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ORIGINAL ARTICLE

A Prospective Study of Brooding and Reflection as Moderators of the Relationship between Stress and Depressive Symptoms in Adolescence

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Abstract This study examined rumination as a moderator of the relationship between stress and depressive symptoms in a sample of adolescents using a multi-wave prospective design. Stressors were analyzed by domain (independent/dependent and interpersonal/noninterpersonal) and both brooding and reflection subtypes of rumination were examined as moderators. At the baseline assessment, 111 adolescents (ages 14–19) reported rumination and depressive symptoms. Youth were subsequently asked to complete a weekly diary assessment for 8 consecutive weeks, and again at 12 weeks, during which stressors and depressive symptoms were reported. Results indicated that brooding, but not reflection, moderated the relationship between stress and depression, for nearly all domains of stress. All results were in the expected direction, suggesting that the greater tendency to brood exacerbates the effects of stress on depression, whereas the greater tendency to reflect does not.

Keywords Depression · Adolescence · Stress · Rumination · Brooding · Reflection

Introduction

Depression is one of the most pressing mental health concerns; rates of depression are steadily increasing and carry an enormous social cost (Lambert 2006). Depressive symptoms typically present in the transition to adolescence, such that while less than 6% of children suffer depression, nearly 20% of youth will experience a depressive episode by age 18 (Davey et al. 2008; Hankin et al. 1998). In addition to major depressive episodes, nearly two-thirds of adolescent youth report clinically significant mild to moderate depressive symptoms at any given time. Both subclinical depressive symptoms and diagnosable depressive disorders place adolescents at risk for academic problems, interpersonal difficulties, and future depressive disorders (Woodward et al. 2002; Hammen and Compas 1994; Rutter et al. 2006).

The cognitive model of depression suggests that individual differences in cognitive responses to stress may predispose individuals to becoming depressed when faced with stress. One such cognitive vulnerability is a ruminative response style (Hyde et al. 2008; Nolen-Hoeksema and Girgus 1994), in which individuals respond to stress with perseverative attention to negative stimuli, including the causes and consequences of negative events and the resultant negative affect. Several studies have found that individuals with a more ruminative response style are more vulnerable to depression. This relationship has been found in adults as well as adolescents, and in both cross-sectional and longitudinal designs (Abela et al. 2004; Jose and Brown 2008). Studies with adult samples demonstrate that rumination has a robust relationship with depressive symptoms; rumination consistently predicts increases in depressive symptoms and the onset of depressive episodes, even when controlling for initial levels of depressive symptoms (Lyubomirsky and Tkach 2003; Nolen-Hoeksema et al. 2008). Additionally, meta-analytic studies indicate that rumination is more strongly associated with depressive symptoms than more general forms of self-focused attention (Mor and Winquist 2002). Although the majority of research examining this relationship has been conducted with adult samples, many researchers have begun to recognize the importance of investigating

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rumination in adolescence as well. Researchers investigating rumination in adolescence have found that higher levels of rumination are associated with greater severity of past episodes of past depressive episodes and greater severity and duration of current depressive episodes (Hong et al. 2010). Such results have been replicated across age groups and in diverse populations (Hong et al. 2010; Kuyken et al. 2006). Previous prospective studies demonstrate that rumination in adolescence is predictive of later depressive symptoms, even after controlling for initial levels of depression (Abela et al. 2002; Broderick and Korteland 2004; Schwartz and Koenig 1996). Furthermore, in a large multi-wave prospective study with early and middle adolescents Hankin (2008), found that baseline rumination predicted prospective fluctuations in symptoms of depression over time as well as increasing trajectories of general internalizing symptoms.

