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Brooding Rumination and Internalizing Symptoms in Childhood: Investigating Symptom Specificity in a Multi-Wave Prospective Study

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Abstract

Specificity of brooding rumination as a cognitive vulnerability for anxiety and depression was examined using the tripartite theory as a framework. The three factors of the tripartite theory (negative affect, positive affect, and physiological hyperarousal) were included in the same structural equation model (latent growth curves) to test three competing hypotheses: brooding rumination as a depression-specific vulnerability (i.e., brooding uniquely predicts shared negative affect + specific positive affect), anxiety-specific vulnerability (i.e., brooding predicts shared negative affect + specific physiological hyperarousal), or shared risk vulnerability (i.e., brooding predicts negative affect, the shared tripartite component common to both anxiety and depression). Data from children in 2nd through 7th grades (N = 303) were collected in three waves over two years. Results revealed brooding to be uniquely associated with initial levels of negative affect and physiological hyperarousal, thus providing support for the anxiety-specific vulnerability. Results from the multigroup analysis confirmed that the relationship among these variables did not differ across sex. Longitudinal associations between brooding and the tripartite factors are also discussed.

Identifying cognitive vulnerabilities that increase children's risk for the development of psychopathology in adolescence or adulthood has the potential to inform etiological theories and lead to the development of effective treatment and preventive interventions. Rumination, the tendency to perseverate about the symptoms, causes, and consequences of negative mood, is a cognitive vulnerability that has been the focus of considerable research and one that has been consistently linked to concurrent and future levels of children's

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depressive symptoms and disorders (see Rood, Roelofs, Bogels, Nolen-Hoeksema, & Schouten, 2009 for review). Originally proposed as a way of explaining risk for depression and the emergence of sex differences in depression in adolescence (Nolen-Hoeksema & Girgus, 1994), a growing body of research shows that rumination is also associated with increased risk of anxiety (Muris, Fokke, & Kwik, 2009; Muris, Roelofs, Meesters, & Boomsma, 2004), leading some researchers to propose that rumination is a transdiagnostic variable for anxiety and depression, rather than a cognitive vulnerability specific to depression (Ehring & Watkins, 2008; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008).

Rumination has also been proposed as an explanation for comorbidity of anxiety and depression (McLaughlin & Nolen-Hoeksema, 2011). Estimates of comorbidity of these disorders are quite high (e.g., 20% to 70%) in youth samples (Angold, Costello, & Erkanli, 1999). Indeed, anxiety is more likely to occur alongside depressive symptoms than without them. Co-occurring anxiety and depression is particularly troublesome insofar as children who evince symptoms of both disorders are more likely to have internalizing problems in adulthood (Pine, Cohen, Gurley, Brook, & Ma, 1998) and worse treatment outcomes (Rowe, Liddle, Greenbaum, & Henderson, 2004). Thus, understanding the causes and comorbidity of anxiety and depression is important for advancing etiological theories and developing effective interventions for these disorders.

Although early work focused on rumination generally, more recent research has examined two distinct components of rumination, brooding rumination and reflective pondering (Armey et al., 2009; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Brooding rumination is defined as passive and judgmental thoughts about one's mood, while reflection refers to conscious inward focus intended to gain insight into one's depressive symptoms (Treynor et al., 2003). Studies with adult and child samples provide support for a two-factor structure of rumination, with brooding rumination more strongly associated with depressive (Burwell & Shirk, 2007; Lopez, Driscoll, & Kistner, 2009) and anxious symptoms (Verstraeten, Bijttebier, Vasey, & Raes, 2011) than reflection. The present study examined brooding rumination as a vulnerability to anxiety and depression.

The tripartite theory of anxiety and depression (Clark & Watson, 1991) offers a useful framework for studying the contributions of brooding rumination to these disorders individually as well as understanding how brooding rumination may explain their high rates of comorbidity. The tripartite theory specifies three factors: negative affect (NA), positive affect (PA), and physiological hyperarousal (PH). NA represents general distress (e.g., sadness, worry, anger, poor concentration); low PA refers to feelings of anhedonia; and PH describes somatic symptoms (e.g., increased heart rate, respiration). According to the theory, depression is conceptualized as high NA and low PA and anxiety as high NA and high PH. The three-factor model has been replicated in clinical populations and community samples of children (Joiner, Catanzaro, & Laurent, 1996; Lambert, McCreary, Joiner, Schmidt, & Ialongo, 2004).

