13$, $t(214) = 1.43$, $p = .16$. Coefficients of BIS at high and low expectation levels were also examined. Among those women expecting to remain cancer-free, BIS was not linked to disengagement, $B = -.02$, $\beta = -.02$, $t(214) = 0.29$, $p = .77$. Among those women expecting cancer recurrence, however, BIS scores related strongly to disengagement, $B = .30$, $\beta = .40$, $t(214) = 4.08$, $p < .001$.

In testing the interaction between expectancies and Reward Responsiveness scores, control variables accounted for 9.4% of the variance in disengagement, the main effects added 4.2%, and the interaction added 3.9%, $B = .19$, $\beta = .21$, $t(214) = 3.18$, $p < .01$. Simple effects tests (see Figure 2B) revealed that at high levels of Reward Responsiveness, expectancies were unrelated to disengagement, $B = .03$, $\beta = .09$, $t(214) = 0.93$, $p = .35$. At low levels of Reward Responsiveness, though, there was a strong relationship between expectancies and disengagement, $B = -.13$, $\beta = -.43$, $t(214) = 3.76$, $p < .001$, such that women who were unresponsive to rewards disengaged more if they also expected their cancer to return than if they did not. We also examined the interaction the other way, testing the effects of Reward Responsiveness at high and low levels of expectancy. Among women who were confident they would remain cancer-free, Reward Responsiveness was unrelated to disengagement, $B = .09$, $\beta = .07$, $t(214) = 0.67$, $p = .50$. Among women who expected cancer to return, however, Reward Responsiveness was strongly linked to disengagement,

Table 2
Final Hierarchical Regression Analysis Predicting Distress

Variable	*B*	β	*t*(*df*)	*p*	ΔR^2	ΔF(*df*s)	*p*
Step 1					.09	10.66 (2, 217)	.001
Age	−.01	−.13	2.06 (217)	.04			
Hispanic	.19	.26	4.01 (217)	.01			
Step 2					.13	12.12 (3, 214)	.001
Age	−.01	−.14	2.29 (214)	.02			
Hispanic	.17	.22	3.68 (214)	.01			
BIS	.30	.30	4.71 (214)	.01			
Fun Seeking	.06	.07	1.05 (214)	*ns*			
Expectancy	−.06	−.15	2.38 (214)	.02			
Step 3					.04	3.39 (3, 211)	.02
Age	−.01	−.14	2.20 (211)	.03			
Hispanic	.16	.21	3.55 (211)	.01			
BIS	.32	.32	5.06 (211)	.01			
Fun Seeking	.04	.04	0.68 (211)	*ns*			
Expectancy	−.04	−.10	1.56 (211)	*ns*			
BIS × Expectancy	−.07	−.13	2.15 (211)	.03			
Fun Seeking × Expectancy	−.07	−.14	2.05 (211)	.04			
BIS × Fun Seeking	.00	.00	0.05 (211)	*ns*			

Note. BIS = behavioral inhibition system.

$B = -.62$, $\beta = -.45$, $t(214) = 4.12$, $p < .001$. Thus, the combination of expecting recurrence and low Reward Responsiveness was most detrimental in this analysis with respect to disengagement.

