MAIN AND INTERACTIVE EFFECTS OF STRESS AND NEGATIVE COGNITIONS AS PREDICTORS OF DEPRESSION IN ADOLESCENCE

by

Jocelyn Smith Carter

Dissertation

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in

Psychology

August, 2008

Nashville, Tennessee

Approved by:

Professor Judy Garber

Professor David Cole

Professor Bruce Compas

Professor Kirsten Haman

DEDICATION

To my wonderfully supportive and encouraging husband, Les

ACKNOWLEDGEMENTS

This study was supported in part by National Institute of Mental Health Grants R29-MH454580, R01-MH57822, and K02 MH66249; National Institute of Child Health and Human Development Grant P30HD15052; and William T. Grant Foundation Faculty Scholar Award 1214-88 and Grant 173096. The author was supported in part from a Ford Foundation Fellowship, and a Dean's Graduate Fellowship and Peabody Fellowship from Vanderbilt University. The author would like to thank the Nashville Metropolitan School District, Edward Binkley, Robert Crouch, and the parents and children who participated in the project. The author would like to thank Laurel Duncan and Jeffrey A. Ciesla, Ph.D. who graciously donated their expertise to assist with data collection and management of the study. The author would like to acknowledge her dissertation committee, David Cole, Ph.D., Bruce Compas, Ph.D., and Kirsten Haman, Ph.D. for their assistance in the development and execution of the study. Finally, the author would like to thank Judy Garber, Ph.D., dissertation committee chair and advisor, for her support and guidance throughout their mentoring relationship.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Cognitive theories of depression propose that individuals with cognitive vulnerabilities are likely to develop depression in response to stressful life events. The two most prominent cognitive theories of depression were proposed by Beck (Beck, 1967) and Abramson and colleagues (Abramson, Metalsky, & Alloy, 1989; Abramson, Seligman, & Teasdale, 1978). Though the basic theories are similar, they specify somewhat different types of cognitive vulnerabilities and causal mechanisms. In Beck's (1967) theory, self-schemata and dysfunctional attitudes are vulnerabilities to individuals' developing negative automatic thoughts about the self, world, and future. These beliefs then lead to depression when stressors occur. In the helplessness/hopelessness theory (Abramson et al., 1989; Abramson et al., 1978), also under conditions of stress, attributions about the causes of negative events and inferences about their consequences and characteristics of the self lead to hopelessness; this then leads to hopelessness depression.

Despite their differences, the major premise underlying these theories is similar: some individuals are more likely to develop depression in the face of stressful life events because of their interpretations and expectations. The central component of both theories is the interaction between the cognitive diathesis and stress. The cognitive-stress model typically is tested by examining the statistical interaction between cognitions and stress; the nature of the interaction is hypothesized to be that at high levels of stressors, high levels of cognitive vulnerability will predict high levels of depression (Monroe & Simons, 1991).

Although cognitive theories of depression were first proposed to explain the etiology of depression in adults, evidence consistent with the theory also has been found with children and adolescents. Out of 23 studies conducted with child and adolescent samples, 5 found that youth with higher levels of stress and higher levels of cognitive vulnerability had higher levels of depressive symptoms than youth with lower levels of cognitive vulnerability and stress (Dixon & Ahrens, 1992; Hankin & Abramson, 2002; Hankin, Abramson, & Siler, 2001; Joiner, 2000; Kraaij et al., 2003). Of these studies, two used clinical samples (Dixon & Ahrens, 1992; Joiner, 2000) and three used community samples (Hankin & Abramson, 2002; Hankin et al., 2001; Kraaij et al., 2003). Only three of these studies were longitudinal, however (Dixon & Ahrens, 1992; Hankin et al., 2001; Joiner, 2000).

Other studies have found partial support for cognitive-stress model of depression in youth. Evidence consistent with cognitive models has been found in youth with low levels of depression at the beginning of the study (Southall & Roberts, 2002) and those with high levels of social support (Abela & Sullivan, 2003). Studies also have found that the relation between cognitions, stressors, and depression varies by gender, with some studies finding support for girls only (Abela, 2001; Prinstein & Aikins, 2004), whereas others finding support for boys only (Abela & Payne, 2003; Prinstein, Cheah, & Guyer, 2005). Regarding age, studies that have tested the model in youth of different ages have found support in older but not younger children (Abela, 2001; Gibb & Alloy, 2006; Nolen-Hoeksema, Girgus, & Seligman, 1992; Turner & Cole, 1994).

Another factor that can affect whether the cognitive diathesis-stress model predicts depression in children is the length of the waves used in the study. For example, Hilsman and Garber (1995) found that attributional style assessed prior to the stressor predicted changes in depressive symptoms a week later, but not immediately after the stressor. Another study showed

that attributional style interacted with peer rejection to predict depression one, but not two years later (Panak & Garber, 1992). Thus, the time interval during which attributional style moderates the effect of stress on depression has been shown to range from as little as one week to as much as one year. Future studies should measure stressors, cognitions, and depression with sufficient frequency to more precisely identify the optimal interval (Cole & Maxwell, 2003).

