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Publisher: Psychology Press

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Cognition & Emotion

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/pcem20>

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Available online: 11 Feb 2011

To cite this article: Amy Mezulis, Jordan Simonson, Elizabeth McCauley & Ann Vander Stoep (2011): The association between temperament and depressive symptoms in adolescence: Brooding and reflection as potential mediators, *Cognition & Emotion*, DOI:10.1080/02699931.2010.543642

To link to this article: <http://dx.doi.org/10.1080/02699931.2010.543642>



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BRIEF REPORT

The association between temperament and depressive symptoms in adolescence: Brooding and reflection as potential mediators

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This study examined whether rumination subtypes (brooding and reflection) mediated prospective associations between temperament (negative emotionality and positive emotionality) and depressive symptoms in a community sample of 423 adolescents. Effortful control and sex were examined as potential moderators of the mediated pathway. Youth self-reported negative emotionality (NE), positive emotionality (PE), and effortful control (EC) at age 12; brooding and reflection subtypes of rumination at age 14; and depressive symptoms at ages 12, 14, and 15. Hierarchical linear regression analyses indicated that, controlling for initial levels of depressive symptoms, high NE, but not low PE, predicted increases in depressive symptoms from age 12 to age 15. Brooding, but not reflection, mediated the association between NE and depressive symptoms. Neither sex nor EC moderated either indirect pathway in the mediated model. The results confirm and extend previous findings on the association between affective and cognitive vulnerability factors in predicting depressive symptoms in adolescence.

Keywords: Depression; Temperament; Rumination; Adolescence.

Both affective and cognitive vulnerabilities have been implicated in the increase in depressive symptoms as well as the emergence of the sex difference in depression in adolescence (Hankin et al., 1998; Hyde, Mezulis, & Abramson, 2008). Affectively, both high negative emotionality and low positive emotionality have been found to

significantly predict adolescent depression. Cognitively, rumination has been implicated in both adolescent depression and the sex difference in depression. In recent years, researchers have suggested that the association between affective vulnerability and depression may be mediated by cognitive vulnerabilities, particularly rumination

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(Hyde et al., 2008). A handful of studies have found support for the hypothesis that rumination mediates the relationship between affective vulnerability and depression in adolescence. However, few studies have examined this hypothesis using prospective data, which is critical for identification of mediators. Furthermore, prior studies have relied upon global measures of rumination, ignoring recent research that demonstrates there are subtypes of rumination with differential associations with depression. Our study addressed these limitations by examining brooding and reflection subtypes of rumination as mediators of the association between temperament and depressive symptoms using a multi-wave prospective design. We further examine whether this affective–cognitive mediation model is itself moderated by effortful control or child sex.

Temperament as a vulnerability factor for depression

Rothbart and Bates (1998) conceptualised temperament as biologically based individual characteristics reflected in emotional, motor, and attentional reactivity and self-regulation that are present from infancy and relatively stable over time. A constellation of temperamental features characterised by high negative affect and intense emotional reactions is typically labelled *negative emotionality* (NE). Individuals high in NE dislike and/or avoid novel situations, show distress to novelty, easily become upset, fearful, sad, or tearful and are highly sensitive to negative stimuli (Belsky, Hsieh, & Crnic, 1996). By contrast, a constellation of temperamental characteristics characterised by high positive affect and adaptability is typically labelled *positive emotionality* (PE). Individuals high in positive emotionality seek novel sensations and situations and are goal-oriented, sociable, easygoing, and extraverted (Rothbart & Bates, 1998). Several studies have found both high negative emotionality and low positive emotionality to be associated with depression in adults, adolescents, and children (e.g., Anthony, Lonigan, Hooe, & Phillips, 2002).