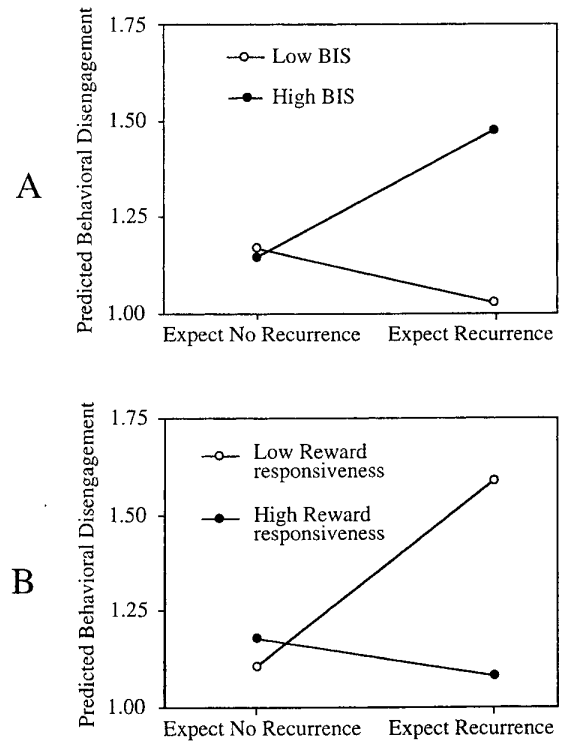

Figure 2. Predicting behavioral disengagement (giving up): (A) interaction between behavioral inhibition system (BIS) sensitivity and expectancy of recurrence, and (B) interaction between Reward Responsiveness sensitivity and expectancy of recurrence.

In another set of analyses, an interaction of similar form, but somewhat weaker, emerged between BAS Drive and recurrence expectancies. Control variables accounted for 9.4% of the variance, main effects added 3.6%, and the interaction added 1.8%, $\beta = .14$, $t(214) = 2.11$, $p < .04$. At high levels of Drive, expectancies were unrelated to disengagement, $B = .00$, $\beta = .01$, $t(214) = 0.13$, $p = .90$. At low levels of Drive, expecting recurrence related to greater disengagement, $B = -.08$, $\beta = -.27$, $t(214) = 2.72$, $p < .01$. We also examined the alternate set of contrasts. Among participants who expected to remain cancer-free, Drive was unrelated to disengagement, $B = .01$, $\beta = .02$, $t(214) = 0.17$, $p = .87$. Among those expecting cancer recurrence, however, Drive and expectancies were inversely related, $B = -.18$, $\beta = -.27$, $t(214) = 3.12$, $p < .01$. Thus, the combination of low Drive and expectancy of recurrence was most detrimental in this analysis with respect to disengagement. No interaction emerged between recurrence expectancy and Fun Seeking scores.

We then examined the independence of the interactions, by testing combinations of the BIS-related and BAS-related interactions. In the first of these models, we entered control variables; main effects of BIS, Drive, and expectancies; and then all interaction terms involving these variables. In this analysis, only the interaction between BIS and expectancies remained significant, $B = -.08$, $\beta = -.20$, $t(211) = 3.14$, $p < .01$. The interaction between Drive and expectancies had a β of only .10 ($p < .15$).

The second model tested control variables, BIS, Reward Responsiveness, expectancies, and the interaction terms involving these variables. In this analysis (which is summarized in Table 3, Steps 1–3), three interactions emerged as significant. The first and second were those described earlier between BIS and expectancy, and between Reward Responsiveness and expectancy. In addition, however, there was an interaction between BIS and Reward Responsiveness (Figure 3). Follow-up tests indicated that at high levels of BIS, Reward Responsiveness related inversely to disengagement, $B = -.53$, $\beta = -.39$, $t(211) = 4.36$, $p < .001$. At low levels of BIS, however, Reward Responsiveness was unrelated to

Table 3
Final Hierarchical Regression Analysis Predicting Behavioral Disengagement (Giving Up)