However, extant research on the role of rumination in predicting depressive symptoms in adolescence is limited by several factors. First, most prior studies have only examined the main effect of rumination on depressive symptoms without considering rumination within a vulnerability-stress model and its potential moderating effects on the relationship between stress and depression. Second, the handful of studies examining rumination within a vulnerability-stress model are limited by reliance on global measures of both stress and rumination. Third, research has demonstrated that there may be multiple components to the construct of rumination (e.g., reflection and brooding) and very few studies have examined these components in an adolescent population (see Burwell and Shirk 2007; Lopez et al. 2009; Papadakis et al. 2006; Verstraeten et al. 2010). The current study extends prior research in the relationship between rumination and depressive symptoms in adolescence by considering rumination as a potential moderator of the relationship between stress and depression, and by examining this vulnerability-stress interaction separately by stressor domains and for brooding and reflection subtypes of rumination.

Rumination as a Moderator of the Relationship between Stress and Depression

Previous research investigating the relationship between rumination and depression has primarily conceptualized rumination as having a main effect on depression (Broderick 1998; Broderick and Korteland 2004; Muris et al. 2009; Nolen-Hoeksema and Girgus 1994). More recently, however, researchers have begun to consider additional mechanisms by which rumination may contribute to increases in depressive symptoms in adolescence. The ABC (affective, behavioral, cognitive) model of depression hypothesizes that rumination confers a unique cognitive vulnerability that, in the presence of stress, leads to increases in depressive symptoms (Hyde et al. 2008). Nevertheless, this moderator hypothesis remains largely under-explored; researchers have only recently begun to examine the moderating role of rumination in the stress-depression relationship (Abela and Hankin 2008). Only a handful of studies exist examining this hypothesis and results are mixed. Past research in support of the moderating role of rumination has demonstrated that a stronger relationship between stress and depressive symptoms exists for adolescents who engage in higher rates of rumination (Kraaij et al. 2003). In contrast, other researchers (Abela et al. 2009; Jose and Brown 2008; Schwartz and Koenig 1996) fail to find significant evidence of the moderating effect of rumination on the relationship between stress and depressive symptoms. Given the small set of extant studies and their resultant mixed findings, more research is needed examining the relationship between rumination and depression within a vulnerability-stress model.

Components of Rumination

One possible explanation for the mixed findings may be examining rumination as a global construct. A growing body of research indicates that rumination may actually consist of various components or subtypes (Bagby and Parker 2001; Roberts et al. 1998; Treynor et al. 2003). In response to criticism that the relationship between rumination and depressive symptoms could be explained by similar depressogenic item content Treynor et al. (2003), removed items confounded with depressive content and found support for a two-factor model of rumination. More specifically, they suggested that that these two unique features of rumination represented subtypes of brooding and reflection. While both brooding and reflection include the cognitive process of self-focused attention, they differ in the content upon which such attention is focused. Brooding is defined as focusing attention on negative, self-blaming, gloomy or anxious thoughts such as "What have I done to deserve this?" or wishing a recent situation had gone better. In contrast, reflection is defined as focusing attention nonjudgmentally upon neutral or even positive content, and as such represents a "purposeful turning inward" and is hypothesized to serve a more adaptive form of contemplation about how to solve problems (see Treynor et al. 2003, p. 251).

Defining rumination as a non-unitary construct has led researchers to consider further what may be the more maladaptive active component of rumination versus the potentially more adaptive aspects of self-focused contemplation. Research suggests that brooding and reflection demonstrate differential effects on the development of

depressive symptoms. Studies have consistently demonstrated that brooding is associated with greater rates of depressive symptoms, whereas research examining the relationship between reflection and depressive symptoms is mixed (Burwell and Shirk 2007; Ciesla and Roberts 2002; Treynor et al. 2003). Only a handful of studies have investigated these subtypes of rumination in adolescence and found results consistent with results from adult samples, with brooding being consistently associated with depressive symptoms and reflection demonstrating mixed relationships with depressive symptoms (Burwell and Shirk 2007; Mezulis, Simonson, McCauley, & Vander Stoep, under review). Specifically, Burwell and Shirk (2007) found that brooding was associated with depressive symptoms both concurrently and longitudinally, whereas reflection was not, while Mezulis et al. found that both brooding and reflection predicted depressive symptoms among adolescents. Researchers have suggested that the mixed results may be a product of the low internal consistency of the reflection subscale items and the questionable contribution of reflection to our understanding of depressive symptoms (Armey et al. 2009).