One study assessed stressors, cognitions, and depression nine times over five years and found that the interaction between stressors and cognitions predicted depression at the later time points (Nolen-Hoeksema et al., 1992). At younger ages, however, stress had a direct effect on depression but was not moderated by cognitions, and cognitions did not significantly predict depression. These results are consistent with the other studies that have found a significant cognition by stress interaction in older, but not younger children (e.g., Abela, 2001; Turner & Cole, 1994).

In addition, several studies have found support for the cognitive diathesis-stress model of depression only when using particular measures of the constructs involved. Abela and Sarin (2002) measured negative cognitions using different types of attributional and inferential styles and found that none of them interacted with stress to predict depression. However, when they examined the most negative of each participants' cognitive styles (i.e., the "weakest link") in interaction with stress, they did find evidence consistent with the model. Another study showed that an interview measure of attributional style interacted with stress to predict depression whereas a questionnaire measure did not (Conley, Haines, Hilt, & Metalsky, 2001). A similar result was found in the only study to use both self-report and diagnoses of depression (Lewinsohn, Joiner, & Rohde, 2001). Lewinsohn et al. reported that the cognitive diathesis-stress interaction significantly predicted diagnoses of depression, but not self-report of depressive

symptoms. Thus, different measures of the constructs have produced different findings across studies.

In comparison to the number of studies finding at least partial support for the model, only three studies have failed to find evidence consistent with the cognitive diathesis-stress model of depression (Cole & Turner, 1993; Hammen, 1988; Hammen, Adrian, & Hiroto, 1988). Each of these studies found different patterns of effects with respect to cognitions and stress. Cole and Turner found that cognitions mediated rather than moderated the relation between stressors and depression. Hammen and colleagues (Hammen, 1988; Hammen et al., 1988) showed direct but not interactive effects of cognitions and stress on the prediction of depression in children.

In summary, the majority of studies that have tested the cognitive diathesis-stress model of depression in youth have found at least partial support for the model, whereas only a few have failed to find evidence consistent with the model. Further studies are needed, however, to clarify the conditions under which the model does and does not predict depression. The majority of the evidence has found support for the cognitive diathesis-stress model in older children and adolescents. The current study further tested the cognitive diathesis-stress model in an adolescent sample, with regard to different types of stressors, different measures of depression, and gender.

Stressors

The conceptualization of stress also might account for some of the mixed findings across studies. All types of stressors do not similarly impact depression (Monroe & Simons, 1991), and not all stressors will be similarly moderated by negative cognitions to predict depression. Thus, to the degree that stress is conceptualized as a general and vague construct and the distinctions

among particular types of stressors remain ignored (Monroe & Simons, 1991), findings are likely to be inconsistent.

Most studies of the cognitive diathesis-stress model have used a broad index of stress that includes stressors in many domains, but have not tested whether different types of stressors interact with cognitive vulnerability in the same way. Two broad groups into which stressful life events can be categorized are: interpersonal and achievement. Interpersonal stressors involve interactions with another person(s) and can include conflict, rejection, and break-ups; achievement stressors involve failure or disappointment in relation to a goal. Interpersonal stressors have been found to have a stronger relation to depression than non-interpersonal stressors (e.g., Rudolph & Hammen, 1999; Rudolph et al., 2000). Specific types of stressors that have been examined in the context of the cognitive diathesis-stress model of depression have included peer rejection and victimization (Panak & Garber, 1992; Prinstein & Aikins, 2004; Prinstein et al., 2005), trauma (Gibb & Alloy, 2006), and academic failure (Hilsman & Garber, 1995). These studies found evidence consistent with the cognitive-stress model with regard to the particular stressors measured, although they did not specifically compare different types of stressors in relation to cognitions and depression (McMahon, Grant, Compas, Thurm, & Ey, 2003).

In addition, the most commonly used method for assessing stressful life events, self-report checklists, do not adequately measure severe life events nor do they gather information about the timing of the events (e.g., Duggal et al., 2000; Grant & McMahon, 2005; McQuaid, Monroe, Roberts, Johnson, & Brussel, 1992). In contrast, contextual threat interviews allow researchers to make objective ratings of the impact of stressful events and to date the onset and offset of the event (Brown & Harris, 1978). Several stress interviews have been developed for use with

children and adolescents (Garber & Robinson, 1997a; Hammen, 1991; Hankin, Mermelstein, & Roesch, 2007; Williamson et al., 1998). These interviews facilitate the gathering of detailed information about the contextual factors surrounding the environment, their impact on the participant, the duration of the event, and the role of the participant in precipitating the event. Moreover, such interviews have been found to overcome problems of counting, recalling, and dating of events often found with checklists (Duggal et al., 2000).