Despite the importance of the tripartite theory for understanding the causes and comorbidity of anxiety and depression, only recently has this model been applied to the study of rumination (Hankin, 2008). Hankin used this theory as a framework for testing the

specificity of rumination in predicting depressive and anxious symptoms in an adolescent sample. Rumination predicted depressive symptoms, presumably a mix of NA and PA, but not PH. These findings were interpreted as support for the hypothesis that rumination is a vulnerability factor specific to depression and not anxiety. In contrast to Hankin's findings, Muris and colleagues (Muris et al., 2009; Muris et al., 2004) found that rumination was significantly associated with anxious symptoms, controlling for depressive symptoms, but rumination was unrelated to depressive symptoms when controlling for anxious symptoms. They interpreted their results as support for rumination as an anxiety-specific vulnerability, but conclusions about the specificity of rumination are difficult to draw from these studies. As noted by Hankin (2008), the measure of anxiety used in the studies by Muris and colleagues appears to assess NA, the tripartite factor common to anxiety and depression, rather than PH, the factor unique to anxiety. By including a measure of PH, Hankin's study provided a more stringent test of the anxiety-specific effects of rumination than the studies by Muris and colleagues. However, Hankin's study did not include a measure of PA, thus it is not clear whether rumination is depression-specific (i.e., predicts NA + PA) or whether it affects only NA, the factor common to anxiety and depression. A test of the specificity of rumination for anxiety and depression requires an examination of unique associations of rumination with each of the tripartite factors. To date, no published studies have examined specificity of rumination in this manner.

The current study addresses this gap in the literature by examining unique associations between brooding rumination and each of the tripartite factors in the period of middle childhood to early adolescence. In doing so, it is possible to test competing hypotheses of how brooding rumination contributes to children's unique risk for anxiety and depression, as well as the comorbidity of these disorders. According to the *depression-specific hypothesis*, brooding rumination is a vulnerability factor specific to depression (i.e., uniquely predicts NA + PA, but not PH). This hypothesis is derived from the original response styles theory in which rumination was presented as a cognitive vulnerability to depression. Rumination is thought to increase NA by increasing access to negative thoughts and memories which exacerbates severity of negative feelings and interferes with concentration and problem solving. Diminished problem solving is expected to lead to increased failures and feelings of inefficacy which, in turn, reduce interest in, and pleasure derived from activities (i.e., PA). Alternatively, the *anxiety-specific hypothesis* posits that brooding rumination is a cognitive vulnerability to anxiety rather than depression (i.e., brooding rumination predicts NA + PH, but not PA). Anxiety typically precedes the onset of depression (Pine et al., 1998). Furthermore, there is evidence that among adolescents depression is more likely to be a consequence of anxiety than the reverse (Cole, Peeke, Martin, Truglio, & Seroczynski, 1998), thus, it seems reasonable to propose that brooding rumination may be a cognitive vulnerability specific to anxiety in childhood. Recent research supports the notion that rumination is associated with increased anxiety via its association with cognitive avoidance in much the same way as worry is associated with anxiety (Dickson, Ciesla, & Reilly, 2012). While it may seem counterintuitive to posit that a repetitive focus on negative thoughts and emotions (i.e., rumination) is associated with cognitive avoidance, Dickson and colleagues found that rumination was predicted by cognitive avoidance and that it mediated the association between cognitive avoidance and anxiety. Presumably the link between

rumination and anxiety includes both somatic (PH) and cognitive aspects (NA) of anxiety. Finally, brooding rumination may function as a nonspecific cognitive vulnerability, one with implications for both depression and anxiety. According to this nonspecific *shared risk hypothesis*, brooding rumination uniquely predicts NA, the tripartite component that is common to both anxiety and depression, but not PH or PA, the tripartite components that are specific to anxiety and depression, respectively.

In summary, the current study examined links between brooding rumination and each of the tripartite factors in a two-year longitudinal study that spanned middle childhood through early adolescence. In this exploratory study, all three tripartite factors were included in the same analytic model so that the competing hypotheses of the unique effects of brooding could be tested while simultaneously controlling for the effects of the tripartite factors on each other. Age was included in the analyses to control for possible confounding effects. In light of sex differences in anxiety and depression, additional analyses were conducted to determine if associations between brooding rumination and tripartite factors differed for boys and girls.

METHOD

Participants

Children in 2nd through 7th grades were recruited from a university-affiliated public school in the southeastern region of the U.S. The Time 1 sample of children was 50.2% girls. Several backgrounds were also represented in this sample (66.7% Caucasian, 19.1% African American, 8.3% Hispanic, 1% Asian, 0.3% American Indian, and 4.6% biracial). The number of children participating totaled 303 at Time 1, 279 at Time 2, and 270 at Time 3. At Time 1, children included in data collection ranged in age from 7 to 14 years old, with a mean age of 10.

Procedure

Institutional IRB approval and both parental consent and child assent were obtained prior to the start of data collection. Questionnaires were administered to groups of students in the school cafeteria (with researchers available to provide assistance as needed) at three different sessions, each 12 months apart.

Measures

Brooding Rumination—The Brooding subscale (Lopez et al., 2009) of the Children's Response Styles Scale (CRSS), a self-report questionnaire that assesses the frequency with which one thinks or does certain things when experiencing feelings of sadness. The CRSS is rated on an 11-point Likert scale (0 = never to 10 = always). Lopez et al. (2009) found support for the reliability and validity of the five-item Brooding subscale ($\alpha = 0.71$ in the current study).