Rumination as a mediator of the temperament–depression association

Hyde and colleagues (2008) integrated cognitive and affective models of adolescent depression by hypothesising that negative emotionality contributes to the development of maladaptive cognitive responses to stress that become habitual and subsequently confer vulnerability to depression. One such maladaptive cognitive response is rumination, defined as perseverative attention to negative affect, and the causes and consequences of that negative affect (Nolen-Hoeksema, 1991). Several studies have found that individuals with more ruminative response styles are more vulnerable to depression; an association between rumination and depression has been demonstrated both concurrently and prospectively in children, adolescents, and adults (see Nolen-Hoeksema, 2004, for a review).

Several studies have examined the association between negative emotionality and global rumination. Early research suggested that negative emotionality was associated with greater attention to negative events and an increase in self-focus (Pyszczynski, Holt, & Greenberg, 1987). More recently, Feldner, Leen-Feldner, Zvolensky, and Lejuez (2006) found that negative emotionality was moderately correlated with global rumination scores in adults. Among adolescents, Chang (2004) similarly found a moderate correlation between negative emotionality and rumination. In the most recent study, Verstraeten, Vasey, Raes, and Bijtterbier (2009) found that the association between negative emotionality and depression among adolescents was mediated by rumination. However, these effects only held concurrently, not prospectively. Thus, one important question is whether the associations among temperament, rumination, and depression observed in cross-sectional studies also appear in longitudinal studies.

Rumination subtypes: Brooding and reflection

A limitation of prior studies is their reliance on global measures of rumination. A growing body of

research reveals that there are subtypes of rumination that may be differentially related to both negative emotionality and depression. One subtype of rumination is brooding, defined as “moody pondering” (Treyner, Gonzalez, & Nolen-Hoeksema, 2003, p. 251). Brooding involves perseverative focus on self-blaming, gloomy, or anxious thoughts and may represent the most maladaptive component of rumination, as evidenced by multiple studies finding that brooding predicts depression (Burwell & Shirk, 2007). By contrast, reflection, defined as “a purposeful turning inward to engage in cognitive problem-solving” (Treyner et al., 2003, p. 256), may represent an adaptive component of rumination that promotes effective problem-solving. Burwell and Shirk (2007) reported that, unlike brooding, reflection did not predict depressive symptoms over time among adolescents. Joormann, Dkane, and Gotlib (2006) found that while both brooding and reflection were associated with higher depression scores, only brooding was associated with a measure of attention bias to negative stimuli. To the best of our knowledge there are no prior studies examining brooding and reflection independently as mediators of the associations among PE, NE and depression.

Examination of brooding specifically as a mediator between negative emotionality and depression may also contribute to a better understanding of the gender difference in depression. Treyner and colleagues (2003) found that although females reported higher levels of depressive symptoms, brooding, and reflection than males, only the gender difference in brooding explained the gender difference in depression.

Effortful control and sex as potential moderators of the temperament–depression relationship

One factor that may moderate the association between NE or PE and rumination is the temperamental dimension of effortful control (EC). EC is a self-regulatory process that requires voluntary control of both attention and behaviour to modulate emotional experience and expression

(Rothbart & Bates, 1998). In general, evidence suggests that vulnerability to psychopathology, including depression, is associated with high levels of NE and low levels of EC (e.g., Oldehinkel, Hartman, Ferdinand, Verhulst, & Ormel, 2007). One explanation for this association is that the effect of NE on subsequent cognitive vulnerabilities may be stronger for youth low in EC. Consistent with this hypothesis, Verstraeten and colleagues (2009) found that the association between NE and rumination was strongest for youth low in EC. We hypothesised that EC may moderate either the effect of NE on rumination and/or the effect of rumination on depression.

Finally, the association between temperament and rumination may vary by sex. While studies generally find few significant gender differences in PE or NE (see Else-Quest, Hyde, Goldsmith, & van Hulle, 2006, for a review), some have found that the association between NE and depressive symptoms is stronger among adolescent girls than boys (see, e.g., Verstraeten et al., 2009). One explanation for the stronger effect of NE on depression among girls is that NE is more strongly predictive of later rumination for girls. Despite the lack of a significant sex difference in NE, adolescent females typically report more rumination than do adolescent males, and this gender difference partially mediates the gender difference in depressive symptoms (Nolen-Hoeksema, 2002). Thus, we hypothesised that the effect of NE on rumination and/or the effect of rumination on depression may be stronger for girls.