Despite the promise of these interview methods for addressing the methodological shortcomings of self-report stress checklists, only Hammen and colleagues (Hammen, 1988; Hammen et al., 1988) have used contextual threat interviews to test the diathesis-stress interaction in adolescents. They failed to detect a significant cognitive-stress interaction, but may have had limited power due to their small sample. One goal of the present study was to test the cognitive-stress model using objective ratings of stressful events, both interpersonal and achievement stressors, in a larger sample of adolescents who varied in risk for depression.

Depression

Results of studies using self-report measures of depressive symptoms might not generalize to diagnosed depressive disorders (Avenevoli & Steinberg, 2001; Compas, Ey, & Grant, 1993). Only three studies have tested whether the cognitive diathesis-stress model predicts depressive diagnoses in children. Hammen and colleagues (Hammen, 1988; Hammen et al., 1988) did not find evidence consistent with the cognitive diathesis-stress model in their high-risk sample of children ages 8 to 16. In contrast, using a normative sample of adolescents, Lewinsohn et al. (2001) found that the cognitive-stress model predicted the onset of depressive disorders, although not depressive symptoms over the same time period.

Possible explanations for the differences between these studies are: (a) the study by Hammen and colleagues (Hammen, 1988; Hammen et al., 1988) likely did not have enough power to detect significant interactions given their relatively small sample (n = 88); (b) the study by Hammen and colleagues used children across a wide age range, and thus the younger children's cognitive styles might not yet have been developed to the point of being moderators of stressors; or (c) the cognitive diathesis-stress interaction does not predict depression as well in high-risk samples as in normative samples. In addition, the two studies varied in to their methods for assessing stress and cognitions. Hammen and colleague used a semi-structured life events interview, whereas Lewinsohn et al. (2001) used an 11-item checklist. Regarding cognitions, Hammen and colleagues measured self-concept, self-schema, and attributional style, whereas Lewinsohn et al. measured attributional style and dysfunctional attitudes. Given these differences between these studies, it is not possible to determine which best explains the discrepant results. A central goal of the current study was to further examine the cognitive diathesis-stress model using a larger sample and a contextual threat stress interview to predict both depressive symptoms and disorder.

Gender

Developmental theorists have attempted to elaborate and integrate the cognitive diathesis-stress model of depression into a more developmentally-sensitive conceptualization of depression that explains the increased rates of depression in adolescence, particularly among girls. Nolen-Hoeksema and Girgus (1994) proposed three ways in which males and females may differ that might explain the increase of depression in girls during adolescence: (a) girls might experience increases in the primary risk factors during adolescence; (b) the risk factors for girls

might be different than those for boys; or (c) girls might have increased levels of risk factors before adolescence, but these risk factors only predict depression in the context of other challenges that emerge during adolescence. Although Nolen-Hoeksema and Girgus did not specifically discuss the cognitive diathesis-stress hypothesis of depression, stress and negative cognitions are both risk factors for depression that easily could be incorporated into their framework.

Studies have found mixed results with respect to gender differences in cognitive vulnerability. Whereas some studies have found no gender differences in attributional style (Gladstone, Kaslow, Seeley, & Lewinsohn, 1997; Hankin et al., 2001; Thompson, Kaslow, Weiss, & Nolen-Hoeksema, 1998), others have shown that girls have more negative attributional and inferential styles (Hankin & Abramson, 2002), negative automatic thoughts (Calvete & Cardenoso, 2005), and lower self-esteem (Allgood-Merten, Lewinsohn, & Hops, 1990) than boys. One study found a more negative attributional style for boys (Gladstone et al., 1997). Several researchers (e.g., Hankin & Abramson, 2001; Rudolph et al., 2000) have suggested that the rise in depression rates among adolescent girls might be due to their experiencing higher levels of stress (Compas, Slavin, Wagner, & Vannatta, 1986; Rudolph, 2002; Rudolph & Hammen, 1999) or their being more reactive to stress than boys (Little & Garber, 2004; Rudolph, 2002; Rudolph & Hammen, 1999; Seiffge-Krenke & Stemmler, 2002).

Given that the rates of depression are known to increase during adolescence and the mixed findings with respect to gender differences in negative cognitions and stress, some studies of the cognitive diathesis-stress model have examined whether gender is an additional moderator of the cognitive diathesis-stress interaction (Abela, 2001; Abela & Payne, 2003; Prinstein & Aikins, 2004; Prinstein et al., 2005). Results of these studies have been inconsistent, however.

Some have found significant cognitive vulnerability by stress interactions for girls, but not for boys (Abela, 2001; Prinstein & Aikins, 2004), whereas others have found the opposite (Prinstein et al., 2005). Thus, questions remain about whether gender differences exist with regard to the cognitive-stress model of depression.

