Developmental Origins of Rumination in Middle Childhood: The Roles of Early Temperament and Positive Parenting

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Developmental Origins of Rumination in Middle Childhood: The Roles of Early Temperament and Positive Parenting

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Rumination, a thinking style characterized by a repetitive inward focus on negative cognitions, has been linked to internalizing disorders, particularly depression. Moreover, research suggests that rumination may be a cognitive vulnerability that predisposes individuals to psychopathology. Surprisingly little is known, however, about the etiology and development of rumination. The present study examined the role of specific components of child temperament—negative emotionality (sadness, fear, anger) and effortful control (inhibition), as well as parenting behaviors during early childhood on the development of rumination in middle childhood. Early childhood (age 3) temperament and parenting behaviors were assessed observationally and rumination was self-reported in middle childhood (age 9) in a large community sample (N = 425; 47.1% female). Two significant interactions emerged. First, temperamental anger interacted with inhibitory control (IC) such that high anger and low IC predicted higher levels of rumination, whereas low anger and low IC predicted lower levels of rumination. Second, IC interacted with parenting such that children with low IC and positive parenting had lower levels of rumination. In contrast, children with high IC reported similar levels of rumination regardless of parenting quality. Overall, these findings highlight the interplay of early IC with temperamental anger and positive parenting in the development of ruminative tendencies in middle childhood.

Rumination has been conceptualized as a harmful response style to stress that is an inward-focused, negative, and repetitive way of thinking whereby one dwells on one’s symptoms of distress (e.g., sad mood) without attempts to shift attention away from negative cognitions or mood or to alter the stressor (Nolen-Hoeksema, Wisco, & Lyubomirsky,
Rumination is hypothesized to generate additional negative cognitions, exacerbate and perpetuate negative mood, interfere with adaptive behavior, and contribute to psychopathology, particularly depression (Nolen-Hoeksema, 1991). A large body of evidence supports the cross-sectional and longitudinal relationship between rumination and depressive symptoms and clinical disorder across studies of adults, adolescents, and children (see Lyubomirsky, Layous, Chancellor, & Nelson, 2015; Nolen-Hoeksema et al., 2008; Rood, Roelofs, Bögels, Nolen-Hoeksema, & Schouten, 2009, for reviews). Rumination has also been identified as a transdiagnostic risk factor for other forms of psychopathology, particularly internalizing disorders (e.g., anxiety), in adolescents and adults (e.g., see Hankin, Snyder, & Gulley, 2016, for a review).

Although the link between rumination and psychopathology is well supported, we know surprisingly little about how rumination develops. Research suggests that temperament and parenting play a significant role in the etiology of rumination (e.g., Hilt, Armstrong, & Essex, 2012; Manfredi et al., 2011; Mezulis, Priess, & Hyde, 2010). Temperament refers to individual differences in emotional reactivity and regulation that are moderately heritable and relatively stable over time (Rothbart & Bates, 1998). According to one prominent model of temperament, two of the three higher order factors of temperament are negative emotionality (NE) and effortful control (EC) (Rothbart & Bates, 1998). Individuals with high NE are prone to experiencing negative emotions, are more sensitive to stress and aversive stimuli, and exhibit avoidance and distress in novel or challenging situations. Key lower order traits of NE include fear, a withdrawal response to unfamiliar or negative stimuli; anger/frustration, a response to a blocked goal; and sadness, a response to loss. EC is characterized by the ability to deliberately alter emotional and behavioral responses including the abilities to inhibit and engage in behavior and to shift and maintain attention (Rothbart & Bates, 1998). One key component of EC, inhibitory control (IC), is the ability to inhibit a prepotent (dominant) response and instead engage in a subdominant behavior in order to achieve a goal (Rothbart, Ellis, Rosario Rueda, & Posner, 2003).

Because rumination encompasses a persistent focus on negative mood, chronic individual differences in emotional reactivity are likely related to rumination risk. Indeed, NE in infancy has predicted rumination in adolescence (Mezulis et al., 2010). Furthermore, rumination has been found to mediate the relationship between NE and depressive symptoms in adolescents (Mezulis et al., 2010; Mezulis, Simonson, McCauley, & Vander Stoepe, 2011; Verstraeten, Bijttebier, Vasey, & Raes, 2011) and young adults (Arger, Sánchez, Simonson, & Mezulis, 2012). Individual differences in the ability to control attention and behavioral responses are also likely related to rumination, as it entails a repetitive focus on negative cognitions and a failure to engage in alternative coping strategies. In support of this, studies using cognitive tasks indicate that individuals high in rumination have greater attentional control difficulties, particularly with inhibiting and shifting attention away from negative stimuli (Berman et al., 2011; Hilt, Leitzke, & Pollak, 2014; Joormann, 2006; Joormann & Gotlib, 2010; Joormann, Levens, & Gotlib, 2011; Koster, De Lissnyder, Derakshan, & De Raedt, 2011; Romens & Pollak, 2012). Synergistic effects of NE and EC on rumination have also been found (Gulley, Hankin, & Young, 2016). Some evidence suggests that the combination of high NE and low EC is associated with higher levels of rumination (Hilt et al., 2012; Verstraeten, Vasey, Raes, & Bijttebier, 2009). However, this pattern has not been consistently supported (Arger et al., 2012; Mezulis et al., 2011).