Examining Stressors by Domain

Extensive past research has demonstrated that exposure to stress is a significant predictor of increases in depressive symptoms among adolescents (Pine et al. 2002; Rudolph 2002; Schmidt et al. 2010). Additionally, stress researchers have suggested that stress in particular domains and the related sequelae of domain specific stress may exert unique effects on later depressive symptoms (Kendler et al. 2001). However, the majority of prior studies on the effects of stress on mental health among adolescents have operationalized stress as a unitary construct assessed by global measures of overall exposure to stress (Tram and Cole 2000; Ge et al. 2001).

Stressors may be differentiated by the extent to which stressors are dependent or independent of the individuals, as well as differentiated by domains that may have particular salience to the individual. One distinction is between independent life events, or events whose occurrence is outside of an individual's control, and dependent life events, or events to which an individual at least partly contributes (Rudolph and Hammen 1999; Hammen 1991, 1992). Hammen (1991, 2009) has argued that while some stressors occur independently of the individual's actions, others are likely to be at least partly dependent on individuals' actions, characteristics, or mood. For example, a completely independent stressor may be "a geographical move about which the child had no choice", whereas a completely dependent stressor may be an "arrest for a car theft" (Rudolph and Hammen 1999, pg. 666). Several studies have suggested that females are more likely to generate dependent stressors, particularly when depressed, than are boys (see Hammen 2009, for a review). Research demonstrates that depressed individuals are, in fact, exposed to more stress because they demonstrate higher rates of dependent events, or events to which they contributed, rather than independent events (Hammen 1991). The few studies among adolescents corroborate these findings (Cohen et al. 1987; Rudolph and Hammen 1999). For example, in a longitudinal study with adolescents, Cohen et al. found that only dependent stress significantly predicted adolescents' depressive symptoms.

Additionally, stressful events have been further differentiated by domain. Stressors in the interpersonal domain, e.g. those involving an individual's relationships with others, may be particularly developmentally salient to mental health among adolescents (Cohen et al. 1987). For example, an interpersonal stressor may be "a fight with a sibling or friend", whereas a non-interpersonal stressor may be an "academic failure" (Rudolph and Hammen 1999, pg. 666). During adolescence, the peer group exerts a strong influence on psychological well-being (Larson and Asmussen 1991). Researchers have emphasized the role of interpersonal stress as particularly salient for the prediction of depressive symptoms among this population (Barnett and Gotlib 1988; Hammen 1991). Consistent with this hypothesis, several studies have found that adolescents are more likely to develop depressive symptoms following exposure to stressful interpersonal events than exposure to stressful noninterpersonal events (Rudolph and Hammen 1999; Rudolph et al. 2000; Shih et al. 2006). Additionally, studies have found that interpersonal stressors may be more strongly related to depressive symptoms for girls than for boys (Rizzo et al. 2006).

The Current Study

In sum, there have been many recent developments in the study of rumination as a vulnerability factor for depression in adolescence. However, to date no empirical study has simultaneously examined brooding and reflection subtypes of rumination as predictors of depressive symptoms among adolescents in an integrated domain-specific, vulnerability-stress model. The present study seeks to address this gap in the literature by examining rumination as a moderator of the relationship between stress and depression in a 3 month prospective study among adolescents. We examined both total stressors as well as dependent versus independent stressors and interpersonal versus noninterpersonal stressors, and both brooding and reflection subtypes of rumination separately as moderators.