The Current Study

The current study examined the cognitive diathesis-stress model of depression in adolescents with a primary focus on three factors that might clarify the conditions under which the model is supported. First, we examined overall level of stressors, as well as levels of interpersonal and achievement stressors assessed with a semi-structured life events interview to capture the timing and objective threat of stressful life events. Given previous literature showing that interpersonal stressors are more predictive of depression than are achievement stressors (e.g., Rudolph et al., 2000), we expected that interpersonal, but not achievement stressors would interact with negative cognitions to predict depression. because studies Second, this study tested the cognitive-stress model to predict both depressive symptoms and depressive diagnoses as the outcome variables. Third, we examined gender as a possible moderator of the cognition by stress interaction.

In addition, the present study used more powerful methodology and statistical techniques to provide a strong test of the cognitive diathesis-stress theory of depression. In general, prospective tests of the cognitive diathesis-stress model have used only two time-points. Some studies have collected data at more than two assessment periods, but have still tested the cognitive-stress interaction as a function of depressive symptoms change scores (Abela, 2001; Hilsman & Garber, 1995; Nolen-Hoeksema et al., 1992; Panak & Garber, 1992). Analyses based

on change scores do not describe the manner in which individuals change or which part of the difference in measurement is due to true change versus measurement error (Singer & Willett, 2003). The current study tested the model using data across five years, making it possible to examine the change process in greater detail using multi-level modeling.

Moderation effects are notoriously difficult to detect due to the reduced levels of reliability that comes from multiplying together two measures that each include measurement error (Jaccard, 1995; McClelland & Judd, 1993). Multi-level modeling (MLM) offers increased precision in parameter estimation compared to linear regression (Singer & Willett, 2003), thereby making it easier to detect true interaction effects. Increased precision can be obtained through the combination of ordinary least squares (OLS) regression estimates and estimates based on the final, best-fitting model. These methods also allow one to estimate fewer parameters, thereby further increasing precision and parsimony. Multi-level modeling also allows one to use an idiographic approach to the measurement of the cognitive-stress model of depression, which takes into account individual differences in the experiences of cognitive vulnerability, stress, and depression over time. For example, the determination of whether an individual is experiencing high levels of stress is not made based on whether the individual scores above the group mean for stress levels, but whether the individual scores above his or her own mean level of stress over time (Abela, Aydin et al. 2006; Abela, Skitch et al. 2006). For these reasons, MLM was used as the primary modeling tool for continuous depression outcomes in the current study.

To date, only one published study has used the MLM procedure to examine the cognitive diathesis-stress model of depression in children. Maternal level of depressive symptoms was used as the stressor and children's fluctuations in depressed mood were examined in relation to

the interaction between maternal depressive symptoms and children's initial cognitive vulnerability to depression (Abela, Skitch, Adams, & Hankin, 2006). Abela et al. (2006) showed that the interaction between stress and negative cognitions could be modeled using MLM methods. The present study expands on this by testing the model with regard to a broader range of stressors and across a longer period of time.

In addition, discrete-time hazard modeling (DTHM) was used to test the risk for experiencing the onset of a depressive disorder during a particular time period and whether stress, negative cognitions, and the interaction between them predicted the onset of depressive disorders. DTHM takes into account the number of periods an individual could experience a target event (e.g., a depressive episode) and describes the probability that an individual will experience the event within a particular time period given that they have not yet encountered it. This probability is known as the hazard function (Singer & Willett, 2003). Similar to the MLM methodology, hazard functions were fit for each individual and then stress, negative cognitions, and their interaction were used to determine whether these variables resulted in different hazard functions and thus different probabilities for depressive disorder onset across individuals and time. DTHM also allows for tests of interactions of time variables with substantive predictors to determine whether the effects vary across periods. To date, no study has used DTHM to predict depressive diagnoses from the interaction between cognitions and stress in youth.

Finally, the sample used in the current study included adolescents who varied in their risk for depression as a function of their mothers' psychiatric history. An advantage of such a sample is that it can provide greater variability on the constructs of interest (i.e., cognitions, stress, and depression), which then can increase the probability of finding "true" interaction effects. Children of depressed mothers are more likely to have elevated levels of depressive symptoms

and to experience depressive disorders compared to children of non-depressed mothers (Beardslee, Versage, & Gladstone, 1998; Cummings, Keller, & Davies, 2005; Downey & Coyne, 1990; Goodman & Gotlib, 1999). Children of depressed mothers also have increased rates of stress (Cummings et al., 2005; Hammen, Shih, Altman, & Brennan, 2003; Hammen et al., 2004) and more negative cognitive styles than children of non-depressed mothers (Garber & Robinson, 1997b; Goodman, Adamson, Riniti, & Cole, 1994; Jaenicke et al., 1987). The current study included maternal depression in all tests of the model to examine whether cognitions, stress, and their interactions predicted depression above and beyond the maternal risk factor.