The current study

The current study extended research on temperament, rumination, and depressive symptoms by examining these constructs prospectively in a large sample of adolescents and by differentiating brooding from reflection as potential mediators of the association between temperament and depression. We further examined effortful control and sex as moderators of these hypothesised mediator models.

Based upon prior studies, we hypothesised that:

1. Higher levels of NE and lower levels of PE would be associated with higher levels of depressive symptoms.
2. Brooding, but not reflection, would be associated with higher levels of depressive symptoms.
3. Brooding, but not reflection, would mediate the association between temperament and depressive symptoms.
4. Gender would moderate one or both of the indirect paths in the mediated model.
5. EC would moderate one or both of the indirect paths in the mediated model.

METHOD

Participants

This study was conducted as part of the Developmental Pathways Project, a community-based longitudinal study of the development of depression and co-occurring conduct problems in young adolescents. The longitudinal sample was comprised of 521 youth recruited from public schools in the Seattle, Washington, area over a period of four successive school years. Over 2,000 students were screened for elevated depressive and/or conduct-problem symptoms using the Moods and Feelings Questionnaire (MFQ; Costello & Angold, 1988) and the externalising scale of the Youth Self-Report (YSR; Achenbach, 1991). For the purpose of selecting a stratified random sample for longitudinal study, all children who were screened were assigned to one of four risk groups: (1) high depressive and high conduct-problem score (CM); (2) high depressive and low conduct-problem score (DP); (3) low depressive and high conduct-problem score (CP); and (4) low depressive and low conduct-problem score (NE). Risk group assignment was determined by using a cut-off of 0.5 *SD* above the screening sample mean for the MFQ and/or the YSR externalising scales. To enhance the likelihood of observing the target psychopathology outcomes over the course of the longitudinal study, children whose screening scores were high on

depressive and/or conduct-problem dimensions were over-sampled for participation in the longitudinal study. A target number of children were randomly selected from the four cells at a ratio of approximately 1 CM: 1 DP: 1 CP: 2 NE. In the general school population the ratio is close to 1 CM: 1 DP: 1 CP: 6 NE. This sampling approach yielded an overrepresentation of children in the CM, DP, and CP groups relative to their representation in the general population. Therefore, to provide general population estimates of associations between variables, each participant in the longitudinal study was assigned a two-component weight to compensate for differences between the screening sample (which was representative of the children enrolled in public school) and the longitudinal sample (that had an overrepresentation of children at risk for depression and conduct problems). Weighted scores were used in all analyses so that prevalence estimates and associations derived from the sample reflected those that would have been obtained in an unselected sample of sixth-grade public school students.

A total of 521 youth were enrolled in the longitudinal study (47.8% female). Racial backgrounds of the participating youth were 48.9% European American; 28.4% African American; 18.6% Asian American; and 4.0% Native American. 10.2% of participants were of Hispanic origin. The proportion of females enrolled in the longitudinal study did not differ significantly from the 48.8% of students who were screened nor from the 47.7% who were enrolled but not screened.

The longitudinal study included six assessments over a three-year period. The current study analyses data from three time points. At the first time point (T1), youth were in sixth grade (mean age 12.0 years). We use additional data from two of the subsequent assessments, the 24-month follow-up (T2) when youth were in eighth grade (mean age 14.1 years) and the 36-month follow-up (T3) when youth were in ninth grade (mean age 15.1 years). Temperament was assessed at T1 and rumination at T2. Depressive symptoms were assessed at all three time points, with depressive symptoms at T3 being the outcome of interest in the current study.

