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A Prospective Test of Cognitive Vulnerability Models of Depression With Adolescent Girls

Cara Bohon, **Eric Stice**, **Emily Burton**, and **Molly Fudell**
University of Texas, Austin

Susan Nolen-Hoeksema
Yale University

Abstract

This study sought to provide a more rigorous prospective test of two cognitive vulnerability models of depression with longitudinal data from 496 adolescent girls. Results supported the cognitive vulnerability model in that stressors predicted future increases in depressive symptoms and onset of clinically significant major depression for individuals with a negative attributional style, but not for those with a positive attributional style, although these effects were small. This model appeared to be specific to depression, in that it did not predict future increases in bulimia nervosa or substance abuse symptoms. In contrast, results did not support the integrated cognitive vulnerability self-esteem model that asserts stressors should only predict increased depression for individuals with a confluence of negative attributional style and low self-esteem, and this model did not appear to be specific to depression.

Depression is one of the most common psychiatric disorders among adolescents, is marked by functional impairment, and increases risk for future suicide attempts, academic failures, interpersonal problems, eating disorders, substance abuse, and delinquency (Lewinsohn, Rohde, Klein, & Seeley, 1999; Newman et al., 1996; Reinherz et al., 1999; Stice, Burton, & Shaw, 2004). Thus, considerable research has evaluated etiologic models of depression to further our understanding of the processes that give rise to this condition, identify those at risk for depression, and inform prevention programs.

Cognitive etiologic theories, in particular, have been extensively examined. Beck's (1967) cognitive theory emphasizes the role of automatic negative thoughts. Specifically, the theory posits that dysfunctional attitudes in combination with stressful events lead to negative thoughts, which in turn increase risk for the development of depressive symptoms. Abramson, Seligman, and Teasdale (1978) propose that the tendency to attribute stressful events to stable and global causes, to believe that the event will lead to future negative events, and to interpret the event as implying that something is wrong with the person, increases risk for onset and persistence of depression when stressors occur. In short, a negative cognitive style is thought to interact with stress to increase risk for depression; this will be referred to herein as the cognitive vulnerability model. A subsequent version of this theory (the hopelessness theory;

Address correspondence to Cara Bohon, University of Oregon, Department of Psychology, 1227 University of Oregon, Eugene, OR 97403; cbohon@uoregon.edu..
Cara Bohon is now at the University of Oregon.

Abramson, Metalsky, & Alloy, 1989) suggests that these negative cognitive styles (stable and global attributions) interact with negative events to produce hopelessness symptoms of depression. The cognitive vulnerability interaction is one of the most widely tested components of the hopelessness theory and of cognitive theories in general, and will be explored further in the current study. Metalsky, Joiner, Hardin, and Abramson (1993) further expanded the cognitive vulnerability model involving attributional style and stress to include self-esteem, hypothesizing that the cognitive vulnerability-stress interaction would be present among individuals with low self-esteem, but not in those with high self-esteem. Theoretically, those with high self-esteem would be less likely to attribute stressful events to internal causes; thus, self-esteem is thought to buffer individuals against depression.

Longitudinal tests of etiologic theories like these cognitive models are important to determine whether a risk factor or interaction between risk factors predicts future increases in the outcome (i.e., to document temporal precedence). The cognitive vulnerability model involving attributional style and stress theorizes that a negative cognitive style coupled with life stress would lead to subsequent increases in depression.

Most prior longitudinal tests of these cognitive vulnerability models have involved young adults from college samples. Many studies have tested whether Time 1 (T1) cognitive style interacts with Time 2 (T2) stress to predict T2 depressive symptoms, controlling for T1 cognitive style, T2 stress, and T1 depressive symptoms (e.g., Abela, Brozina, & Seligman, 2004; Hankin, Abramson, & Siler, 2001; Metalsky & Joiner, 1992; Reilly-Harrington, Alloy, Fresco, & Whitehouse, 1999). These studies have provided mixed support of the cognitive vulnerability model involving attributional style, in that 46% of the tests of the interactions were significant (average $r = .18$). One benefit of this approach is that the assessment of cognitive style is not affected by the occurrence of the life stress. However, a limitation is that elevated depressive symptoms may increase the probability of life stressors, as suggested by the stress-generation model of depression (Hammen, 1991), or may lead participants to simply perceive more stress in their lives (Monroe & Simons, 1991). That is, if depressive symptoms and stress are measured concurrently, it is not possible to determine whether the stressor preceded the depression or whether the depression preceded the stressor. In order to provide a rigorous prospective test of this model, it is necessary to measure stress and cognitive style before the change in depressive symptoms that serves as the outcome. This ensures that (a) current depression symptoms do not bias the assessment of these constructs, and (b) the stress and cognitive style occurred before the depressive symptoms.

A parallel series of studies that tested this cognitive vulnerability model used a failure paradigm to determine whether an objective life stressor, such as receiving a low grade, interacted with cognitive style to predict increases in depression. These studies have generally tested whether the interaction between T1 cognitive style and T2 stress (receipt of low grade or rejection) predicts T3 depressive symptoms controlling for the effects of T1 cognitive style, T2 stress, and T1 depressive symptoms (e.g., Hilsman & Garber, 1995; Ralph & Mineka, 1998). These studies have also provided mixed support for this cognitive vulnerability model, in that 66% of the interactions tested were significant (average $r = .06$). This approach likewise provides some assurance that the assessment of cognitive style is not influenced by the occurrences of life stress. However, because these analyses are modeling change in depressive symptoms from T1 to T3, it is possible that increases in depression between T1 and T2 contribute to the stressful event experienced at T2. For instance, concentration problems that often occur with depression could result in poor performance on an exam.