The following hypotheses were tested:

1. Maternal depression history (risk) will account for a significant amount of the variance in the prediction of depressive symptoms and depressive disorders.
2. The interaction between negative cognitions and stress will predict (a) depressive symptoms and (b) the onset of depressive disorders over time within the same individuals over and above the effect of maternal depression history.
3. Interpersonal stressors will significantly predict depressive symptoms and disorders in interaction with negative cognitions, whereas achievement stressors will not.
4. The interaction between negative cognitions and stress in the prediction of depressive symptoms and the onset of depressive disorders will vary by gender. Specifically, the interaction between stress (total and interpersonal) and cognitions will be statistically significant for females, but not for males.

CHAPTER II

METHOD

Participants

Participants were 240 mothers and their children who were first assessed when they were in 6th grade (mean age = 11.86, SD = .57). The sample was 54.2% female, 82% Caucasian, 14.7% African-American, and 3.3% other (Hispanic, Asian, Native American, or mixed ethnic background). Participants were predominantly working (e.g., nurses aid, sales clerk) to middle class (e.g., store manager, teacher) with a mean socioeconomic status (Hollingshead, 1975) of 41.84 (SD = 13.25).

Parents of 5th grade children from metropolitan public schools were invited to participate in a study about parents and children. A brief health history questionnaire comprised of 24 medical conditions (e.g., diabetes, heart disease, depression) and 34 medications (e.g., Prozac, Elavil, Valium) was sent with a letter describing the study to over 3500 families. Of the 1495 mothers who indicated an interest in participating, the 587 who endorsed either a history of depressive symptoms, use of antidepressants, or no history of psychopathology were interviewed further by telephone. The remaining families were excluded because the mother either did not indicate depression or indicated other kinds of psychiatric problems without depression, or had serious medical illness (e.g., cancer, multiple sclerosis). The screening calls of the 587 families indicated that 349 mothers had either a history of depression or no history of psychiatric problems. The 238 families not further screened were excluded because they did not indicate sufficient symptoms to meet criteria for a depressive disorder (38%), had other psychiatric disorders that did

not also include a depressive disorder (19%), they or the target child had a serious medical condition (14%), were no longer interested (21%), the target child either was in the wrong grade or was in special education (6%), or the family had moved out of the area (2%). The remaining 349 mothers who indicated in the screening call that they had had a history of some depression or had had no psychiatric problems were interviewed in person using the Structured Clinical Interview for *DSM* diagnoses (SCID; Spitzer, Williams, Gibbon, & First, 1990). One hundred and forty-nine families then were excluded because during the interview the mother indicated a history of a psychiatric diagnosis that did not also include a mood disorder, reported a serious medical condition, the child had a serious and/or chronic medical illness, was not primarily in a regular classroom, or had a pervasive developmental disorder. The final sample of 240 families consisted of 185 mothers who had had depressive disorders (147 mothers had had diagnoses of Major Depressive Disorder; the remaining 38 mothers had had diagnoses of Dysthymia, Depression NOS, or Adjustment Disorder with Depressed Mood); 55 mothers were life-time free of psychopathology. Of the 240 families who participated in the initial data collection, 188 (78%) completed all assessments. Significant differences between families who did and did not complete the assessments were tested using ANOVA and chi-square analyses for continuous and categorical variables, respectively. The results showed that no significant differences were found with regard to child age, gender, race, or family SES.

Mothers and children completed a battery of questionnaires and were interviewed separately about the child's psychiatric history. All study personnel working with the children were unaware of the mothers' psychiatric history. The present study reports the results of the baseline (grade 6) and annual follow-up assessments of the adolescents during grades 7, 8, 9, 11,

and 12.[1] Only those measures relevant to the current study are described here. Cognitions assessed in grades 6, 7, 8, 9, and 11, and stressors and depressive symptoms assessed in grades 7, 8, 9, 11, and 12 were used in the present study. Time 1 refers to cognitions measured in grade 6 and stressors and depression measured in grade 7; Time 2 refers to grade 7 cognitions and grade 8 stressors and depression; Time 3 involves grade 8 cognitions and grade 9 stressors and depression; Time 4 includes grade 9 cognitions and grade 11 stressors and depression; Time 5 includes grade 11 cognitions and grade 12 stressors and depression.