Of the 521 enrolled youth, 511 (247 females) provided complete data on study variables at T1. At each assessment every effort was made to contact each enrolled child. 447 (85.8%) participated in the 24-month follow-up at T2, and 423 (81.1%) participated in the 36-month follow-up at T3; thus, for the current study, the final $N=423$. To evaluate selective attrition, we compared participants at each assessment with those who did not participate at that assessment. At no point in time were significant differences in attrition observed between females and males, in screening psychopathology group status, or in levels of NE, PE, or rumination.

Measures

Depressive symptoms. The Mood and Feelings Questionnaire (MFQ) is a self-report measure designed to assess depressive symptoms in epidemiological studies of children ages 8 to 18. The MFQ has 33 items that comprise both the full range of DSM-IV diagnostic criteria for depressive disorders, as well as additional items reflecting common affective, cognitive, and vegetative features of childhood depression (Costello & Angold, 1988). Previous validation studies have demonstrated high content and criterion validity and moderate to high discriminant validity (e.g., Daviss et al., 2006). Cronbach's alpha coefficients for the MFQ in this sample were good, exceeding .85 at every time point.

Rumination. Rumination was assessed using the *brooding* and *reflection* subscales of the Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991; Treynor et al., 2003) The *brooding* subscale includes 5 items assessing moody pondering, such as: "Think 'Why can't I handle things better?'" and "Think about a situation, wishing it had gone better". The *reflection* subscale includes 5 items assessing neutral pondering, such as: "Analyse recent events to try and understand why you are depressed". Participants rated each item according to how much they engaged in the ruminative response when feeling sad, down, or low, on a scale from 1 = *never* to 4 = *always*. The

mean response for each scale is reported. Cronbach's alphas for both scales were good and comparable to those reported in other studies (*brooding*, $\alpha = .75$ and *reflection*, $\alpha = .72$; see also Treynor et al., 2003).

Temperament. Negative and positive emotionality were assessed using the Early Adolescent Temperament Questionnaire – Revised (EATQ-R; Ellis & Rothbart, 2001). The EATQ-R is an updated version of the EATQ, designed to measure reactive and regulative components of temperament in 9- to 15-year-olds (EATQ; Capaldi & Rothbart, 1992). The EATQ-R includes 103 items across 12 subscales that cluster in 3 factors: Negative Emotionality, Positive Emotionality and Effortful Control. Responses on a 5-point Likert scale vary from 1 = *almost always untrue* to 5 = *almost always true*. Negative emotionality (NE) is a scale comprised of the 17 items on the Frustration, Fear, and Shyness subscales (Muris & Meesters, 2009). Positive Emotionality (PE) is comprised of the nine items on the Extraversion/Surgency scale. Effortful Control (EC) is comprised of the 16 items from the Attention, Inhibitory Control, and Activation Control scales. Internal consistency of the NE, PE, and EC scales in the current sample were $\alpha = .78$, $.66$, and $.80$, respectively. Test-retest stability of the EATQ-R has been reported to be moderate to good, and the EATQ-R has been shown to correlate with other self-report measures of personality (Muris & Meesters, 2009).

RESULTS

Descriptive analyses

Means, standard deviations, and bivariate correlations for study variables are presented in Table 1. *T*-tests indicated that girls reported significantly more brooding ($t=2.03$, $p=.04$), reflection ($t=4.27$, $p=.00$), effortful control ($t=6.38$, $p=.00$), and depressive symptoms at ages 14 ($t=1.96$, $p=.05$) and 15 ($t=5.33$, $p=.00$) than boys. There were no significant sex differences in NE or PE, or in depressive symptoms at age 12.