Thus, although one benefit of many prior studies is that they provide an assessment of cognitive style that should not be influenced by whether the participant experiences life stress, these approaches do not document that the confluence of a negative cognitive style and stress

temporally precedes increases in depression. Accordingly, we think it is also important to test whether the interaction between T1 cognitive style and T1 stress predicts T2 depressive symptoms controlling for the effects of T1 cognitive style and T1 stress, as well as T1 depressive symptoms—which will ensure that the model is predicting future changes in the dependent variable, as the theory proposes. This is consistent with tests of other etiologic theories, such as the stress-buffering model of depression, which have tested whether the interaction between T1 social support and T1 stress predicts T2 depressive symptoms controlling for the T1 effects of support, stress, and depression (Burton, Stice, & Seeley, 2004; DuBois, Felner, Brand, Adan, & Evans, 1992; McFarlane, Norman, Streiner, & Roy, 1983; Zimmerman, Ramirez-Valles, Zapert, & Maton, 2000).

We found seven prior tests of these cognitive vulnerability theories that ensured that current depressive symptoms did not bias the report of stress and that the stress occurred before the depressive symptom outcome. Of these tests, one study with an adult sample (Johnson & Miller, 1990) and one study with a child/early adolescent sample (Nolen-Hoeksema et al., 1992) used self-report measures of stressful events to investigate the cognitive vulnerability model. Another study with an adolescent sample used an objective measure of peer rejection (peer nomination) to investigate the model. These studies tested whether T1 cognitive style interacted with T1 stress to predict T2 depressive symptoms, controlling for T1 cognitive style, T1 stress, and T1 depression. The other four studies used a failure paradigm with young adult samples (Abela, 2002; Abela & Seligman, 2000; Metalsky, Halberstadt, & Abramson, 1987; Metalsky et al., 1993), in which participants were assessed prior to and after the receipt of an exam grade or acceptance/rejection letter from a college or fraternity/sorority. In these studies, the change in depressive symptoms was measured from before the receipt of the grade or acceptance/rejection letter, but not before the exam or application was submitted. This is important because it ensures that initial depressive symptoms could not contribute to the occurrence of the stressor.

Although researchers have concluded that there is consistent prospective support for the cognitive vulnerability model involving attributional style and stress (Abramson et al., 2002; Hankin, Abramson, Miller, & Haeffel, 2004; Reilly-Harrington et al., 1999), only 16 of the 53 tests (30%) conducted across these prospective studies supported this model (average $r = .18$). Johnson and Miller (1990) found that the Stressors × Negative Cognitive Style interaction did not predict increases in depression in 2 tests. A multiwave study by Nolen-Hoeksema et al. (1992) found that the Stressors × Negative Cognitive Style interaction predicted increases in depressive symptoms in 6 of 18 tests. Interestingly, significant effects were more often observed during adolescence versus childhood. Prinstein and Aikins (2004) found that peer rejection interacted with a negative cognitive style to predict increases in depressive symptoms in 2 of 2 tests, but further qualified this interaction in a 3-way test including gender. They found that this model significantly predicted depressive symptoms only in female adolescents, potentially as a result of increased depressive symptoms and variation of depressive symptoms among females compared to males. In a failure paradigm study (Metalsky et al., 1987), the interaction between exam failure and negative cognitive style predicted increases in depressive symptoms 2 days after receiving the exam grade, but not immediately after receiving the grade (1 of 2 tests was significant). Metalsky et al. (1993) found that the interaction between exam failure and negative cognitive style predicted increases in depressive symptoms 2 days after receiving the exam grade, but not immediately, 1, 3, or 4 days after (1 of 5 tests was significant). In contrast, Abela and Seligman (2000) found that failure to be accepted to a college or a sorority/fraternity resulted in increased depressed mood immediately after the rejection for individuals with a negative cognitive style, but this interaction did not predict depressed mood 3 days later (6 of 12 tests were significant). Finally, rejection from a university did not interact with negative cognitive style in the prediction of increased depressive mood the day of or 3 days later (0 of 2 tests were significant; Abela, 2002).

We found only two studies that provided truly prospective tests of the integrated cognitive vulnerability self-esteem model; 10 out of the 17 tests (59%) of this 3-way interaction were significant (average r = .25). Metalsky et al. (1993) found a significant 3-way interaction between cognitive style, self-esteem, and exam grade to predict increases in depressive symptoms 1, 2, 3, and 4 days after receiving the exam grade, but not immediately following grade receipt (4 of 5 tests were significant). Similarly, Abela (2002) found that the 3-way interaction between negative cognitive style, rejection from a university, and low self-esteem predicted increases in depressed mood 4 days after receiving notification of rejection, but not the day of the rejection (6 of 12 tests were significant).

Because it appears that there is less consistent prospective support for these interactive models than has been suggested, the first aim of the present study was to provide truly prospective tests of these models in a study that addresses certain methodological limitations of previous tests. We tested the theory in a sample of adolescent females because only one of the seven studies that provided a truly prospective test of these theories focused on children and adolescents (Nolen-Hoeksema et al., 1992). Most prior studies used college samples of late adolescent or young adult participants. Our sample comprised middle adolescent girls in 10th or 11th grade. One methodological issue is that sample sizes have tended to be small (average N = 130). It is possible that the limited support for these cognitive models emerged because most studies had low power. For example, with a sample size of 130 and 2-tailed inferential tests, the power to detect a small effect size (r = .10; the effect size we found in the present study) was only .19; this is considerably less than the recommended power of .80. Accordingly, we used a much larger sample than most previous studies (N = 496). Another methodological issue is that all prior studies testing T1 attributional style and T1 stress to predict T2 depressive symptoms relied on survey measures of depression. This might have contributed to the limited support of the interactive models because survey measures appear to be less sensitive than interview measures of depressive symptoms (Nezu, Nezu, McClure, & Zwick, 2002). Additionally, surveys may identify more negative affective states than interviews and may not rule out bereavement, short-term sadness, or physical illness. Most prior tests of cognitive models involving attributional style in children and adolescents have used the Children's Attributional Style Questionnaire–Revised (CASQ-R; Kaslow & Nolen-Hoeksema, 1991), which may also have contributed to the mixed support for this model because this scale has been found to have low internal consistency (α .42–.67; Thompson et al., 1998). Thus, we used a new measure of negative attributional style with higher internal consistency: the Adolescent Cognitive Style Questionnaire (ACSQ: Hankin & Abramson, 2002).