Tripartite Scale—A scale developed by Chorpita, Plummer, and Moffitt (2000) was used to assess the tripartite factors in the present study. This scale uses items from the *Children's Depression Inventory* (CDI; Kovacs, 2001) and the *Revised Manifest Anxiety Scale for*

Children (RCMAS; Reynolds & Richmond, 1985) to form measures of PA (CDI items 4, 12, 15, 20, 21, 22), NA (CDI items 6, 19; RCMAS items 1, 22, 30, 34, 37), and PH (RCMAS items 5, 9, 13, 17, 21, 33). Prior research offers support for the factor structure, reliability, and validity of this scale (Chorpita et al., 2000; Turner & Barrett, 2003). Results of a confirmatory factor analysis indicated that the tripartite model provided a good fit to our data (detailed results available upon request from the author); factor loadings of items on NA (0.48 – 0.79), PA (0.51 – 0.76), and PH (0.38 – 0.74) were all significant at the $p < 0.001$ level and comparable to those reported in prior research (Chorpita et al., 2000; Turner & Barrett, 2003). In order to keep the valence of tripartite symptoms consistent, PA was reverse scored so that higher values reflect lower levels of PA (i.e., higher scores reflect elevated anhedonia).

Overview of Data Analyses

Hypotheses pertaining to associations between brooding rumination and tripartite factors were tested by multiple latent growth curve analyses (LGM) using Mplus 5.0 (Muthén & Muthén, 2007). In LGM, multiple waves of data on individuals at different time points can be considered simultaneously, permitting the study of initial levels, individual change, average change, and predictors of individual differences in change over time. Full Information Maximum Likelihood (FIML) was used to handle missing data (Graham, 2009; Schafer, 1997). Parameter estimates from FIML provide less biased information than ad hoc procedures (e.g., listwise and pairwise deletion, imputation of means) and is more robust to non-normal data (Little & Rubin, 1987).

Each of the tripartite growth constructs was comprised of two latent factors or growth parameters. The first latent factor (intercept) represents the initial level (or intercept mean, *Mi*) of the outcome of interest and individual differences in the intercept (or intercept variance, *Di*). The intercept factor is defined by fixing all of the factor loadings (or bases) of the three repeated measures to 1 and serves as a constant for each child over time, thus capturing the starting point of the developmental growth trajectory at Time 1. The second latent factor (slope) represents the growth rate (slope mean, *Ms*) and individual differences in rates of change over time. Loadings on the slope factor define the shape of the trajectory over time, which were fixed to identify the model. Specifically, the first loading was fixed at 0, the second loading at 1, and the third loading at 2, indicating that change over time was linear. Error variances and intercept-slope correlations were allowed to be freely estimated. Growth parameters of these three univariate models, which included the intercept mean, slope mean, intercept variance, slope variance, and the covariance between the intercept and slope, were then estimated. Multigroup analysis (using boys and girls as two groups) was conducted separately for each tripartite factor to determine whether sex differences were present in the mean or variance of each growth parameter (i.e., intercept and slope). A univariate latent growth curve model for each tripartite model was fitted simultaneously for boys and girls, allowing each parameter to be estimated freely across sex and thus determining a baseline χ^2 for each tripartite factor. The next step involved setting equality constraints on specific growth parameters (i.e., factor means, factor variances), to determine whether the model that forces boys and girls to have equal estimates of a certain parameter

provides a significantly worse fitting model than the model that allows the growth parameters to differ by groups (i.e., unconstrained model).

The three tripartite variables were then examined in the same multivariate latent growth curve model, regressing all six latent growth parameters (i.e., intercepts and slopes for each of the three tripartite factors) on the time invariant predictors of base-line brooding and age, as illustrated in Figure 1. To determine whether there were sex differences in the associations between brooding rumination and the tripartite factors, we tested for significant χ^2 differences between a model in which the different paths between brooding and the six latent growth curve parameters (i.e., intercepts and slopes for each of the tripartite factors) were constrained to be equal for boys and girls and an alternative model in which these paths were allowed to be freely estimated. Results of the best-fitting model were used to interpret effects of brooding on the tripartite factors. Several fit indices were examined to determine model fit: the χ^2 statistic, Comparative Fit Index (CFI; Bentler, 1990), Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), Root Mean Square Error of Approximation (RMSEA; Steiger, 1990), and the Standardized Root Mean Square Residual (SRMR; Kenny & McCoach, 2003).

RESULTS

Preliminary Analyses

Correlations between the repeated measures of the tripartite factors, as well as brooding rumination, age, and sex, are reported in Table 1. Generally, all of the outcome variables were significantly related to each other both within and across time points. For the most part, correlations indicated that sex was unrelated to our measures, except that, as compared to girls, boys exhibited higher levels of PA (higher scores reflect greater anhedonia) and PH (Time 2 only). Significant correlations of age revealed that younger children reported higher levels of brooding, NA, and PH (Times 1 and 2).