Table 1. Bivariate correlations, means, and standard deviations for study variables

	Means (standard deviations)											
	1	2	3	4	5	6	7	8	All	Boys	Girls	<i>t</i>
1. <i>RRreflect</i>	—								1.97 (0.62)	1.85 (0.57)	2.10 (0.64)	4.27**
2. <i>RBrood</i>	.53**	—							2.03 (0.60)	1.97 (0.60)	2.08 (0.59)	2.03*
3. <i>EATQ - NE</i>	.05	.12*	—						2.42 (0.53)	2.67 (0.58)	2.65 (0.68)	0.36
4. <i>EATQ - PE</i>	-.04	-.01	-.01	—					3.32 (0.67)	3.35 (0.62)	3.43 (0.62)	1.56
5. <i>EATQ - EC</i>	.00	-.07	-.43**	.14*	—				3.39 (0.62)	3.22 (0.60)	3.56 (0.61)	6.38**
6. <i>MFQ - T1</i>	.02	.18**	.16**	-.07	-.05	—			9.05 (7.87)	9.65 (7.92)	8.44 (7.78)	1.69
7. <i>MFQ - T2</i>	.20**	.33**	.22**	.04	-.09	.49**	—		6.96 (6.21)	6.29 (5.49)	7.44 (6.79)	1.96*
8. <i>MFQ - T3</i>	.34**	.35**	.10*	.04	-.05	.35**	.59**	—	8.77 (7.12)	6.98 (5.98)	10.59 (7.71)	5.33**
9. <i>Sex</i>	.20**	.10*	-.04	.07	.27**	-.08	-.17**	.25**	—	—	—	—

Note: Standard deviations are in parentheses. * $p < .05$; ** $p < .01$.

Main effect analyses: Does temperament predict depression?

To examine the first hypothesis that higher NE and lower PE at T1 would prospectively predict depressive symptoms at T3, we used hierarchical linear regression. Depressive symptoms at age 15 (T3) was the outcome variable. Child sex and depressive symptoms at age 12 (T1) were entered as control variables in the first step, and the temperament variable at age 12 (T1) in the second step. Separate regressions were run for NE and PE. As hypothesised, after controlling for initial levels of depressive symptoms, greater NE at T1 was significantly predictive of greater depressive symptoms at T3 ($\beta = 0.15, t = 3.45, p = .00$). However, lower PE at T1 was not associated with depressive symptoms at T3 ($\beta = 0.05, t = 1.26, p = .21$).

Mediator analyses: Does brooding or reflection mediate the relationship between NE and depression?

Given our finding that NE, but not PE, was associated with later depressive symptoms, we further examined whether this association was mediated by brooding or reflection. In all analyses, we controlled for child sex and depressive symptoms at age 12 (T1). Mediation was tested using hierarchical linear regression according to the methods outlined in Baron and Kenny (1986). In addition, we used the product of coefficients method to test the significance of mediation (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) with 1,000 bootstrap samples (Edwards & Lambert, 2007).

First, we examined brooding as a potential mediator. The path from NE to brooding was marginally significant ($\beta = 0.09, t = 1.84, p = .06$). With NE in the model, the path from brooding to depression was significant ($\beta = 0.23, t = 5.58, p = .00$). The direct path from NE to depression prior to entering brooding was significant ($\beta = 0.15, t = 3.45, p = .01$) and the effect of NE on depression was reduced after entering brooding as a mediator ($\beta = 0.12, t = 3.04, p = .01$). The z-test of mediation was marginally significant,

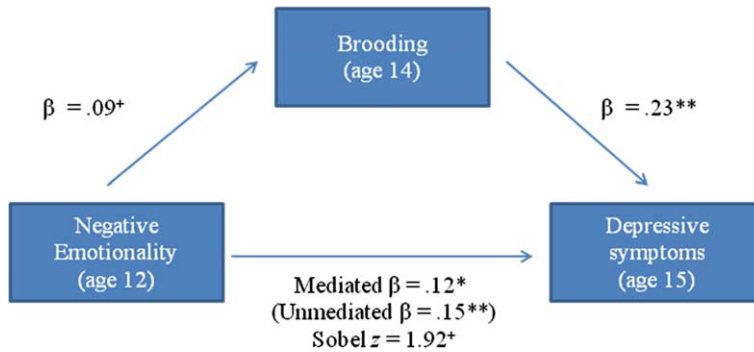


Figure 1. Brooding partially mediates relationship between NE and depressive symptoms. Note: Depressive symptoms at age 12 and child sex were controlled for in all analyses. $^+p < .10$; $^*p < .05$; $^{**}p < .01$. The z -test of mediation was marginally significant at $p = .05$.