The study was designed to provide a strong test of study hypotheses. After completing a baseline set of measures assessing trait rumination and depressive symptoms, youth were asked to complete a weekly diary assessment each week for eight consecutive weeks, and then again at 12 weeks. In each weekly diary assessment, youth identified stressors they had experienced that week as well as current depressive symptoms. This design conferred several important advantages for addressing study questions. One advantage of this methodology is that it reduced the likely impact of recall biases on reporting. Another advantage of this approach was that it allowed us to examine the relationship between stress exposure and depressive symptoms within participants, as well as whether that prospective relationship varied as a function of between-participant differences in rumination. A final advantage of our design was our examination of these questions within an adolescent population; this developmental period is of particular importance for understanding the emergence and increase in depressive symptoms (Hankin et al. 1998).

We examined the following questions:

1. Is there a significant relationship between stress and depressive symptoms over time? Does this relationship vary by stress domain? We hypothesize the relationship between stress and depressive symptoms to be stronger for dependent and interpersonal stressors.
2. Does rumination (brooding, and/or reflection) predict trajectories of depressive symptoms over time? We hypothesize that brooding, but not reflection, will predict the trajectory of depressive symptoms.
3. Does rumination (brooding, and/or reflection) moderate the relationship between stress (total and/or domain-specific) and depressive symptoms over time? We hypothesize that brooding, but not reflection, will moderate the effects of stress on depressive symptoms.

Method

Participants

Participants were 111 (80 female) adolescents recruited from 9 to 12th grade high school classrooms in the Pacific Northwest. Participants ranged in age from 14.08 to 19.33 years, with a mean age of 16.40 years (SD = 1.33). Approximately 75% identified as Caucasian, 16% as Asian, 6% as African American, and 3% did not identify their race.

Procedure

Youth were recruited at school via in-class presentations. An information packet and parent consent form was sent home with interested youth. Parents and youth provided written consent. Youth completed a baseline set of questionnaires that included measures for depressive symptoms and rumination. Then, youth were asked to complete 9 weekly diary assessments across the 12 week follow-up period. These weekly diary assessments were administered weekly for the first 8 weeks, and then again at 12 weeks. In each diary assessment, youth reported on current depressive symptoms and stressors experienced in the previous week. Participation across the study was excellent. The mean number of weekly diary assessments completed was 7.4 out of a possible 9; total number of weekly assessments ranged from 3 to 9. Weekly participation averaged 84.5%. Youth who missed three consecutive weekly assessments were considered to have discontinued participation in the study; of the 111 youth who completed baseline questionnaires, only 6 dropped out of the study altogether. There were no differences between the 105 youth who remained in the study and the 6 who dropped out on any baseline measures. Youth completed all assessments at school in small groups. Participants received $5 each for completing the initial questionnaire and a small gift (valued at $3 or less) for each weekly questionnaire.

Measures

Depressive Symptoms

Youth depressive symptoms were assessed at baseline using the long form of the Children's Depression Inventory (CDI; Kovacs 1992). The CDI is a 27-item self-report inventory, which inquires about the presence of depressive symptoms within the past 2 weeks. Each item contains three statements; participants are asked to select the statement that best describes them in the previous 2 weeks. The CDI was designed for use with youth between the ages of 8 and 17. Total scores on the CDI can range from 0 to 54, with higher scores indicating more severe depressive symptoms. The CDI has repeatedly demonstrated excellent internal consistency (alpha reliability ranges from .80 to .87), test–retest reliability, and predictive and construct validity, especially in community samples (Blumberg and Izard 1986; Kovacs 1981). The internal consistency of the full CDI for our sample was high ($\alpha = .85$). Weekly depressive symptoms were assessed using the short form of the CDI (CDI-S; Kovacs 1992). The short form of the CDI includes 10 items from the full 27-item CDI. This short version shows acceptable internal reliability ($\alpha = .80$) and has comparable results with the full CDI (Kovacs 1992). Internal consistency for the weekly short CDI ranged from .71 to .86 in the current study.