Measures

Cognitions. Attributional Style was assessed with the Children's Attributional Style Questionnaire (CASQ; Seligman et al., 1984), which measures attribution dimensions derived from the reformulated learned helplessness model (Abramson et al., 1978). The revised CASQ (Thompson et al., 1998) containing 12 positive and 12 negative items, was used. Each item varies one causal dimension (locus, stability, globality) while holding the other two dimensions constant. A mean "positive composite" score was created by dividing the number of external, unstable, and specific responses to "good" events by the total number of positive events; a mean "negative composite" score was created by dividing the number of internal, stable, and global responses to all "bad" events by the total number of negative events. The total score was derived by subtracting the negative from the positive composite scores, as is typical when using the CASQ (Gladstone & Kaslow, 1995). Lower total scores reflect a more depressive or negative attributional style. Coefficient alpha for the total score ranged from .63 to .76 across waves,

[1] In grade 10, participants completed a briefer assessment that did not include all variables used in the current study; therefore the grade 10 data were not included in the analyses.

which is consistent with what has been found elsewhere in the literature (Gladstone & Kaslow, 1995; Robins & Hinkley, 1989). The CASQ administered in grades 6, 7, 8, 9, and 11 were used in the present study.

Global self-worth was assessed using the global self-worth scale of the Harter Self-Perception Profile (GSW; Harter, 1985), which contains six items measuring the degree to which children are satisfied with themselves and their lives and think the way things are is fine. Responses are scored on a 4-point scale with lower scores representing lower perceived self-worth. Coefficient alpha ranged from .81 to .84 across the time points. Global self-worth administered in grades 6, 7, 8, 9, and 11 were included here.

At each time point, scores on attributional style and global self-worth were standardized and then an average of the two was computed. This composite score was used as the measure of cognitive vulnerability. This approach was chosen because studies using multiple measures of negative cognitions have found them to be significantly correlated (e.g., Abela et al., 2006), suggesting that they may represent a common underlying construct (although see also Abela, 2001; Conley et al., 2001). Creating a composite variable comprised of measures of negative cognitions has been used in studies with adults (Hankin, Carter, Abela, & Adams, 2004), but not yet with children or adolescents. In the current study, significant correlations between attributional style and global self-worth were found at each time point (Time 1 = .51, Time 2 = .46, Time 3 = .55, Time 4 = .39, Time 5 = .53).

Adolescent Depression. Adolescents completed the Children's Depression Inventory (CDI; Kovacs, 1981,1983), which contains 27 items measuring cognitive, affective, and behavioral symptoms of depression. Each item lists three statements, scored 0 through 2, in order of increasing symptom severity. The CDI has adequate internal consistency, test-retest reliability,

and convergent validity with other self-report measures (e.g., Abela, 2001; Cole, Hoffman, Tram, & Maxwell, 2000; Saylor, Finch, Spirito, & Bennett, 1984; Smucker, Craighead, Craighead, & Green, 1986). Internal consistency of the CDI in this sample was greater than .83 at all time points. CDI scores from grades 7, 8, 9, 11, and 12 were used in the present study.

The Schedule for Affective Disorders and Schizophrenia for School-Age Children – Epidemiological version –Present and Lifetime (K-SADS-PL; Ambrosini, 2000; Kaufman et al., 1997) is a semi-structured clinical interview from which diagnoses of depressive disorders can be made (e.g., Major Depressive Disorder, Dysthymia, Depression – Not Otherwise Specified, and Adjustment Disorders with depressed mood, mixed anxiety and depressed mood). At the first assessment (grade 6), the K-SADS-PL was administered to mothers and children. Follow-up interviews were conducted annually using the Longitudinal Interval Follow-up Evaluation (LIFE; Keller et al., 1987), which parallels the K-SADS-PL and assesses disorders since the previous interview. The LIFE yields a depression score on a six-point scale from 1 (one or no depressive symptoms and no impairment) to 6 (meets criteria for a major depressive episode with marked impairment). A score of 4 indicates a probable diagnosis of an MDD (4 symptoms and impairment) and 5 indicates a definite MDD. All interviews were audio-taped. A second rater who was unaware of the ratings of the primary interviewer reviewed a random 25% of the interview audiotapes. Kappa (Cohen, 1960) was 0.81 for depressive disorders.

Stressors. Life events were assessed annually with regard to events that had occurred for the adolescent during the previous year. Mothers and adolescents were interviewed separately with the Life Events Interview for Adolescents (LEIA; Garber & Robinson, 1997a), which was based on the Life Events and Difficulties Schedule (Brown & Harris, 1978, 1989), and the Life Stress Interview developed by Hammen et al. (1987). The LEIA asked mothers and adolescents

to describe the context of the event, what happened, who was involved, when it occurred, and what changed for the adolescent as a result of the event. The LEIA was administered annually in grades 7, 8, 9, 11, and 12.