Variable	*B*	β	*t*(*df*)	*p*	ΔR^2	ΔF(*df*s)	*p*
Step 1					.09	11.20 (2, 217)	.001
Radiation	−.07	−.12	1.82 (217)	.07			
Hispanic	.15	.26	4.02 (217)	.01			
Step 2					.07	5.50 (3, 214)	.001
Radiation	−.06	−.10	1.58 (214)	*ns*			
Hispanic	.15	.27	4.21 (214)	.01			
BIS	.12	.16	2.42 (214)	.02			
Reward Responsiveness	−.24	−.17	2.71 (214)	.01			
Expectancy	−.03	−.09	1.32 (214)	*ns*			
Step 3					.11	10.23 (3, 211)	.001
Radiation	−.04	−.07	1.16 (211)	*ns*			
Hispanic	.15	.27	4.47 (211)	.01			
BIS	.15	.20	3.23 (211)	.01			
Reward Responsiveness	−.26	−.19	3.19 (211)	.01			
Expectancy	−.04	−.12	1.95 (211)	.05			
BIS × Expectancy	−.09	−.21	3.56 (211)	.01			
Reward Responsiveness × Expectancy	.15	.17	2.60 (211)	.01			
BIS × Reward Responsiveness	−.30	−.15	2.46 (211)	.01			
Step 4					.02	5.61 (1, 210)	.02
Radiation	−.05	−.08	1.38 (210)	*ns*			
Hispanic	.15	.27	4.52 (210)	.01			
BIS	.15	.19	3.11 (210)	.01			
Reward Responsiveness	−.22	−.16	5.26 (210)	.01			
Expectancy	−.04	−.14	2.23 (210)	.03			
BIS × Expectancy	−.10	−.24	4.02 (210)	.01			
Reward Responsiveness × Expectancy	.18	.19	2.98 (210)	.01			
BIS × Reward Responsiveness	−.32	−.16	2.65 (210)	.01			
BIS × Reward Responsiveness × Expectancy	.18	.15	2.37 (210)	.02			

Note. BIS = behavioral inhibition system.

disengagement, $B = -.07$, $\beta = .06$, $t(211) = 0.60$, $p = .55$. The alternate contrasts showed that at high levels of Reward Responsiveness, BIS was not related to disengagement, $B = -.02$, $\beta = -.03$, $t(211) = 0.29$, $p = .77$. At low levels of Reward Responsiveness, however, there was a strong relationship between BIS and disengagement, $B = .32$, $\beta = .42$, $t(211) = 4.47$, $p < .001$.

The form of this third interaction suggested one more possibility: that of a three-variable interaction among BIS, Reward Responsiveness, and recurrence expectancy. Accordingly, we recomputed the prior analysis with the addition of a fourth step, in which this last interaction term was entered (see Table 3). After this step, all two-variable interactions retained their significance, and the three-variable interaction also emerged as significant. Exploration of the form of this interaction revealed a very clear picture (see Figure 4). Put simply, expectancies of recurrence related to behavioral disengagement in only one set of circumstances: when threat responsiveness (BIS) was high and Reward Responsiveness was low, $B = -.24$, $\beta = -.81$, $t(210) = 4.73$, $p < .0001$.[3]

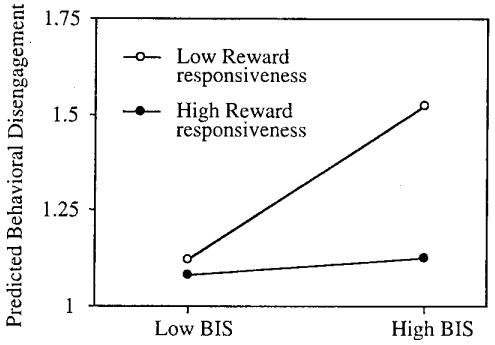

Figure 3. Predicting behavioral disengagement (giving up): interaction between behavioral inhibition system (BIS) sensitivity and Reward Responsiveness sensitivity.

Discussion

This study examined individual differences in distress and giving-up (disengagement) responses to threat and loss of incentive in the months following a diagnosis of breast cancer. The hypotheses derived from a joint consideration of the constructs of two distinct approaches to motivation. The first approach emphasizes the role of sensitivities of appetitive and aversive motivational systems; the second approach emphasizes the role of expectancies for the future. In a sample of patients with early stage breast cancer, we examined whether the sensitivities of these aversive and appetitive systems would interact with confidence for the future to predict emotional distress and a giving-up reaction.

[3] Finding this more complex interaction for disengagement raised the possibility of a similar interaction emerging for distress. Such was not the case, however.