The second aim was to test whether these cognitive vulnerability models predict future onset of clinically significant major depression versus changes in depressive symptoms, as virtually no studies have addressed this question. We hypothesized that the model would significantly predict the onset of depressive disorder, as the original theorists predicted (e.g., Metalsky, Abramson, Seligman, Semmel, & Peterson, 1982). Indeed, Metalsky et al. (1993) and Abela (2002) specifically call for future research to address this important question.

A third aim was to test whether these cognitive vulnerability models are specific to depression or whether they more generally predict increased risk for psychopathology. If these models show predictive effects for a variety of psychiatric disturbances, it raises questions about the theoretical mechanisms that have been offered to explain why stressors only result in an increased risk for depression among vulnerable individuals (Ralph & Mineka, 1998). Because eating disorders and substance abuse are common comorbid conditions among adolescents with depression (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993) and it has been theorized that individuals engage in substance use and binge eating in an attempt to regulate negative affect and depression (Marsh & Dale, 2005; Stice, 2001), we tested whether the cognitive vulnerability model would also predict onset of these disorders. Despite the high

rates of comorbidity and the common role of negative affect in these three disorders, we hypothesized that the cognitive vulnerability models would predict change in depressive symptoms, but not in bulimia nervosa and substance abuse symptoms, which would provide evidence that these models are specific to depression. We examined these pathological outcomes rather than anxiety, another disorder often comorbid with depression, because these data come from a larger study of adolescent mental health that did not assess anxiety.

To the best of our knowledge, this is the first study to (a) provide truly prospective tests of these two interactive models, (b) test whether these models predict onset of interview-assessed major depression and changes in interview-assessed depressive symptoms, and (c) test the specificity of these models to depression. Accordingly, we believe the present study makes a unique contribution to the literature by potentially adding support for the model while addressing issues that may have led to inconsistencies in prior findings.

Methods

Participants

Participants were 496 adolescent females recruited from public and private middle schools in a metropolitan area of the Southwestern United States. Adolescents were in 10th and 11th grades at T1 for this report and ranged in age from 15 to 18 (M = 16.5). The sample was 2% Asian/Pacific Islanders, 7% African Americans, 68% Caucasians, 18% Latina, 1% Native Americans, and 4% “other” or “mixed” racial heritage, which was representative of the schools from which we sampled (2% Asian/Pacific Islanders, 8% African Americans, 65% Caucasians, 21% Hispanics, 4% other or mixed). Average parental education, a proxy for socioeconomic status, was 29% high school graduate or less, 23% some college, 33% college graduate, and 15% graduate degree, which was representative of the metropolitan area from which we sampled (34% high school graduate or less, 25% some college, 26% college graduate, and 15% graduate degree). We focused on adolescent girls because these data were drawn from a study of eating disorders, which primarily afflict girls. Nonetheless, because depression increases during adolescence, particularly for females (Cole et al., 2002; Hankin et al., 1998), this sample should be ideal for testing etiologic models for depression. Indeed, research has found more support for cognitive models of depression in adolescence versus childhood (Nolen-Hoeksema et al., 1992). Further, Prinstein and Aikins (2004) found more support for the cognitive vulnerability-stress model in adolescent females than males.

Procedure

An active parental consent procedure was used to recruit participants, wherein an informed consent letter describing the study and a stamped return envelope were sent to parents of eligible females (a second mailing was sent 2 weeks later). The study was described as an investigation of adolescent mental and physical health. The participation rate was 56% across schools, similar to that of other school-recruited samples that used active parental consent and structured interviews (e.g., 61% for Lewinsohn et al., 1993). Further, the 1-year prevalence rates of major depression (4.2%), bulimia nervosa (0.4%), and substance abuse (8.9%) were similar to the prevalence rates from other epidemiological studies (Lewinsohn et al., 1993; Newman et al., 1996).

Participants completed a questionnaire and a structured interview at baseline and six annual follow-ups. Because we only assessed attributional style using the ACSQ at the fourth and fifth annual assessments, the present report focused solely on data from these assessments, which will be referred to as T1 and T2 for this report. Because the larger study focused on a wide array of variables, it was necessary to use abbreviated versions of certain measures to reduce respondent burden (only measures examined in this report are described here). Female

assessors with at least a bachelor's degree in psychology conducted all interviews. They participated in 24 hours of training, wherein they learned interview skills, reviewed diagnostic criteria for relevant Diagnostic and Statistical Manual of Mental Disorders (*DSM-IV*; American Psychiatric Association, 1994) conditions, observed simulated interviews, and role-played interviews. Assessors demonstrated interrater agreement for diagnoses ($\kappa > .80$) with experts using tape-recorded interviews before collecting data. Interviews were recorded periodically throughout the study to ensure that assessors continued to demonstrate acceptable interrater agreement ($\kappa > .80$) with other clinical assessors. Assessments were conducted on the school campus, at participants' houses, or in our lab. Participants received gift certificates to a local book and music store or a cash payment for participating in each assessment.

Measures

Cognitive style—Twelve items from the ACSQ (Hankin & Abramson, 2002) were administered at T1. The ACSQ presents negative hypothetical events, such as, *You take a test and get a bad grade*, which the participants rate regarding the degree to which the cause of the event is internal, stable, global, and the degree to which the event signifies that the person's idea of self is flawed. They also rate the likelihood that negative consequences will result from the negative event. Scores on each item range from 1 to 7 and are averaged to form a scale score in which high scores signify a negative attributional style. The ACSQ has displayed internal consistency ($\alpha = .95$), 2-week test-retest reliability ($r = .73$), and concurrent validity with self-reported depressive symptoms (Hankin & Abramson, 2002); $\alpha = .82$ at T1. This measure provides more detail about the attributional style of the participant for each hypothetical situation than the CASQ-R, while still maintaining a closed response style format.