Separate Tripartite Factor Models

Fit indices from the LGMs, run separately for each tripartite factor, indicated good fit to the data—all models: $\chi^2(2) = 0.95–1.93$, ps > 0.10; CFI = 1.00; TLI = 1.00– 1.01; RMSEA = 0.00 (90% C.I. = 0.00–0.10); SRMR = 0.01–0.02. Parameter results of these initial models can be found in Table 2. Intercept and slope means were significant for all tripartite factors. Inspection of the slope means across NA, PA, and PH models indicated that all three factors had significant decreases in symptoms over time. In addition, variances for intercept and slope (i.e., random effects) were significant across all models, indicating significant individual differences in initial levels and changes over time in NA, PA, and PH. For the PA model, slope and intercept were not correlated significantly ($p = 0.18$). However, the NA slope and intercept correlation ($r = −0.41$, $p = 0.03$) as well as the PH slope and intercept correlation ($r = −0.33$, $p = 0.001$) were significant, indicating that children endorsing initially higher levels of NA and/or PH showed steeper declines in NA and/or PH symptoms over time.

We then tested each of the univariate models with two groups: boys and girls. Results of the models demonstrated no significant sex differences (i.e., $\Delta\chi^2$ difference tests yielded *p*s > 0.10) across means and variances of intercept and slope for NA and PH. However, the χ^2 difference test for the intercept mean, $\Delta\chi^2(1) = 8.47$, $p = 0.004$, of PA yielded significantly worse fit when these values were estimated to be equal across sex. Analyses revealed that boys ($M = 2.40$, $SD = 2.20$) had significantly higher initial levels of anhedonia than girls ($M = 1.69$, $SD = 1.91$).

Specifying the Full Multivariate LGM

Fit statistics for the multivariate latent growth curve model for the full sample indicated that the model fit the data acceptably well: $\chi^2(24) = 77.9$, $p < .001$; CFI = 0.94; TLI = 0.89; RMSEA = 0.08 (90% C.I. = 0.06–0.10); SRMR = 0.04. We then tested the model using two groups: boys and girls. The multigroup model continued to adequately fit the data: $\chi^2(48) = 106.2$, $p < .001$; CFI = 0.93; TLI = 0.87; RMSEA = 0.08 (90% C.I. = 0.06–0.11); SRMR = 0.05. The change in χ^2 from the full sample model to the multigroup model was not significant, $\Delta\chi^2(24) = 28.3$, $p > 0.20$. Next, we tested for sex differences in each path using the procedures outlined above. Placing constraints on each of the paths between brooding and the six latent growth parameters did not yield any significant changes in the fit of the model, suggesting path estimates for boys and girls are not significantly different. Finally, we tested for sex differences in path estimates from age to each of the growth parameters. There were no significant differences between path estimates for boys and girls. Given that there were no significant differences in the relationships between the latent factors and the predictors of brooding and age and that multigroup analysis did not provide a significantly better fit to the data, we determined the full sample model was the most parsimonious model. All of the following results refer to results from the full sample model.

Growth parameters of the multivariate model are provided in Table 2. While means and variances of the intercept factors remained significant for all tripartite factors in the multivariate model, only the mean slope of PH remained significant ($Ms = -0.99$, $p = 0.005$), indicating that when the model accounts for effects of brooding, age, and other tripartite factors, there are no significant changes in NA or PA over time ($Ms = -0.18$, $p = .73$; $Ms = -0.74$, $p = .08$, respectively). When controlling for all other tripartite factors in one model, none of the correlations between the slope and intercept of the same tripartite factor (e.g., NA slope with NA intercept) were significant (*p*s > 0.10). In addition, nonsignificant slope variances in the multivariate model indicated that there were no significant individual differences in the decline rate of any of the tripartite factors when brooding and age were included in the model.

Unique Effects of Brooding and Age on Tripartite Factors

Estimates and standard errors for brooding and age effects in this model are reported in Table 3. To control for any potential confounding effects of age, paths between age and each of the six growth parameters of the tripartite factors were estimated. Age predicted intercepts of NA and PH, but not PA. Relative to older children, younger children reported higher levels of NA and PH. Age was only associated with the slope of PH; younger children exhibited steeper declines in PH relative to older children.

Finally, specificity of the effects of brooding on the tripartite factors was examined. In accord with the anxiety-specific hypothesis, brooding was associated with higher initial levels of NA and PH, but was unrelated to PA. Brooding also predicted slopes of NA and PH, but not PA. Contrary to expectations, higher initial levels of brooding predicted larger decreases in NA and PH over time. To better understand these unexpected findings, trajectories of NA and PH for children with higher versus lower levels of brooding are illustrated in Figure 2.