Interviewers presented to a group of trained raters all information about each adolescent's life events. After information about an event was presented, the group rated the event using a 7-point severity scale with regard to the degree of objective threat the event had for the person given the context, ranging from *1* = none to *7* = severe. Raters were unaware of any information about the mothers' or adolescents' psychopathology. Inter-rater reliability of the objective stress ratings was obtained by having interviewers present the information about the events at the same time to two different groups who made independent ratings of the events. Based on 202 events, agreement among raters was 89.6%, with a Kappa of .79. A total event count and a total level of stress rating were derived from the interview for each subject. Because the two stress variables were highly correlated (r =.92), analyses were conducted using only one indicator of stress, the mean level of stress that occurred each year. As in other studies of the relation between stress and depression (e.g., Barnett & Gotlib, 1988; Lewinsohn et al., 2001), life events were assessed at Time N + 1 regarding the previous year; that is, events that occurred between Time N to Time N+1. Monthly stress scores also were calculated and measured the mean level of stress that occurred each month.

Events also were rated with regard to their content. The content of the stressors was categorized as either interpersonal or achievement focused. Interpersonal stressors were defined as those that involved adolescents' relationships with another person (e.g., family or peer conflict, a friend moving away), whereas achievement stressors were those that had to do with performance in academic or job domains (e.g., failing a test or getting a poor performance

evaluation). Stressors were coded by two independent raters who overlapped on 25% of the cases rated. Agreement was 90% ($\kappa = .75$, Cohen, 1960).

Missing Data

Some participants were lost or dropped out across the course of the study: 207 participants had complete data on all study measures at the assessment conducted at Time 1, 181 at Time 2, 158 at Time 3, 156 at Time 4, and 146 at Time 5. Those with and without missing data at Time 5 were compared on study variables at the previous time-points. One-way ANOVA's were used to test for attrition group differences on continuous variables, and chi-square analyses were used to test for differences on categorical variables. Participants who did not complete the study had significantly higher levels of achievement stress at Time 1 ($F = 9.96$, $p < .01$) and were more likely to be male than those who did complete the study [χ^2 (1) = 11.75, $p < .01$]. There were no other differences at any other time point or on any other measure.

CHAPTER III

RESULTS

Overview of Data Analyses

Descriptive statistics and bivariate correlations for all study variables were computed. ANOVAs were used to determine whether there were gender differences in any study variables. To test whether the interaction between negative cognitions and stress predicted depression at the dimensional level, over time within the same individuals and whether that interaction varied by gender, multi-level modeling in the SAS PROC MIXED program was used. Multi-level modeling tests for effects of fixed and random effects at multiple levels. In the current study, data were collected at two levels: individual (level-2) and repeated measures within individuals (level-1). Stress, cognitions, and time were modeled as time-varying (level-1) predictors; risk (maternal depression history) and gender were modeled as time-invariant (level-2) predictors. In addition, the prior year's scores on the depression outcome were used as control variables to test for increases in depression, which provides a more conservative test of study hypotheses (Shih, 2006).

The three types of stressors (i.e., total, interpersonal, achievement), cognitions, and depressive symptoms were centered within each person at each time-point to provide an idiographic approach to data analysis. For each of the variables, the mean of each person's scores on that variable across the five waves of data was subtracted from that person's scores on the variable at each time point. These person-centered scores thus represent fluctuations from the

person's mean level of that variable; positive scores represent higher than average levels of the variable and negative scores represent lower than average levels of the variable.

A series of models were fit beginning with the unconditional means model (Singer & Willett, 2003). This model has no predictors, but is useful in that it partitions variance in the depression outcome into within-person and between-person variance and assesses the amount of variance at level-1 and level-2 to be explained by the predictors (e.g., stress and negative cognitions). It also assesses the intra-class correlation coefficient, which represents the amount of between-person outcome variance.

Next, the unconditional growth model was fit. This model adds time as a predictor of the level-1 sub-model. The variance components of the individual growth model indicate how much variance there is around each individual's depression trajectory and whether level-2 predictors are needed to better explain the variance.

Finally, a series of models that included the substantive predictors was evaluated. Models containing the two-way interaction between cognitions and stress were examined first. Three-way interactions between gender, cognitions, and stress were examined second. If the results showed a significant interaction, tests of simple slopes were conducted to determine whether the slopes were significantly different from zero. All of these models included risk and the prior year's depression scores as control variables. If the results did not show significant evidence of moderation, main effects of stress and cognitions were examined.

The discrete-time hazard model analyses proceeded in several steps as well. First, models for the specification of time were compared to each other. The completely general model that included each month as a predictor of the hazard function was compared to more parsimonious models for time such as a constant model that constrains the hazard function to be equal in each

month of the study, a linear model that allows the hazard function to linearly increase each month of the study, and a quadratic model that allows the hazard function to increase and then decrease over time. The model with the fewest parameters for time that does the best job of explaining the hazard function was selected as the baseline model (Singer & Willett, 2003). Predictors then were added to the baseline model with the most parsimonious time specification. Risk was included as a control variable in all analyses. Stress and depression were measured on a monthly basis (time-varying); cognitions measured at time one only were used in these models (time-invariant). Untransformed variables were used in the DTHM analyses because only initial cognitive vulnerability was included in the model and thus it was not possible to calculate a person-centered score for this variable. In addition, person-centered scores are not appropriate for use with the depression diagnostic outcome variable as individuals are removed from the data set once they have experienced an onset of an event. Separate models were tested for each type of stressor (total, interpersonal, achievement). Model-trimming was performed in the same manner as with the MLM models: three-way interactions with gender were tested first, then two-way interactions, then main effects.