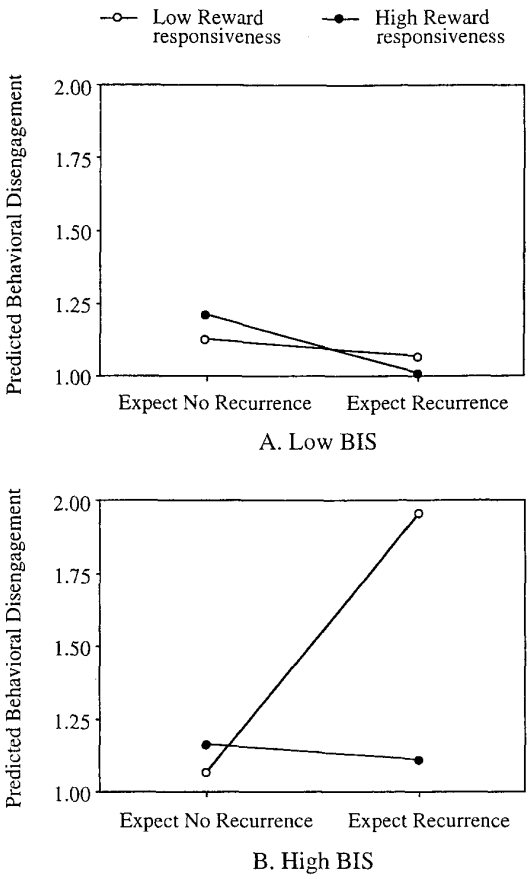

Figure 4. Predicting behavioral disengagement (giving up): effects of expectancy of recurrence and Reward Responsiveness (A) at low levels of behavioral inhibition system (BIS) sensitivity and (B) at high levels of BIS sensitivity.

We operationalized confidence as the women's expectation that they would remain free of cancer in the future (confident) or that they would experience a recurrence (doubtful). We operationalized the sensitivity of aversive and appetitive motivational systems by the self-report measure of Carver and White (1994).

We predicted, and found, that dispositional threat reactivity interacted synergistically with doubt about the future, such that the combination of high levels of the two related to elevations in giving up. We also predicted and found that low responsiveness to reward interacted with expectation of recurrence to predict more giving up. There were also two further interactions regarding giving up. In one, the combination of high threat sensitivity and low incentive responsiveness related to more disengagement than did other combinations. The final interaction involved these two sensitivities plus doubtfulness, such that disengagement was maximized by the combination of high threat sensitivity, low Reward Responsiveness, and expectation of recurrence.

With respect to distress, we predicted and found that high threat sensitivity interacted with doubt for the future to yield greater distress than other patterns of expectancy and threat reactivity. Two views of the potential role of BAS sensitivity led to two further competing hypotheses. One was that low BAS sensitivity combined with adverse expectancy would relate to higher distress, as it did to greater disengagement. The data did not support this hypothesis. The other possibility was that adverse expectancies among people who were very *sensitive* to incentives would relate to higher distress. This hypothesis was supported: Women with high levels of Fun Seeking who reported expecting their cancer to return also reported more distress than women with all other combinations of Fun Seeking tendencies and expectancies.

We should acknowledge that this study has important limitations. It is cross-sectional, and the data came from women undergoing one particular kind of adversity: treatment for early stage breast cancer. This study was by no means an attempt to create a descriptive picture of particular sorts of disorder (cf. Watson et al., 1995). Furthermore, the sample consisted of women who chose to reply to an invitation to join in a study of cancer patients, not a random sample of cancer patients (on the positive side, it had a larger minority representation than is typical of psycho-oncology research). Another limitation is that the measures we used were brief (indeed, expectancy of recurrence was assessed by a single item). The smaller number of items per scale resulted in lower reliabilities than displayed by longer scales (though other data also indicate that the abbreviated scales correlate strongly with relevant longer scales). The possibility that these lower reliabilities might have obscured or reduced potentially meaningful findings cannot be discounted.