DISCUSSION

Adopting the tripartite theory of anxiety and depression (Clark & Watson, 1991) as a framework, a multivariate latent growth curve model was used to test the specificity of brooding rumination on children's risk for anxiety and depression. Brooding rumination was uniquely predictive of initial levels of NA and PH, but not PA. To our knowledge, this is the first study to test unique associations of brooding rumination on all tripartite factors. Hankin (2008) found that rumination predicted depressive and general internalizing symptoms. He speculated that rumination has its effect on NA rather than on PA, but his study did not test this. Our findings offer support that brooding rumination is uniquely associated with NA, but not PA. It is possible that unique associations of brooding rumination with PA may be found in samples in which there is greater variability in levels of PA (e.g., clinical samples; older age groups) than was true of our sample. Alternatively, brooding rumination may directly impact NA with only an indirect effect on PA. While the findings of our study suggest that the impact of brooding rumination is on broad negative affect and not the depression-specific factor of (low) positive affect (i.e., anhedonia), they do support the view of rumination as a transdiagnostic factor for anxiety and depression (Ehring & Watkins, 2008). That is, brooding rumination is associated with elevated NA, a factor common to risk for both anxiety and depression.

Our results also revealed a unique association of brooding rumination with PH, a finding that offers support for the anxiety-specific hypothesis. These results are consistent with the findings of Muris and colleagues (Muris et al., 2009; Muris et al., 2004), but are at odds with Hankin's (2008) results. Our measure of PH includes a broad range of somatic symptoms whereas Hankin's measure of PH more narrowly focused on symptoms associated with autonomic arousal. It is possible that differences in PH measures accounts for discrepant findings across studies. Chorpita et al. (2000) found that associations of PH with types of anxiety disorders differed somewhat depending upon whether the measure of PH focused specifically on autonomic arousal or more diffuse somatic symptoms. It will be important to replicate our findings using multiple measures of PH to better understand the specificity of brooding rumination. Another possible explanation for discrepant findings is that our study focused on brooding rumination, an especially virulent subtype of rumination, whereas a more general mea-sure of rumination that includes brooding and self-reflection items was used by Hankin. Brooding rumination may be associated with a broader range of symptoms (e.g., PH) than is the case for more general measures of rumination. Indeed, the only other study to examine the relation between the subtypes of rumination and anxiety found that brooding, but not reflection, was predictive of anxiety symptoms (Verstraeten et al., 2011). Yet another potential explanation for the discrepant results is age differences of our samples

(grades 2–7 in our study; grades 6–10 in Hankin's study). Associations between rumination and tripartite factors may differ across developmental periods although prior research suggests a tendency toward greater specificity of associations with increasing age (Muris et al., 2009).

The findings that brooding rumination predicted initial levels of NA and PH is consistent with the anxiety-specific hypothesis, but our findings of predictions of the slopes of our measures were unexpected. Rather than brooding predicting increases in tripartite symptoms over time, as one would expect of a vulnerability factor, brooding was negatively associated with longitudinal changes in both NA and PH. These findings need to be interpreted in the context of decreases over time in all three tripartite factors for the full sample. Although there is compelling evidence that internalizing disorders rise in adolescence, decreases in self-reported internalizing symptoms are commonly found in longitudinal studies of children and adolescents, a phenomenon attributed to the effects of repeated testing (Twenge & Nolen-Hoeksema, 2002). Moreover, higher levels of brooding rumination predicted steeper declines in NA and PH symptoms. One explanation for this unexpected finding is that brooding rumination is not a causal risk factor for anxiety and depression. Associations of brooding with initial levels of NA and PH may be due to a third (unmeasured) variable. Alternatively, unexpected longitudinal findings may reflect artifacts of floor effects on measures of NA and PH among children with low levels of initial brooding and/or regression to the mean effects for children with high levels of initial brooding (see Figure 2). Although brooding predicted steeper declines in NA and PH over time, it is important to note that brooding assessed at Time 1 was associated with higher levels of NA (at all three time points) and PH (Times 1 and 2). Decreases in associations of brooding (Time 1) with later assessments of NA and PH may reflect changes in response styles or the impact that other environmental and interpersonal factors had on NA and PH during the two-year prediction interval.

Sex and Age Differences

In accordance with prior research, there were no sex differences in brooding rumination (e.g., Burwell & Shirk, 2007) and associations between brooding rumination and the tripartite symptoms did not differ by sex (e.g., Hankin, 2008). Studies of self-reported depressive symptoms in preadolescence are about equally divided between those that find no sex differences and those that find boys report more symptoms than girls (Angold et al., 1999). Similarly, findings of sex differences in tripartite symptoms in preadolescents have been mixed (Chorpita et al., 2000; Weinstein, Mermelstein, Hankin, Hedeker, & Flay, 2007). In the present study, the few sex differences in levels of tripartite symptoms that emerged were in the direction of boys reporting more symptoms than girls (i.e., PA at all three times and PH at Time 2 only).