Rumination

Rumination was assessed at baseline and follow-up using the Ruminative Response Scale of the Response Style Questionnaire Rumination (RRS; Nolen-Hoeksema 1991). The RRS includes 21 items describing ruminative responses to depressed mood. Participants rate on a four-point Likert scale if they 1 ("never") to 4 ("always") perform these responses. Sample items include: "When I feel sad or down, I think about how alone I feel;" and "When I feel sad or down, I think about how hard it is to concentrate." Nolen-Hoeksema and Morrow (1991) report a coefficient alpha of .89 for the rumination items. In order to examine the possibility that the various forms of rumination may interact differentially with stress, *reflection* and *brooding* subscales of the RSQ were extracted following the work of Treynor et al. (2003). Treynor et al. reported a coefficient alpha of .72 and .77 for the reflection and brooding subscale respectively. The internal consistency for the full scale was $\alpha = .91$, $\alpha = .71$ for the reflection subscale, and $\alpha = .79$ for the brooding subscale in our sample.

Stress

Stressors were assessed weekly using 33 items from the Adolescent Perceived Events Scale (APES; Compas et al. 1987). These 33 items represent both major and daily stressors. For each stressor, participants indicated whether the stressor had occurred within the last week. We created a total count of stressors. Additionally, stressors were rated on 2 dimensions: Independent/Dependent and Interpersonal/Non-Interpersonal. Two trained raters independently coded items continuously on two 5-point scales, one each for Independent—Dependent and for Non-Interpersonal—Interpersonal. Raters had to demonstrate reliability, with a criterion set at .80 categorical agreement with the trainer (lead author). During coding, percentage agreement between raters was computed. Kappa was used to calculate categorical agreement with inter-rater reliability at .80. Coding yielded 11 independent stressors (e.g., "My parents had an argument and 22 dependent stressors" (e.g., "I got in trouble at school."). Coding also yielded 22 interpersonal stressors (e.g., "I had problems/argumens with my boyfriend/girlfriend") and 11 non-interpersonal stressors (e.g., "I wasn't able to complete all my schoolwork").

Data Analyses

Data were analyzed using multi-level modeling in HLM 6.04, which offers many benefits for the analysis of mulitwave data, including its capacity for flexibly handling cases with missing data (Raudenbusch and Bryk 2002). In multilevel models, Level 1 regression equations are constructed that model variation in the repeated dependent variable (i.e., depressive symptoms) as a function of time (i.e. weeks 1 through 12) and other repeatedly measured predictor variables (here, stress). Each equation captures features of an individual's trajectory over time: an intercept that describes the initial level on the variable and a slope that describes change in that level over time. At Level 2, equations are specified that model individual differences in the Level 1 variables as a function of Level 2 variables (here, brooding and reflection). Thus, the Level 1 equations capture an individual's trajectory for a given variable as a function of time and stress, and the Level 2 models organizes and explains the between-subjects differences as a function of rumination. Thus, in our model, the effects of rumination subtype (entered in Level 2) on the relationship between stress (entered in Level 1) and depressive symptoms represents a cross-level interaction.

In all HLM analyses, depressive symptoms were modeled in Level 1 as a function of intercept, slope over time, stress, and random error, and in Level 2 as a function of rumination subtypes (brooding and reflection). Separate models were run for each stressor domain (total stress, independent stress, dependent stress, interpersonal stress, and noninterpersonal stress).

Results

Descriptive statistics and correlations for CDI, Brooding, and Reflection at the initial questionnaire are presented in Table 1. Table 2 contains the means and standard deviations for weekly depressive symptoms and stressors.