Perceived stressors—The Major Life Events Scale (Lewinsohn et al., 1994) assessed the occurrence of nine stressful events in the past year (e.g., *Did your parents get divorced or separated?*). Response options range from *no* = 1 to *at least twice* = 3, and items are summed to form a composite score. This scale has shown 1-week test-retest reliability ($r = .90$) and predictive validity for future onset of major depression (Burton et al., 2004; Lewinsohn et al., 1994). In addition, the agreement between negative life events endorsed with these items and interview-confirmed negative life events has been found to be high (*M* percent agreement = 68; Lewinsohn, Rohde, & Gau, 2003). It has been noted (Cleary, 1981) that internal consistency is not an appropriate index of the reliability for stressful life events measures because experiencing one stressful event (e.g., having a possession stolen) should not increase the odds of experiencing others (e.g., experiencing an illness). This scale had an $\alpha = .51$ at T1, which was similar to other stressful life events measures (αs ranged from .41 to .53; Hurst, Jenkins, & Rose, 1978).

Self-esteem—An adapted version of the Rosenberg Self-Esteem scale (Rosenberg, 1979) assessed participants' general self-worth. The adapted scale consists of six statements (e.g., *I feel that I have a number of good qualities*). Participants indicate their level of agreement with items using a 4-point response scale (1 = *strongly disagree* to 4 = *strongly agree*). Responses were averaged to form a scale score, wherein high scores reflect higher self-esteem. This scale has shown internal consistency (*M* $\alpha = .82$), test-retest reliability (*M* $r = .86$), and convergent validity with self-esteem assessed by structured interviews, observer ratings, clinical ratings, and peer ratings (*M* $r = .51$; Demo, 1985); $\alpha = .84$ at T1.

Depressive symptoms and diagnoses—An adapted version of the Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS; Puig-Antich & Chambers, 1983), a semistructured psychiatric interview, assessed diagnostic criteria for *DSM-IV* major depression. Severity ratings for each symptom were averaged to form a depressive symptom composite at each assessment. Responses were also used to classify participants as

having met diagnostic criteria for major depression during the past year. The adapted interview consists of 13 questions assessing the 9 *DSM-IV* symptoms of major depressive disorder. All interviewers were trained and observed extensively before conducting their own interviews. The K-SADS has shown test-retest reliability (κ = .63–1.00), interrater reliability (κ = .73–1.00), and internal consistency (α = .68–.84) and discriminates between depressed and nondepressed individuals (Ambrosini, 2000; Lewinsohn et al, 1993). The interrater agreement and 1-week test-retest reliability for the K-SADS diagnoses, for randomly selected subsets of participants from the present sample (5% each year) was high (κ = 1.0 for both); α = .79 at T1.

Bulimic symptoms—The diagnostic items from the Eating Disorder Examination (EDE; Fairburn & Cooper, 1993) semistructured interview assessed *DSM-IV* criteria for bulimia nervosa. Severity ratings for each diagnostic item were summed to form a bulimic symptom composite reflecting binge frequency, compensatory behavior frequency (vomiting, diuretic use, laxative use, fasting), and overvaluation of weight and shape. Because the bulimic symptom composite was skewed, thereby violating the assumption of normal univariate distributions, it was necessary to apply a square root transformation to normalize the data. The symptom composite used in the current study has shown internal consistency (α = .96), 1-month test-retest reliability (*r* = .95), interrater agreement (κ = .88), convergent validity with alternative measures of eating pathology, and sensitivity to detecting intervention effects in previous studies (Stice, Fisher, & Martinez, 2004; Stice, Presnell, Groesz, & Shaw, 2005); α = .92 at T1.

Substance abuse—Eight items adapted from Stice, Barrera, and Chassin (1998) assessed *DSM-IV* substance abuse symptoms. Items focused on obligation impairment, health problems, physically hazardous behavior, legal problems, and social difficulties resulting from substance use (i.e., got arrested because of substance use, had an accident or injury because of substance use). Items were summed to create a substance abuse symptom composite. Because this symptom composite was very skewed, a $\log_{10}$ transformation was necessary to normalize the distribution, so as to satisfy the assumption of univariate normality. This scale has shown internal consistency (α = .85), 1-month test-retest reliability (*r* = .78), and predictive validity for future onset of depression (Stice et al., 1998; Stice, Burton, et al., 2004); α = .85 at T1.

Results

Preliminary Analyses and Descriptive Statistics

Over the course of this prospective study, attrition averaged 1% to 2% annually, resulting in an available *N* of 480 to 488 for this report. Analyses verified that participants who were missing data at any assessment did not differ significantly from those who were not on demographic factors or any of the variables examined here, suggesting that attrition should not introduce bias. The correlations among the negative attributional style, perceived stress, self-esteem, and depressive symptom measures are reported in Table 1, along with means, standard deviations, and skew coefficients. Depression, attributional style, and negative life events showed high auto-correlations over the 1-year interval. Because of implications for the integrated cognitive vulnerability model, it is important to note that although attributional style and self-esteem may seem similar, the average correlation between the two constructs in our study was *r* = .32, suggesting that they are different enough to be considered separate constructs. Additionally, attributional style includes judgments about stability and globality of events, which may or may not be related to self-esteem.

Tests of the Cognitive Vulnerability Models for Predicting Increases in Depressive Symptoms

To test the cognitive vulnerability model, we estimated a multiple regression equation to test whether the two-way T1 Attributional Style × T1 Stressors interaction predicted T2 depressive

symptoms controlling for T1 attributional style, stressors, and depressive symptoms. As recommended by Aiken and West (1991), all variables were mean-centered prior to forming cross-product terms used in this model (and all subsequent models) to minimize colinearity between the main effect and cross-product terms. This two-way interaction was statistically significant (see Table 2 and Figure 1). Simple slope analyses probed the form of this interaction (Aiken & West, 1991). T1 stressors were a significant predictor of future increases in depressive symptoms at one *SD* above the mean of T1 negative attributional style (β = .10, *B* = .03, 95% CI = .01 – .05, *r* = .10, *p* = .034), but not at one *SD* below the mean of T1 negative attributional style (β = −.04, *B* = −.01, 95% CI = −.04 – .02, *r* = −.03, *p* = .435). Thus, results provide support for the theory that stressors predict future increases in depressive symptoms for those with a negative attributional style.