A final limitation that we should note is that although the interaction effects took the predicted forms, they were not overly strong. With respect to distress, each interaction accounted for only slightly more than 2% of the variance; because they were relatively independent contributors, they combined to yield 4% of the variance. With respect to disengagement, the effects were larger, around the 4% level; together, the various interactions pertaining to disengagement accounted for a total of 11% of the variance. It is of interest that the outcome for which the interactions were weaker (distress) also displayed stronger main effects for the predictors (12.8%, compared with 3.6% for disengagement). This may hint that there is a more direct path to distress than to disengagement, which rests more on the joint working of biological and cognitive variables.

Despite limitations, this study appears to represent a reasonable test of the reasoning outlined in this article's introduction. Its findings have several kinds of implications. Some concern the experiences of cancer patients, and persons who are under serious stress more generally. Other implications are more conceptual in nature.

Implications Regarding People Facing Adversity

Although we undertook this study primarily as a test of a theoretical model, the findings make several points about the experiences of breast cancer patients and of other people confronting serious adversity. Most basically, personality makes a difference in the experiences that people have in such circumstances. Threat sensitivity, incentive sensitivity, and appraisals of prospects for the future all played a role in predicting distress and giving up in this study.

The pattern of these findings suggests a clear basis for identifying specific cancer patients (and others in similarly difficult situations) for potential psychological intervention. Specifically, those who express doubt about important future outcomes and who are also high in dispositional threat sensitivity are likely candidates for intervention. People who combine these characteristics will experience more distress and a stronger impulse to give up than will other people. If they also are low in reward responsiveness, the synergistic effect on giving up will be further magnified.

The fact that the negative synergy almost always involved the presence of doubt about the future also suggests a possible target for intervention. It is difficult, at best, to change biologically rooted temperaments, as BIS and BAS sensitivities are generally construed to be. However, confidence versus doubt for the future, as a cognitive appraisal, should be more amenable to change. If one were to view the perception of doubt about remaining cancer-free as the trigger point for distress and giving up, it follows that cognitive restructuring bearing on that perception may be a useful way of preventing disengagement from or restoring engagement with life. This approach would be especially reasonable for early stage cancer patients, whose objective risk of recurrence is quite low.

The giving-up tendency is particularly pernicious in this population. One previous study found that reports of disengagement at one time point predicted subsequent distress among breast cancer patients, when previous distress was controlled for (Carver et al., 1993). Another longitudinal project found that the giving-up response was a predictor of subsequent recurrence (Greer et al., 1979, 1990; Pettingale et al., 1985). On both counts, it would seem desirable to try to diminish the giving-up response, and the involvement of expectancies suggests that they are a reasonable target for the effort.

We should also note that two demographic variables played predictive roles in this study, although they were not the focus of our attention. First, age was related inversely to distress, a pattern that has shown up in some previous studies, though not all (Given, Given, & Stommel, 1994; Mor, Allen, & Malin, 1994; Vinokur, Threatt, Vinokur-Kaplan, & Satariano, 1990). This pattern is typically viewed as suggesting that cancer seems more "age appropriate" to older patients than to younger patients, or that older patients have a greater sense of having already experienced a full life, resulting in lower distress. The other variable was ethnicity: Hispanic women reported more distress (as was reported from this data set by Spencer et al., 1999) and more of a giving-up response (which was not reported by Spencer et al., 1999) than did the other women. It is uncertain how best to interpret this pattern. Perhaps Hispanic women reported greater distress and disengagement than the other women because such responses are culturally appropriate—or because acknowledgment of feelings is culturally appropriate.

Theoretical Implications

The pattern of findings from this study also seems to have theoretical implications. Consider the disjunction between the two sets of findings regarding BAS sensitivity. Specifically, negative emotional responses were most intense among those whose BAS was most sensitive (as reflected in the Fun Seeking subscale), but the experience of disengagement was most intense among those whose BAS was least sensitive (as reflected in the Reward Responsiveness subscale). How should this pattern be interpreted?