Main Effects of Time and Stress on Depressive Symptoms

Results of multi-level models indicated that depressive symptoms showed a significant positive slope across the 12 week study (slope coefficient = .08, $t = 3.07$, $p < .01$). Depressive symptoms also varied as a function of stress exposure, with significant time-varying effects of stress on depressive symptoms for total stress (coefficient = .32, $t = 12.62$, $p < .001$); independent stress (coefficient = .61, $t = 10.14$, $p < .001$); dependent stress (coefficient = .39,

Table 1 Descriptive statistics and correlations for CDI, brooding, and reflection at the initial questionnaire ($N = 111$)

Variable	*M*	SD	1.	2.	3.
1. CDI	10.64	6.66	–	.57**	.52**
2. Brooding	2.12	.75	.57**	–	.75**
3. Reflection	2.16	.68	.52**	.75**	–

CDI children's depression inventory. ** indicates that $p < .001$

Table 2 Means and standard deviations for weekly depressive symptoms and stressors

Week	*N*	Depressive Sx		Total		Dependent		Independent		Interpersonal		Non-interpersonal	
		M	SD	*M*	SD	*M*	SD	*M*	SD	*M*	SD	*M*	SD
1	108	3.14	3.25	6.63	3.90	4.08	2.76	2.25	1.87	4.11	3.07	2.22	1.61
2	93	2.89	3.20	5.18	3.71	2.81	2.79	1.50	1.59	2.71	2.67	1.59	1.62
3	90	2.67	3.00	4.01	3.12	2.11	2.29	1.12	1.34	2.16	2.43	1.07	1.22
4	99	2.75	3.04	3.48	3.14	1.99	2.25	1.06	1.34	2.00	2.20	1.05	1.37
5	90	2.10	2.43	2.53	3.19	1.26	2.08	.76	1.28	1.37	2.22	.65	1.05
6	91	2.49	3.48	3.22	3.11	1.68	2.08	.91	1.34	1.72	2.22	.88	1.27
7	82	2.85	3.22	2.85	2.69	1.32	1.64	.75	1.33	1.40	2.03	.67	1.01
8	87	2.34	3.11	2.99	2.47	1.53	1.84	.77	1.10	1.64	1.84	.66	1.07
12	90	4.04	3.19	–	–	–	–	–	–	–	–	–	–

Table 3 Moderator models: multi-level model predicting depressive symptoms as a function of stress, brooding, and reflection

	Total		Dependent		Independent		Interpersonal		Non-interpersonal	
	Estimate (SE)	*t*	Estimate (SE)	*t*	Estimate (SE)	*t*	Estimate (SE)	*t*	Estimate (SE)	*t*
Predicting depressive symptoms from baseline to week 12										
Level 1										
Stress	.17 (.08)	2.05*	.16 (.12)	1.34	.30 (.20)	1.51	.26 (.12)	2.23*	.04 (.20)	.22
Level 2										
Brooding	.06 (.05)	1.06	.07 (.06)	11.31	.06 (.05)	1.07	.08 (.05)	1.45	.05 (.05)	.91
Reflection	.04 (.06)	.65	.05 (.06)	.72	.05 (.06)	.77	.06 (.06)	1.01	.03 (.06)	.45
Cross-level interaction										
Stress × Brooding	.13 (.05)	2.52*	.17 (.07)	2.35*	.27 (.11)	2.37*	.08 (.07)	1.19	.48 (.12)	.88**
Stress × Reflection	−.07 (.05)	1.36	−.07 (.08)	1.04	−.15 (.12)	1.22	−.02 (.07)	.31	−.23 (.14)	1.72

* Indicates $p < .05$, ** Indicates $p < .001$

$t = 10.94$, $p < .001$); interpersonal stress (coefficient = .42, $t = 11.91$, $p < .001$); and noninterpersonal stress (coefficient = .54, $t = 8.60$, $p < .001$).

Moderator Analyses: Does Brooding or Reflection Moderate the Relationship Between Stress and Depressive Symptoms?