$z = 1.92$, $p = .05$, indicating that the association between NE and depression is mediated in part by brooding (see Figure 1). Approximately 20% of the association between NE and depression was accounted for by brooding.

Next we examined reflection as a potential mediator. The path from NE to reflection was not significant ($\beta = 0.07$, $t = 1.43$, $p = .15$). With NE in the model, the path from reflection to depression, however, was significant ($\beta = 0.28$, $t = 6.02$, $p = .00$). The z -test of mediation was not significant, $z = 1.46$, $p = .14$, indicating that reflection is not a significant mediator of the association between NE and depression.

Does EC or sex moderate the relationship between NE and brooding?

Last, we examined our hypothesis that EC or child sex may moderate one or both of the indirect pathways between NE and brooding, or between brooding and depression. We conducted a moderated mediation analyses using the procedures outlined in Edwards and Lambert (2007) for first-stage moderation (e.g., that EC or sex moderated the association between NE and brooding) and for second-stage moderation (e.g., that EC or sex moderated the association between brooding and depression). Using this method, we avoided the drawbacks associated with splitting datasets to examine the effect of potential moderators within mediated relationships. We found that EC mod-

erated neither indirect pathway in the mediation model. Neither the test of first-stage moderation of the association between NE and brooding ($t = 1.23$, $p = .22$) nor the test of second-stage moderation of the association between brooding and depression ($t = 0.41$, $p = .68$) were significant. Thus, we conclude that EC is not a significant moderator of either of the mediated pathways.

Nor did child sex moderate either indirect pathway in the mediation model. The test of the first-stage moderation of the association between NE and brooding was not significant ($t = 1.42$, $p = .16$). Similarly, the test of the second-stage moderation of the association between brooding and depression was also not significant ($t = 0.42$, $p = .68$). Thus, we conclude that child sex is not a significant moderator of either of the mediated pathways.

DISCUSSION

This study extended previous research on temperament, rumination and adolescent depressive symptoms by examining these constructs prospectively and by examining brooding and reflections components of rumination separately. As hypothesised, our results indicate that NE measured at age 12 predicted depressive symptoms at age 15 and that this developmental pathway was mediated by the brooding, but not reflection, subtype of rumination. Contrary to hypotheses,

however, sex did not moderate either indirect path in this mediated relationship. Below we discuss the implications of these findings for current research on temperament, rumination, and depression.

Temperament as a predictor of depressive symptoms in adolescence

Several previous studies have found associations between NE and depressive symptoms (Clark & Watson, 1991), and our findings lend further support to the hypothesis that high NE is a salient risk factor for adolescent depression. However, our data did not support a model in which low PE predicted depressive symptoms over time. PE measured at age 12 was not associated with depressive symptoms at age 15. This finding is inconsistent with Clark and Watson's tripartite model of anxiety and depression (1991) as well as other prospective adolescent studies (e.g., Verstraeten et al., 2009).

Brooding partially mediates the pathway between NE and depressive symptoms

Recent research on cognitive vulnerabilities to depression has distinguished between brooding and reflection subtypes of rumination (e.g., Burwell & Shirk, 2007). Treynor and colleagues (2003) stated that brooding may represent the more maladaptive component of rumination, characterised by negative focus on self-critical thoughts. By contrast, reflection may represent an adaptive form of self-focused attention, which may promote problem-solving. We therefore thought it was necessary to investigate how NE may be differentially related to each subtype of rumination, and, in turn, how each subtype of rumination may mediate the pathway between NE and depressive symptoms. We hypothesised that brooding would mediate the association between NE and depressive symptoms because NE has been associated with focus on negative aspects of oneself, others, and the world (Pyszczynski et al., 1987). By

contrast, we did not expect reflection to act as a mediator because NE may inhibit purposeful problem-solving behaviour. The findings of our prospective study were consistent with these hypotheses.