To test the integrated cognitive vulnerability self-esteem model, a multiple regression equation tested whether the three-way T1 Attributional Style × T1 Stressors × T1 Self-Esteem interaction predicted T2 depressive symptoms controlling for T1 attributional style, stressors, and self-esteem, the two-way interactions between each of these three variables, and T1 depressive symptoms. The three-way interaction was statistically significant (see Table 2).[1] Simple slope analyses indicated that T1 stressors were a significant predictor of increases in depressive symptoms at one *SD* above the mean of T1 negative attributional style and one *SD* above the mean of T1 self-esteem (β = .34, *B* = .09, 95% CI = .04 – .14, *r* = .17, *p* < .001), marginally significant at one *SD* above the mean of T1 negative attributional style and one *SD* below the mean of T1 self-esteem (β = .09, *B* = .02, 95% CI = −.00 – .05, *r* = .09, *p* = .062), and not significant at one *SD* below the mean of T1 negative attributional style and one *SD* above the mean of T1 self-esteem (β = −.10, *B* = −.03, 95% CI = −.06 – .01, *r* = −.07, *p* = .117), or at one *SD* below the mean of T1 negative attributional style and one *SD* below the mean of T1 self-esteem (β = .01, *B* = .00, 95% CI = −.04 – .04, *r* = .01, *p* = .885). Figure 2 shows the nature of this interaction. Thus, contrary to expectations, stressors predicted increased depression for those with a negative attributional style and high self-esteem, and showed only marginally significant prediction of increases in depressive symptoms for those with a negative attributional style and low self-esteem.

Tests of the Cognitive Vulnerability Models for Predicting Onset of Major Depression

To test whether the cognitive vulnerability model predicted onset of major depression, a logistic regression model tested whether the two-way T1 Attributional Style × T1 Stressors interaction predicted onset of major depression at T2 among individuals who were free of a diagnosis at T1 controlling for T1 attributional style and stressors. The two-way interaction significantly predicted onset of major depression (see Table 3).[2] Simple slope analyses indicated that T1 stressors were a significant predictor of major depression onset at one *SD* above the mean of T1 negative attributional style (*B* = .37, OR = 1.45, 95% CI = 1.04 – 2.02, *p* = .027), but not at one *SD* below the mean of T1 negative attributional style (*B* = −.14, OR = 0.87, 95% CI = 0.54 – 1.41, *p* = .578). Thus, results provide support for the theory that stressors predict major depression onset in individuals with a negative attributional style.

[1]Because the original integrated theory did not include internal attributions, but rather focused on the stable and global attributions in defining a negative cognitive style, we also tested the three-way interaction between attributional style defined by only these two types of attributions and stress, controlling for initial depressive symptoms. All effects (predicting symptoms and onset of depression, as well as specificity analyses) were consistent, regardless of which form of attributional style we used (including or excluding internal attributions).

[2]We also estimated even more stringent models predicting onset of major depression, which controlled for initial depressive symptoms (in addition to excluding those with major depression at baseline). The parameter estimate for the two-way interaction became marginally significant (OR = 1.24, 95% CI = 0.99 – 1.55, *p* = .062), but the effect for the three-way interaction remained significant (OR = 1.42, 95% CI = 1.04 – 1.93, *p* = .029).

To test whether the integrated cognitive vulnerability self-esteem model predicted onset of clinically significant depression, a logistic regression model tested whether the three-way T1 Attributional Style × T1 Stressors × T1 Self-Esteem interaction predicted onset of major depression at T2 among individuals who were free of a diagnosis at T1 controlling for T1 attributional style, stressors, self-esteem, and two-way interactions between these variables. The three-way interaction was significant (see Table 3). Simple slope analyses indicated that T1 stressors were a significant predictor of major depression onset at one *SD* above the mean of T1 negative attributional style and one *SD* above the mean of T1 self-esteem (B = .80, OR = 2.22, 95% CI = 1.04 – 4.81, p = .042) and at one *SD* above the mean of T1 negative attributional style and one *SD* below the mean of T1 self-esteem (B = .47, OR = 1.61, 95% CI = 1.10 – 2.36, p = .016), but not at one *SD* below the mean of T1 negative attributional style and one *SD* above the mean of T1 self-esteem (B = −.69, OR = 0.50, 95% CI = 0.20 – 1.27, p = .145) or at one *SD* below the mean of T1 negative attributional style and one *SD* below the mean of T1 self-esteem (B = −.22, OR = 0.80, 95% CI = 0.41 - 1.58, p = .525). Thus, contrary to expectations, stressors predicted major depression onset for participants with a negative attributional style that is coupled with either high or low self-esteem, but not for those without a negative attributional style, regardless of their self-esteem.

Specificity of the Cognitive Vulnerability Models

Multiple regression models tested whether the cognitive vulnerability and integrated cognitive vulnerability self-esteem models predicted future increases in bulimic and substance abuse symptoms, in an effort to establish that these etiologic models are specific to depression. The two-way Negative Attributional Style × Stressor interaction did not predict increases in bulimic symptoms from T1 to T2 (β = −.06, B = −.01 [−.03 – .01], r = −.06, p = .188), or increases in substance abuse symptoms from T1 to T2 (β = .05, B = .02 [−.01 – .04], r = .06, p = .167).

With regard to the integrated cognitive vulnerability self-esteem model, the three-way Negative Attributional Style × Stressor × Self-Esteem interaction did not predict increases in bulimic symptoms from T1 to T2 (β = .03, B = .01 [−.02 - .03], r = .02, p = .609), but it did predict increases in substance abuse symptoms from T1 to T2 (β = .11, B = .04 [.01 – .07], r = .12, p = .011). The form of this interaction conformed to hypotheses: T1 stressors predicted increases in substance abuse symptoms at one *SD* above the mean of T1 negative attributional style and one *SD* below the mean of T1 self-esteem (β = .16, B = .06 [.02 – .10], r = .14, p = .003), but not at any of the other three combinations of negative attributional style and self-esteem.