Next we examined if brooding or reflection (entered in Level 2) moderated the Level 1 relationship between stress and depressive symptoms. Given the significant correlation between brooding and reflection, both were entered simultaneously in all models. This allowed us to examine the unique effect of each rumination subtype above and beyond the effect, if any, of the other subtype, on depression and on the stress-depression relationship. Results from these multi-level models are presented in Table 3. Brooding significantly moderated the effects of stress on depressive symptoms for total stress (coefficient = .07, $t = 2.36$, $p = .02$) as well as stressors that were rated independent (coefficient = .16, $t = 2.26$, $p = .02$); dependent (coefficient = .11, $t = 2.54$, $p = .01$); and noninterpersonal (coefficient = .31, $t = 4.08$, $p = .00$). In all analyses, the cross-level interaction was in the expected direction, suggesting that greater tendency to brood exacerbates the effects of stress on depressive symptoms, such that depressive symptoms increased most for youth with high levels of stress and brooding. Brooding did not significantly moderate the effects of interpersonal stress on depressive symptoms (coefficient = .07, $t = 1.59$, $p = .11$). However, after controlling for the effects of brooding on depression and the stress-depression relationship, reflection did not significantly moderate the effects of stress on depressive symptoms for any stress domain.

Discussion

The purpose of the current study was to examine brooding and reflection as a moderator of the relationship between

stress and depressive symptoms in a 3 month prospective study among adolescents. This study makes a novel contribution by simultaneously examining the effects of rumination on depressive symptoms among adolescents in an integrated domain-specific, vulnerability-stress model. We examined different domains of stress including total stressors as well as dependent versus independent stressors and interpersonal versus noninterpersonal stressors, and two components of rumination (brooding and reflection) in order to provide more specific examination of the effects of stress and rumination on depressive symptoms. We hypothesized that brooding, but not reflection, would moderate the effects of stress on depressive symptoms. We also expected the relationship between stress and depressive symptoms to be stronger for dependent and interpersonal stressors. We examined these hypotheses in a community sample of adolescents aged 14–19 who completed a baseline measures of rumination as well as nine weekly diary assessments of stress and depressive symptoms across a 12 week period. Next, we summarize our findings and their contribution to our understanding of stress, rumination, and depression during adolescence.

Not surprisingly, we found that greater stress exposure was associated with more depressive symptoms over time. Current studies consistently find that increases in stress predict depressive symptoms throughout adolescence and into young adulthood (Pine et al. 2002). As such, stress experienced during adolescence can have both an immediate impact for the individual and more far reaching consequences that persist across the lifespan. Although previous studies have found dependent stressors are more likely to predict adolescents' depressive symptoms (Cohen et al. 1987; Rudolph and Hammen 1999), we found that both independent and dependent stressors were significant predictors of depressive symptoms among our participants. Also in contrast to past research, we found that both interpersonal and noninterpersonal stress were significantly associated with depressive symptoms. While past research has emphasized the powerful role of the adolescent's peer group in determining these outcomes (Rudolph and Hammen 1999; Rudolph et al. 2000; Shih et al. 2006), our study did not find a difference between these two types of stressful events. One explanation for this finding may be due to our method of weekly assessment of stress exposure. Youth completed their weekly diary assessments at school, and academic-related stressors constituted the greatest number of noninterperonsal stressors. The school context in which both stress and depressive symptoms were reported may have heightened the salience of academic stressors both in reporting frequency as well as in reference to current symptoms. As such, while peer/interpersonal stress remained a salient stressor, our participants may have been dually affected by stress in both domains.

Consistent with a vulnerability-stress hypothesis, we found that rumination interacted with stress to predict depressive symptoms over time, but that the relationship between rumination, stress, and depression varied by rumination component. As expected, brooding significantly moderated the relationship between stress and depression, for nearly all domains of stress; the cross-level interaction was in the expected direction for all analyses. These findings suggest that the greater tendency to brood exacerbates the effects of stress on depressive symptoms, such that depressive symptoms increased most for youth with high levels of stress and brooding. The one exception to this pattern of results is our unexpected finding that brooding did not significantly moderate the effect of interpersonal stress on depression. This unexpected result may have been due to the dominant main effect of peer stress (the majority of interpersonal stressors) on mental health. Because peer stress is such strong contributor to adolescent's depressive symptoms, brooding may not further exacerbate the effect. This finding is consistent with previous research, as previously mentioned, which has highlighted the particular importance of peer stress on adolescent adjustment in general and depressive symptoms in particular.