Our findings that younger children had higher initial levels of PH and steeper declines of PH than older children are consistent with findings of prior studies of this tripartite factor (Chorpita & Daleiden, 2002) and of self-reported symptoms of anxiety (Cole et al., 1998). Consistent age-related differences in NA have not typically been reported, particularly in the developmental span included in our study (Lonigan, Hooe, David, & Kistner, 1999;

Weinstein et al., 2007), thus our finding that younger children reported higher initial levels of NA than older children should be interpreted with caution. Replication of our findings pertaining to age-related changes, preferably including a wider age range and an examination of linear and nonlinear trends, is needed to better understand developmental patterns of tripartite symptoms.

Limitations and Future Directions

By examining the unique concurrent and prospective associations of brooding rumination with the tripartite factors of anxiety and depression, this study sheds some light on the specificity of brooding rumination for the development and comorbidity of these disorders. As with any study, there are some limitations and caveats for interpreting our results that should be considered in future research investigating the specificity of brooding. Of particular concern are issues pertaining to the psychometric properties of our measure of NA, PA, and PH. Replication using a measure specifically developed to assess the tripartite model constructs (rather than drawing items from existing measures of internalizing symptoms) with stronger psychometric properties (e.g., high factor loadings of items on scales) than the measure used in the present study is needed. Our methods were limited by reliance on self-report measures and consequently concerns about mono-method bias and self-report biases. Also, although our measure of brooding rumination assesses how children respond to feelings of sadness rather than the frequency with which they experience sadness or other symptoms of internalizing disorders, possible content overlap with measures of tripartite factors could contribute to our findings. Multi-method assessment of tripartite factors that includes behavioral and psychophysiological measures could make a critical contribution to answering research questions about the specificity of the effects of brooding rumination on children's risk for anxiety and depression.

This study was conducted with a nonclinical sample; our findings may or may not generalize to clinical samples. Future research should examine these associations in clinical samples where the range of tripartite symptoms is likely to be greater than in nonclinical samples. Use of latent growth curve analyses allowed us to test hypotheses pertaining to the specificity of brooding rumination, but a limitation of these analyses is that only linear growth was tested. It may be informative to assess trajectories of growth that are nonlinear in future studies. Finally, this study did not examine mediators of associations between brooding rumination and the tripartite factors underlying anxiety and depression. Future research should investigate possible mechanisms underlying associations between brooding and tripartite factors.

Conclusions

Our results suggest that brooding may be a risk factor for anxiety (through the shared and unique factors) in children, and may show associations with depression only through the influence of brooding rumination on the shared factor of NA. These results are consistent with the view of brooding rumination as a transdiagnostic factor, one that is helpful for identifying children at risk for anxiety or depression and one that may account for comorbidity of these disorders. However, results of prospective associations between brooding rumination and tripartite factors do raise questions about whether this response

style is a causal risk factor for anxiety or depression. Interventions to treat and/or prevent anxiety and depression in youth may benefit by targeting brooding rumination, but additional research (e.g., multi-method assessment of tripartite factors, evaluation of potential mediators, etc.) is needed to determine whether brooding rumination causally contributes to the development of these disorders.