Discussion

We sought to provide a rigorous prospective test of the cognitive vulnerability model and integrated cognitive vulnerability self-esteem model of depression within a study that addressed certain methodological limitations of prior studies (e.g., use of survey measures of depressive symptoms and relatively small samples). Our results provided support for the cognitive vulnerability model of depression (Abramson et al., 1978), which posits that stressors only predict future increases in depressive symptoms among individuals with negative cognitive style. The fact that we found this support in a study that controlled temporal precedence of the stress and attributional style is important in ensuring that the risk factors really do precede the depressive symptoms rather than developing afterward or concurrently. The fact that these findings emerged from a very rigorous prospective test from a study that improved upon methodological limitations of past studies might be interpreted as providing important support for this etiologic theory, although it would be useful to replicate this finding in an independent study. Another novel contribution of our study is that we found that the cognitive vulnerability model also predicted future onset of clinically meaningful depression, as prior studies have not examined this question. Nonetheless, it is important also to

acknowledge that these effects were small in size; for example this two-way interaction only accounted for 1% of the variance in change in depressive symptoms over time.

The finding that the ACSQ showed a main effect for predicting future increases in depressive symptoms and interacted with stressors in the prediction of both future increases in depression and onset of major depression provides the first evidence, to our knowledge, that the ACSQ possesses predictive validity. These results suggest that the ACSQ is useful for investigating the role of negative cognitive style in predicting future increases in depression.

An additional contribution of our findings is that they provide support for the specificity of the cognitive vulnerability model involving attributional style and stress. Results indicated that this two-way interaction consistently predicted future increases in depressive symptoms, but did not predict future increases in bulimic or substance abuse symptoms. The evidence of the specificity of the cognitive vulnerability model is novel, in that it appears that none of the prior prospective tests of the cognitive vulnerability models in adolescents have examined this question. We must note that the lack of support for this model to predict bulimic or substance abuse symptoms does not imply that there are not other forms of cognitive vulnerability that would predict increases in these symptoms. There may be types of cognitive vulnerabilities other than attributional style that have an effect on those symptoms. For example, thinking that one's weight is extremely important could be a cognitive vulnerability that could interact with a stressor such as weight gain to impact bulimic symptoms (Fairburn, 1997).

In contrast to the support for this cognitive vulnerability model, our results provided little support for the integrated cognitive vulnerability self-esteem model that asserts that stressors would only predict increases in depression for low self-esteem individuals with a negative cognitive style (Metalsky et al., 1993). Although the three-way interactions between negative cognitive style, stressors, and self-esteem were significant when predicting increases in depressive symptoms and major depression onset, these interactions did not take the hypothesized form. They were not even consistent in form within this study; one found that stressors predicted increased depression for high self-esteem individuals with a negative cognitive style, and the other found that stressors predicted the onset of a depressive disorder for both low and high self-esteem individuals with a negative cognitive style. These inconsistent findings may have emerged because parameter estimates become unstable when numerous terms are entered into the regression equations, which is necessary to test a 3-way interaction (Fidell & Tabachnick, 2003). These results seem to provide additional support for the notion that a negative cognitive style is the most important vulnerability factor and suggest that self-esteem may not confer a consistent vulnerability.

Specificity analyses revealed that the integrated cognitive vulnerability model did not predict future increases in bulimic symptoms, although it did predict future increases in substance abuse symptoms. The form of this latter interaction was as hypothesized: stress predicted increases in substance abuse symptoms in those participants with a negative attributional style and low self-esteem, but not in other participants. Thus, these findings suggest that this model may not be specific to depression (although it should be recalled that this model did not predict future increases in depression in the present study). It is possible that participants with a negative attributional style and low self-esteem engage in substance use as a coping mechanism to manage negative affect caused by stress. It should be noted that due to the low rates of bulimic pathology in our sample, it may have been more difficult to detect effects for this outcome.

Our results did not support the integrated cognitive vulnerability self-esteem model, but 10 of 17 prospective tests of this 3-way interaction were significant in two studies that used a failure paradigm (Abela, 2002; Metalsky et al., 1993). This pattern of findings may imply that this

three-way interactive model has predictive validity for acute changes in mood, but not for longer-term increases in clinically significant depression, as was observed for the original cognitive vulnerability model. This pattern of findings might also suggest that this model has greater predictive validity for males, in that the studies that used mixed samples of males and females provided more support for this model than our female-only sample.

It is important to consider the limitations of this study. First, we relied on survey measures for several constructs (e.g., stressful life events). It would have been preferable if we had used interview measures of these constructs because they typically provide more reliable and valid data, although most previous studies testing these models likewise relied on survey-reported negative life events (Johnson & Miller, 1990; Metalsky et al., 1993; Nolen-Hoeksema et al., 1992). Second, we used shortened versions of several measures to minimize respondent burden. Although the internal consistency coefficients were similar to coefficients observed for the longer scales, results might have been different if the full versions of these measures were used. Our measure of stress, in particular, had limited content validity. We did find support, however, for the cognitive vulnerability model with this limited scale, so this measure appears to have predictive validity. Third, we relied solely on self-report data for the survey and interviews. It would be desirable if future tests of cognitive vulnerability models made use of multiple reporter data and objective behavioral measures to decrease the possibility that reporter bias artificially inflates relations. Fourth, our assessment methods for the three outcome variables were not consistent. The use of a survey measure for substance abuse and an interview measure for depression and bulimia nervosa complicates the comparison of the results of the different outcomes. Null findings for some of the effects on substance abuse could be due to the survey assessment method. However, we chose to use a survey measure for this outcome because self-reports of substance use appear to be the most valid measure of adolescent substance use (Winters, Stinchfield, Henly, & Schwartz, 1991). Finally, the moderate recruitment rate suggests that some caution should be used in generalizing these findings.