Our finding that brooding partially mediated the NE–depressive symptom relationship provides further insight into the mechanisms by which temperament may convey risk for depression. Mezulis, Hyde, and Abramson (2006) hypothesised that individuals with greater NE make more negative interpretations of the world when experiencing stressful events and that this pattern may result in the crystallisation of cognitive vulnerabilities to depression. While our study design did not allow us to explicitly test whether NE contributed to the development of brooding, the data do suggest that one way NE operates as a risk factor for depression is through cognitive mechanisms. Like the brooding subtype of rumination, reflection was also predictive of depressive symptoms at age 15; however, reflection did not mediate the association between NE and depressive symptoms. Thus, while both brooding and reflection appear to convey risk for depressive symptoms, brooding is uniquely associated with the temperamental vulnerability of NE. This differential relationship between NE and each subtype of rumination has important implications both for understanding the origins of cognitive vulnerabilities to depression and for designing interventions that target salient cognitive features.

Contrary to our hypothesis, study results showed that the pathways between NE and brooding, and between brooding and depressive symptoms, operate similarly among boys and girls. This finding contributes to a growing body of literature examining the extent to which gender differences in temperament and cognitive vulnerabilities help to explain the gender difference in depression in adolescence (Hyde et al., 2008). Gender differences in depressive symptoms may emerge as a result of gender differences in mean levels of predictor variables and/or as a result of gender differences in associations among predictor

and outcome variables. As in prior studies, the current study found that girls were more likely to report brooding, reflection, and depression symptoms by age 13 (e.g., Broderick, 1998). Also similar to other studies, girls in our sample displayed similar levels of NE as boys (Else-Quest et al., 2006). The fact that sex did not moderate the association between NE and brooding, or between brooding and depression, is consistent with the idea that sex differences in mean levels of brooding are explaining sex differences in depressive symptoms in adolescence.

Our results also suggest that the relationships among NE, brooding, and depression do not vary as a function of individual differences in effortful control. A handful of prior studies have suggested that depression is associated with high levels of NE and low levels of EC (e.g., Oldehinkel et al., 2007); however, few studies have examined whether EC moderates the effects of NE on depression or rumination prospectively. Our prospective analyses are consistent with that of Verstraeten and colleagues (2009) in failing to find that EC moderated the effects of NE on rumination or depression prospectively.

Limitations and future research directions

While our study provides further support for the links between temperament, rumination, and depressive symptoms, its limitations should be noted. One of the most significant limitations is our inability to explicitly test whether NE contributes to the development of brooding and reflection over time. Future research should investigate the developmental timing of the emergence and persistence of temperament-related maladaptive cognitions in relation to NE and the emergence of depression. Prospective studies that measure rumination and depression at multiple time points will be useful in addressing such questions. In particular, it will be important to examine if NE and rumination predict the onset of clinically significant episodes of depression in addition to increases in depressive symptoms.

A second limitation of our study was the low reliability in our measure of PE. Although the reliability we found is consistent with that found in other samples ($\alpha = .66$, compared with $\alpha = .73$ in Muris & Meesters, 2009, and $\alpha = .60$ in Muris, Meesters, & Blijlevens, 2007), it is still below recommended reliability for research purposes. Lack of support for the tripartite model may have been due in part to low reliability of the PE subscale.

In spite of these limitations, the study contributes to our understanding of how temperament is associated with depressive symptoms over the course of adolescence. Our findings support the theory that NE contributes to cognitive vulnerability, particularly rumination, which in turn contributes to depression in adolescence.

Manuscript received 25 February 2010

Revised manuscript received 11 November 2010

Manuscript accepted 11 November 2010

First published online 000

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