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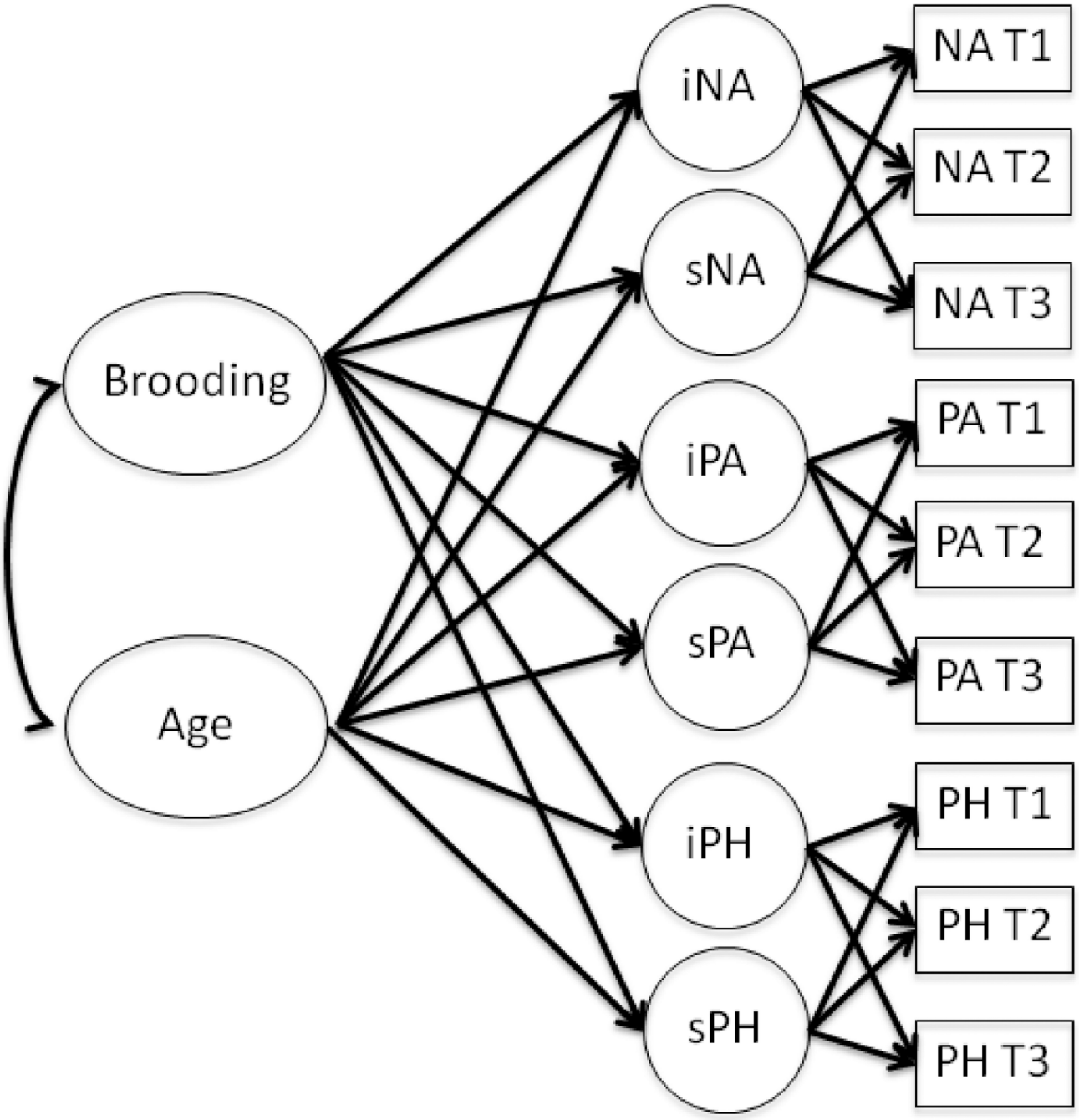
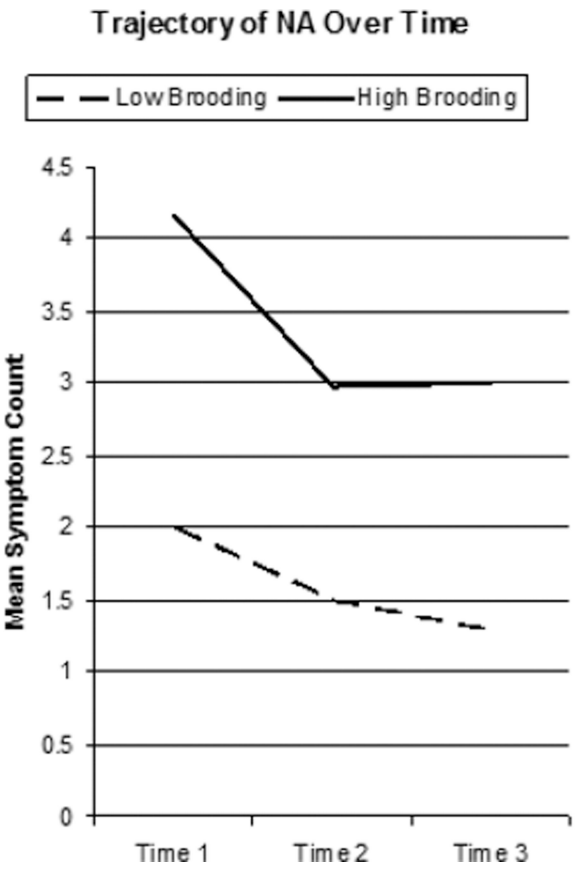


FIGURE 1.
Multivariate Model.



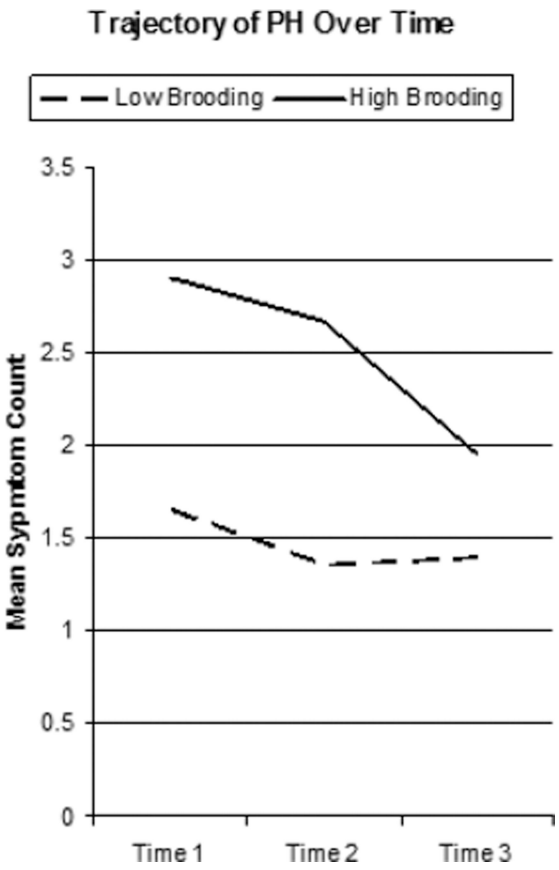


FIGURE 2.