In sum, the current study found consistent support for the cognitive vulnerability model involving attributional style and stress for predicting increases in both depressive symptoms and onset of major depression, while addressing certain limitations of prior studies. Because there is always a possibility that some omitted third variable explains any prospective effects observed in longitudinal studies, it would be useful for future studies to conduct randomized prevention trials that focus solely on reducing suspected risk factors (e.g., a negative attributional style) in order to provide an experimental test of the relation between these risk factors and future increases in depression. If we observe agreement between the results from prospective studies and such randomized prevention trials, our confidence in putative etiologic processes that give rise to depression would be increased. More broadly, the fact that the main and interactive effects of negative attributional style and stressors were small in magnitude suggests that it will be important to develop and evaluate additional theories regarding the risk factors for depression as well as multivariate models postulating how the various risk factors work in concert to promote this pernicious psychiatric disorder.

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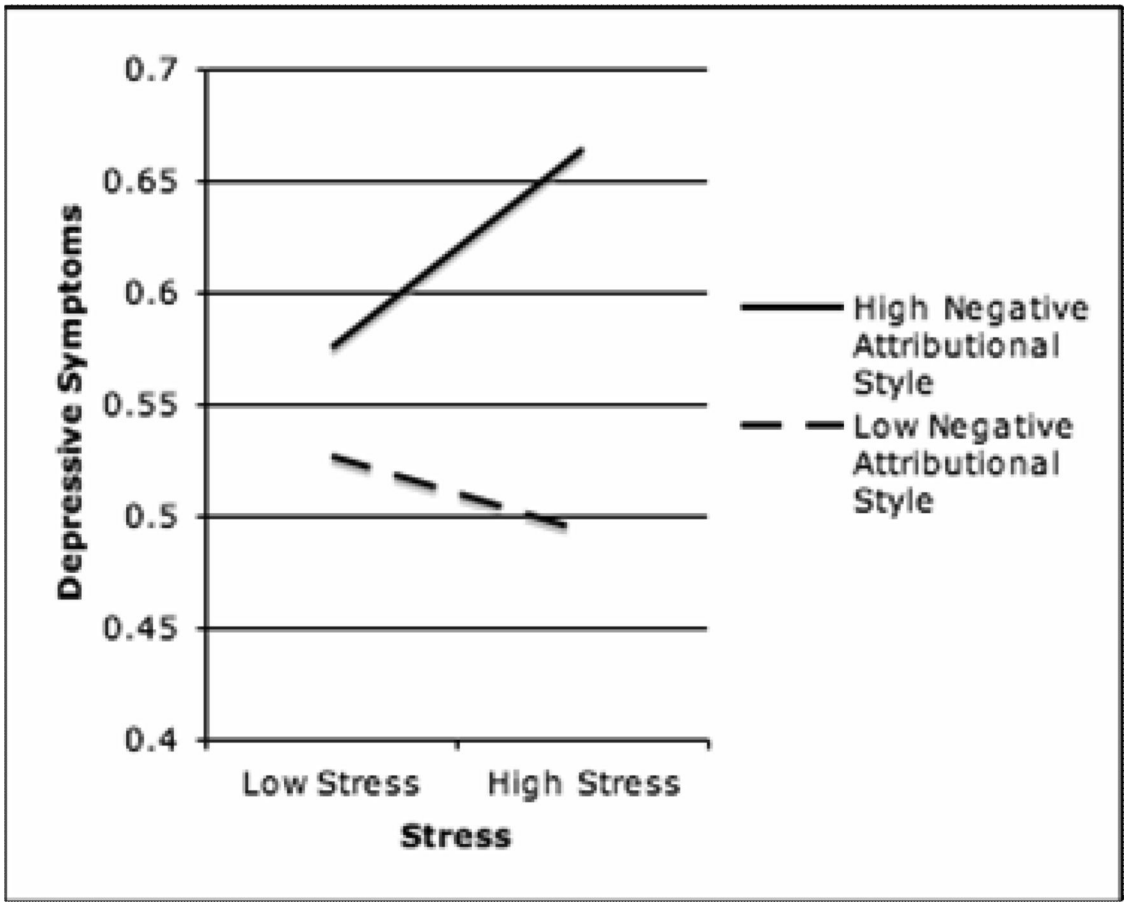

Figure 1.
Depressive symptoms at one standard deviation above and below mean levels of attributional style and stress