Descriptive Statistics

Means and standard deviations for the entire sample for each study variable are shown in Table 1. Participants' yearly scores on interpersonal stressors were higher than their scores on achievement stressors at all time-points indicating that they experienced more interpersonal than achievement stressors. These data are also presented separately for males and females and for low- and high-risk participants. One-way ANOVAs were used to test for group differences. There were no gender differences on any study measures at any time-point. High risk

participants scored lower on cognitions (i.e., more negative) and higher on depression at all time points than did low-risk participants. There were no risk group differences on the yearly stress measures at any time-point.

One-way ANOVAs also were used to test for risk group differences on monthly stress scores (see Appendix A). Results showed that for both total and interpersonal stressors, high risk participants had higher stress levels during most months. For achievement stressors, the groups differed only at month 55, with low risk participants reporting higher levels of achievement stress than did high risk participants.

Table 1. Means, Standard Deviations for the Total Sample, and as a Function of Gender and Risk

Variable	Total Sample		Gender				Risk				ANOVA	
			Girls		Boys		Low		High		Gender	Risk
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*F*	*F*
Time 1												
Total stress	3.38	3.16	3.18	3.10	3.63	3.22	3.21	3.75	3.44	2.97	1.19	.22
Int. stress	2.18	2.69	2.10	2.76	2.27	2.61	2.24	3.27	2.19	2.50	.22	.01
Ach. stress	.18	.60	.11	.35	.25	.80	.07	.23	.21	.67	3.39	2.04
Cognitions[a]	.00	.87	.08	.82	-.10	.92	.32	.78	-.09	.88	2.49	9.96**
Depression	4.76	4.45	4.62	4.60	4.93	4.27	3.08	3.10	5.28	4.67	.25	9.72**
Time 2												
Total stress	2.44	2.48	2.31	2.47	2.60	2.50	2.35	2.31	2.47	2.54	.79	.10
Int. stress	1.75	2.21	1.58	2.09	1.95	2.34	1.53	1.88	1.81	2.30	1.60	.69
Ach. stress	.16	.54	.12	.53	.21	.55	.24	.86	.14	.40	1.75	1.64
Cognitions	.00	.86	.06	.88	-.10	.92	.26	.82	-.08	.85	1.08	6.08*
Depression	4.68	5.06	4.43	4.62	4.98	5.56	2.88	3.14	5.27	5.43	.58	8.55**
Time 3												
Total stress	2.59	2.49	2.50	2.48	2.70	2.50	2.84	2.60	2.52	2.45	.38	.70
Int. stress	1.71	2.20	1.75	2.27	1.67	2.12	1.84	2.40	1.67	2.14	.08	.24
Ach. stress	.16	.39	.15	.41	.16	.37	.18	.44	.15	.38	.02	.34
Cognitions	.00	.88	.10	.89	-.12	.87	.30	.81	-.09	.89	2.98	6.91**
Depression	4.88	5.22	5.17	5.81	4.51	4.35	3.57	3.64	5.31	5.58	.73	3.94*
Time 4												
Total stress	2.03	2.46	2.15	2.74	1.90	2.08	1.83	2.14	2.10	2.54	.59	.50
Int. stress	1.47	2.08	1.56	2.34	1.35	1.73	1.38	2.01	1.49	2.11	.57	.12
Ach. stress	.10	.26	.13	.31	.07	.17	.11	.33	.10	.23	3.38	.10
Cognitions	.00	.83	.04	.87	-.05	.79	.34	.79	-.11	.82	.46	9.80**
Depression	5.17	5.40	5.58	5.64	4.66	5.08	3.10	3.95	5.88	5.65	1.32	9.92**
Time 5												
Total stress	1.69	2.14	1.74	2.44	1.63	1.72	1.97	1.92	1.61	2.20	.14	1.17
Int. stress	1.21	1.72	1.21	1.85	1.20	1.55	1.40	1.67	1.15	1.73	.00	.84
Ach. stress	.09	.33	.09	.25	.08	.41	.08	.23	.09	.36	.06	.03
Cognitions	.01	.88	.06	.88	-.07	.88	.28	.69	-.08	.92	.98	5.69*
Depression	5.72	6.39	6.32	6.81	4.83	5.65	4.15	5.58	6.31	6.60	2.44	4.23*

*$p < .05$; ** $p < .01$; [a] Cognitions were from the prior time point.
Int. = Interpersonal; Ach. = Achievement