Trajectories of NA and PH over time for youths with high (+ 1 SD) and low (−1 SD) brooding rumination.

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TABLE 1

Descriptive Statistics and Correlations Among Predictor and Outcome Variables

	1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**
1. BR (T1)	1.00											
2. NA(T1)	0.38**	1.00										
3. NA(T2)	0.27**	0.45**	1.00									
4. NA (T3)	0.27**	0.34**	0.48**	1.00								
5. PA(T1)	0.10	0.45**	0.36**	0.21**	1.00							
6. PA (T2)	0.07	0.31**	0.47**	0.29**	0.42**	1.00						
7. PA (T3)	0.07	0.29**	0.26**	0.42**	0.50**	0.41**	1.00					
8. PH(T1)	0.23**	0.52**	0.38**	0.29**	0.50**	0.35**	0.34**	1.00				
9. PH (T2)	0.29**	0.36**	0.55**	0.31**	0.44**	0.45**	0.28**	0.53**	1.00			
10. PH(T3)	0.11	0.29**	0.36**	0.54**	0.29**	0.29**	0.42**	0.47**	0.47**	1.00		
11. Sex	0.095	−0.01	0.04	0.08	−0.17**	−0.16*	−0.17**	−0.06	−0.15*	−0.02	1.00	
12. Age	−0.16**	−0.19**	−0.24**	−0.17*	−0.10	−0.03	0.04	−0.27**	−0.21**	−0.07	0.02	1.00
M(*SD*)	24.82(10.67)	2.91 (2.20)	2.25(2.06)	1.89(2.00)	2.04(2.09)	1.69(1.87)	1.55(1.74)	2.25(1.72)	1.98(1.67)	1.61 (1.54)	0.51 (.50)	10.68(1.85)

BR = Brooding; NA = Negative Affect; PA = Positive Affect (Anhedonia); PH = Physiological Hyperarousal;

* $p < 0.05$;

** $p < 0.01$.

TABLE 2

Growth Factor Parameter Estimates for Univariate and Multivariate Models

	Univariate Models				Multivariate Model			
	Intercept		Slope		Intercept		Slope	
	Mean (SE)	**Variance (SE)**	**Mean (SE)**	**Variance (SE)**	**Mean (SE)**	**Variance (SE)**	**Mean (SE)**	**Variance (SE)**
NA	2.886*** (0.122)	2.446*** (0.367)	−0.510*** (0.075)	0.415* (0.180)	3.129*** (0.751)	1.497*** (0.411)	−0.183(0.531)	0.286(0.214)
PA	2.019*** (0.111)	1.542*** (0.314)	−0.215*** (0.058)	0.261* (0.126)	2.565*** (0.743)	1.451*** (0.422)	−0.742 (0.413)	−0.285(0.191)
PH	2.278*** (0.096)	1.882*** (0.228)	−0.307*** (0.052)	0.174* (0.090)	3.779*** (0.600)	1.135*** (0.262)	−0.993** (0.352)	−0.020(0.127)

Note. NA= Negative Affect; PA = low Positive Affect/anhedonia; PH = Physiological Hyperarousal;

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$.

TABLE 3

unstandardized Parameter estimates for Multivariate latent growth Curve Model for Full Sample

	intercept		Slope	
Tripartite Factor	**b estimate (95% Ci)**	**S.e.**	**b estimate (95% Ci)**	**S. e.**
NA				
Brooding	0.068 (0.048 to 0.089)	0.011***	−0.015 (−0.029 to −0.001)	0.007*
Age	−0.015 (−0.025 to −0.005)	0.005**	< .001 (−0.007 to 0.007)	0.004
PA				
Brooding	0.016 (−0.005 to 0.036)	0.011	−0.003 (−0.014 to 0.008)	0.006
Age	−0.007 (−0.017 to 0.003)	0.005	0.005 (−0.001 to 0.010)	0.003
PH				
Brooding	0.038 (0.021 to 0.054)	0.009***	−0.010 (−0.019 to < .001)	0.005*
Age	−0.019 (−0.027 to −0.011)	0.004***	.007 (0.003 to 0.012)	0.002**

Note. NA = Negative Affect; PA = low Positive Affect/anhedonia; PH = Physiological Hyperarousal; CI = Confdence Interval;

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$.