By contrast, results demonstrated that, as expected, reflection did not moderate the relationship between stress and depression. This finding suggesting that the tendency to reflect upon one's problems does not necessarily exacerbate the effect of stress on depressive symptoms.

The notion that brooding represents the more maladaptive component of rumination, with reflection representing the more adaptive strategy, is a relatively new addition to the rumination literature (Treynor et al. 2003). The current study provides additional support for this assertion and goes further by applying brooding and reflection to a vulnerability-stress model with various domains of stress. This study contributes to a growing body of literature demonstrate the maladaptive effects of brooding in interaction with stress, regardless of stressor domain. These findings also may aid our understanding of the mixed results from previous studies that have examined rumination in a vulnerability-stress model (Burwell and Shirk 2007; Fresco et al. 2002; Joormann et al. 2006; Rude et al. 2007; Treynor et al. 2003). Such prior studies tend to only examine rumination as a global construct and, as such, these studies have been unable to determine the differential effects of reflection and brooding.

Limitations and Future Directions

The current study builds on past research in its use of a prospective, multi-wave design to examine the relationship between rumination and depressive symptoms in a domain-specific, vulnerability-stress model. Our study had many

strengths, including repeated measures of study constructs allowing for the prospective examination of the effects of stress and rumination on fluctuations in depressive symptoms. By utilizing this design, we were able to examine these relationships over time and in the absence of marked changes in depressive symptoms, which are typically not observed in short-term prospective studies. Additionally, strengths of the study also include examination of stressors by domain and two subtypes of rumination, and an adolescent sample. However, some important limitations should be noted.

One limitation is a predominantly Caucasian, community sample, which may limit the generalizability of our findings. A second limitation is the slight gender imbalance in our sample (72% female), which precluded our ability to examine whether any of the effects were moderated by gender. There are well-documented gender differences in both depressive symptoms and rumination (Hankin et al. 1998; Nolen-Hoeksema 1991; Nolen-Hoeksema and Girgus 1994). Some studies have suggested that certain types of stressors, and particularly interpersonal stressors, may exert stronger effects on depressive symptoms for girls than for boys (Rizzo et al. 2006). As such, examining how gender influences the rumination-stress relationship should b considered in future studies. Additionally, it may be that our sample is limited by a self-selection bias, in which females with a tendency to reflect on their stressors and emotions were more likely to participate in the study. A third limitation may be the mean age of our sample at 16.4 years of age. Depressive symptoms typically present in the transition to adolescence, and as such, it is a possibility that the age of our sample is past the mean age when depression rates rise sharply (Davey et al. 2008; Hankin et al. 1998). Examining similar research questions in a sample of early adolescents would be beneficial. A fourth limitation is the reliance on self-report measures. Future studies can include a multimethod or multirater approach such as participant or parent interviews to more independently assess depressive symptoms and reduce the potential for rater characteristics to influence results. Finally, our sample reported evaluated stress and depression scores at Week 1 in comparison to all subsequent weeks. Because the elevation in scores does not reliably correspond with any calendar or academic event, we are unsure of what may have contributed to this difference. It may be that the novel event of assessment at Week 1 imparted unique demand characteristics, which influenced participants to slightly over report stress and depressive symptoms.

In conclusion, this study suggests that brooding, but not reflection, exacerbates the effects of stress on depressive symptoms. This finding provides a step forward in our understanding of the maladaptive effects of brooding, regardless of particular domain of stress. Identifying individuals who have a greater tendency to brood in response to stress is tremendously helpful for curtailing the greater depressive symptoms that these individuals experience. Further exploration of the differential outcomes of brooding vs. reflection is needed in order to understand the mechanisms at work and how these processes affect the individual throughout their development.

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