One potential answer is based on the idea that creation of affect—both negative and positive—depends on the engagement of motive tendencies, whereas disengagement represents the absence or loss of a motive tendency. For example, Carver and Scheier (1998) argued that among people who are engaged in approach, positive feelings are created when their efforts are going well (i.e., there are grounds for confidence) and negative feelings are created when their efforts are going poorly (i.e., there are grounds for doubt). This line of reasoning seems to fit the finding that distress was more intense among the doubtful women with great sensitivity in the Fun Seeking aspect of the approach system than among doubtful women whose Fun Seeking tendency was lower.

Carver and Scheier's (1998) position is that disengagement reflects withdrawal of effort, and eventually withdrawal of commitment to the goal (see also Klinger, 1975). This position would suggest that disengagement should be greatest among persons whose approach sensitivity is weakest. This reasoning fits the pattern of our findings with respect to the Drive and Reward Responsiveness manifestations of the approach tendency. Indeed, Carver and Scheier (1998, chap. 12) also hold that withdrawal of effort in the face of doubt is accompanied by distress only if commitment to the goal remains. If disengagement is more complete—if commitment is minimal—distress diminishes. This argument is consistent with the relatively modest association we found here between distress and disengagement.

This reasoning has at least surface similarity to aspects of Clark and Watson's (1991) tripartite model of anxiety and depression. In particular, Clark and Watson distinguished between anhedonic aspects of depression and distress-related aspects of depression. Their discussion of anhedonia focused both on the absence of pleasure and on the loss of motivation and lack of goal engagement, the latter being reflected in items such as "felt that nothing was interesting or enjoyable" and "felt withdrawn from other people" (Watson et al., 1995). These anhedonic qualities have a good deal of similarity to the behavioral disengagement that was assessed in our study. Clark and Watson's measure also includes feelings of depressed mood, but reports of the intensity of such feelings load on a different scale than do ratings of anhedonia.

Clark and Watson (1991) conceptualized this differentiation between qualities of sadness and anhedonia essentially in terms of temperamental differences. Anhedonia is seen as related to low levels of a positive affect temperament, and mood disturbance is seen as related to high levels of a negative affect temperament. A number of theorists have drawn parallels between positive affect as a temperament and BAS sensitivity (and extraversion); similar parallels have been drawn between negative affectivity as a temperament and BIS sensitivity (and neuroticism; e.g., Carver & Scheier, 1998; Carver, Sutton, & Scheier, 2000; Fowles, 1993; Gray, 1994b; Tellegen, 1985; Watson, Wiese, Vaidya, & Tellegen, 1999; Zuckerman, 1995). Thus, some grounds exist for saying that these theoretical views in some respects represent variations on a theme.

The clearest difference between the approaches (at this superficial level) is in what variables relate to high levels of emotional distress. In Clark and Watson's (1991) model, the positive affect temperament relates to positive affect, but only positive affect;

negative affect arises from the negative affect temperament (see also Watson et al., 1999). Carver and Scheier's (1998) analysis, in contrast, argues that both of these motivational dimensions have the potential to yield affects of both valences. Evidence consistent with this argument has recently been reported by Harmon-Jones and Allen (1998). They found that anger (a negative affect) was associated with differential activation of the left frontal cortical area, the area commonly linked to BAS functioning (Harmon-Jones & Allen, 1997; Sutton & Davidson, 1997). Further evidence that high BAS sensitivity can relate to negative affect comes from the data reported here.

The overall pattern of our findings also conveys a final, more diffuse implication. The findings are generally supportive of the theoretical arguments with which we began. They thus suggest the usefulness of thinking about BIS and BAS sensitivities as distinct constructs, both of which are relevant in examining negative responses to the experience of adversity. The pattern of findings also suggests that these constructs have useful and interesting intersections with another historically important motivational construct—expectancies for the future—thus extending the BIS and BAS research in a potentially important new direction. In sum, the findings suggest that this joint conceptualization is worth examining more thoroughly in future studies.

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