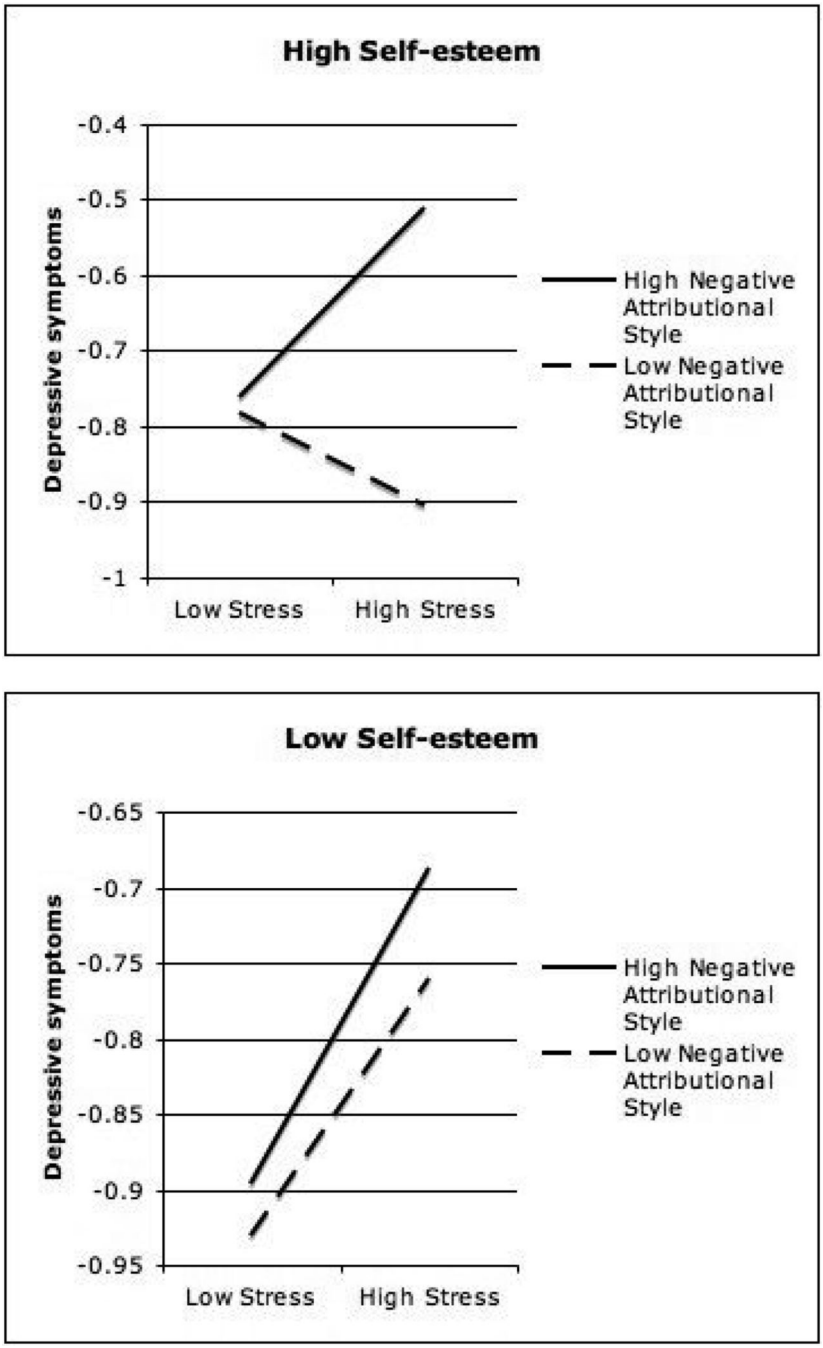

Figure 2.
Depressive symptoms at one standard deviation above and below mean levels of attributional style, stress, and self-esteem

Table 1

Correlations between predictor and criterion variables

	2.	3.	4.	5.	6.	7.	8.Mean	*SD*	Skew
1. T1 attributional style	.12	−.41	.29	.55	.10	−.14	.303.24	1.09	.16
2. T1 perceived stressors		−.17	.31	.08	.42	−.04	.2410.00	1.72	1.08
3. T1 self-esteem			−.34	−.28	−.06	.29	−.303.11	.53	−.14
4. T1 depressive symptoms				.22	.27	−.15	.641.41	.41	1.60
5. T2 attributional style					.11	−.23	.343.30	1.05	.12
6. T2 perceived stressors						−.03	.3110.10	1.84	1.53
7. T2 self-esteem							−.182.81	.31	.27
8. T2 depressive symptoms							1.44	.43	1.62

Note: For all correlations, if $r > .13$, $p < .05$.

Table 2

Results from the multiple regression models testing the cognitive vulnerability and integrated cognitive vulnerability and self-esteem models of depression

Cognitive Vulnerability Model	Changes in Depressive Symptoms from T1 to T2			
	β	B	(95% CI)	*sr* *p*-value
T1 Depressive Symptoms	.59	.57	.45 – .68	.58 <.001***
T1 Attributional Style	.13	.05	.02 – .08	.16 .001***
T1 Perceived Stressors	.03	.01	−.01 – .03	.04 .404
T1 Attributional Style × Stressors	.08	.02	.00 – .03	.10 .033*
Cognitive Vulnerability, Self-Esteem Model				
T1 Depressive Symptoms	.56	.59	.50 – .67	.55 <.001***
T1 Attributional Style	.11	.05	.01 – .08	.13 .004**
T1 Perceived Stressors	.09	.02	.01 – .04	.10 .029*
T1 Self-Esteem	−.06	−.05	−.11 – .01	−.07 .122
T1 Attributional Style × Stressors	.14	.03	.01 – .05	.15 .002**
T1 Attributional Style × Self-Esteem	−.08	−.05	−.10 – −.01	−.10 .032*
T1 Stressors × Self-Esteem	.04	.02	−.02 – .06	.04 .396
T1 Attributional Style × Stressors × Self-Esteem	.17	.04	.02 – .06	.18 <.001***

Note. *B* = unstandardized coefficients, CI = Confidence interval, *sr* = semipartial correlation coefficient from equations in which all predictors were entered simultaneously.

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 3

Results from logistic regression models testing whether the cognitive vulnerability and integrated cognitive vulnerability and self-esteem models predict onset of major depression

	Onset of Major Depression from T1 to T2			
Cognitive Vulnerability Model	**B**	**OR**	**(95% CI)**	**p-value**
T1 Attributional Style (ACSQ)	.24	1.27	0.75 – 2.15	.373
T1 Perceived Stressors	−.14	0.87	0.54 – 1.41	.578
T1 Attributional Style × Stressors	.23	1.26	1.01 – 1.58	.043*
Cognitive Vulnerability, Self-Esteem Model	B	OR	(95% CI)	p-value
T1 Attributional Style (ACSQ)	.30	1.35	0.71 – 2.59	.358
T1 Perceived Stressors	.09	1.10	0.72 – 1.66	.670
T1 Self-Esteem	−.71	0.49	0.14 – 1.79	.281
T1 Attributional Style × Stressors	.50	1.65	1.18 – 2.32	.004**
T1 Attributional Style × Self-Esteem	.06	1.06	0.39 – 2.90	.905
T1 Stressors × Self-Esteem	−.07	0.93	0.42 – 2.05	.863
T1 Attributional Style × Stressors × Self-Esteem	.35	1.41	1.04 – 1.92	.028*

Note. B = unstandardized coefficients, OR = Odds ratio, CI = Confidence interval for the OR, from equations in which all predictors were entered simultaneously.

* $p < .05$,

** $p < .01$.