One potential reason for inconsistent findings could be because prior research has examined EC and NE as global constructs. Some theorists have argued that the unique yet interrelated components of EC might vary in terms of their specificity for different outcomes (Nigg, 2006). Although multiple studies have found evidence for concurrent and prospective associations between low EC and both externalizing and internalizing psychopathology (Eisenberg, Valiente, Spinrad, & Cumberland, 2009; Gartstein, Putnam, & Rothbart, 2012; Moffitt et al., 2011; Schoemaker, Mulder, Deković, & Matthys, 2013; Valiente et al., 2006), research examining IC, in particular, has found associations with emotion regulation and internalizing symptoms in early childhood (Carlson & Wang, 2007; Rhoades, Greenberg, Domitrovich, 2009). IC may be especially influential on the development of rumination.

It is also possible that components of NE may be differentially related to rumination risk. In particular, sadness may be more strongly related to rumination as compared to anger or fear. There is a well-established relationship between rumination and internalizing problems, especially depression (e.g., Lyubomirsky et al., 2015). In addition, some longitudinal studies of young children have shown that temperamental sadness is a stronger predictor of internalizing problems, like depression, whereas anger has been more strongly associated with externalizing problems (Blair, 2002; Eisenberg et al., 2001; Eisenberg et al., 2009; Rydell, Berlin, & Bohlin, 2003), although these problems often co-occur (Vidal-Ribas, Brotman, Valdivieso, Leibenluft, & Stringaris, 2016). Furthermore, although rumination has been linked to both depression and anxiety (e.g., Nolen-Hoeksema & Watkins, 2011), meta-analytic evidence indicates that the relationship between depression and rumination is stronger than that of anxiety and rumination (Olatunji, Naragon-Gainey, & Wolitzky-Taylor, 2013). Last, the majority of studies in the rumination literature have conceptualized and measured rumination as a response to sadness (e.g., Response Styles Questionnaire: Nolen-
Hoeksema & Morrow, 1991; Child Response Styles Questionnaire: Abela, Brozina, & Haigh, 2002). Thus, temperamental sadness may be more relevant for ruminative than the other components of NE, though this possibility has not yet been tested.

In addition to temperament, parental influences during childhood likely contribute to rumination. Research has demonstrated that a variety of aspects of the “emotional climate” of the family including parenting style, positive and negative affect expressivity, and the quality of the parent–child relationship are interrelated and crucial for development of child emotion regulation (ER) skills (Abela & Hankin, 2008; Bariola, Gullone, & Hughes, 2011; Morris, Silk, Steinberg, Myers, & Robinson, 2007). Positive parenting behaviors such as support, high positive affect expression, and a higher quality parent–child relationship enhance ER, whereas negative parenting behaviors such as hostility, high negative affect expression, and a lower quality parent–child relationship diminish ER (e.g., see Morris et al., 2007, for a review). Broadly speaking, research on parenting and rumination has paralleled this pattern such that overcontrolling parenting (Hilt et al., 2012; Manfredi et al., 2011; Spasojevic & Alloy, 2002) and lower positive parenting (Gaté et al., 2013) have been related to rumination. Similarly, family socialization of child emotional expression as indicated by higher negative-submissive family expressivity (e.g., sadness) (Hilt et al., 2012) and maternal encouragement of emotional expression in response to a stressor have also been linked to rumination in youth (Cox, Mezulis, & Hyde, 2010).

It is also important to consider that the effects of child temperament might be moderated by parenting. Hilt and colleagues (2012) found that temperament and family context during preschool interacted to predict rumination in adolescence. Some of their results were consistent with a diathesis-stress model of risk (Ingram & Luxton, 2005) such that children high in NE had the highest levels of rumination in the context of overcontrolling parenting; in contrast, children with low NE showed similar levels of rumination regardless of the level of overcontrolling parenting. However, they also found that rumination was predicted by low-risk temperament in conjunction with negative family context. Specifically, low NE and a high negative-submissive family environment, as well as high EC and overcontrolling parenting, predicted elevated levels of rumination (Hilt et al., 2012).

Although this literature has begun to illuminate the origins and development of rumination, some limitations should be noted. First, most prior studies have used self-report measures of temperament (Arger et al., 2012; Mezulis et al., 2010; Mezulis et al., 2011; Verstraeten et al., 2009; see Hilt et al., 2012, for an exception) and parenting (e.g., Hilt et al., 2012; Manfredi et al., 2011; Spasojevic & Alloy, 2002; see Cox et al., 2010; Gaté et al., 2013, for exceptions) as opposed to observational measures, which reduce the likelihood of inflated findings due to shared method variance. Second, only a few studies have examined the antecedents of rumination using longitudinal designs (Cox et al., 2010; Gaté et al., 2013; Hilt et al., 2012; Mezulis et al., 2010), which are important for establishing the temporal relationships among variables. Finally, all prior work investigating the relationships between parenting and rumination has measured rumination in adolescence (Cox et al., 2010; Gaté et al., 2013; Hilt et al., 2012) or adulthood (Manfredi et al., 2011; Spasojevic & Alloy, 2002). Examining rumination in middle childhood, prior to the period of heightened risk for depression in adolescence (e.g., Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Hankin et al., 1998), could help to elucidate a developmental path to the onset of internalizing disorders.

The present study examined the main and interactive effects of temperament and parenting during early childhood (age 3) on rumination in middle childhood (age 9) using observational measures of temperament and parenting. Another aim of the study was to examine whether key components of NE (sadness, fear, anger) differentially relate to rumination risk. Due to the paucity of research examining antecedents of rumination prior to adolescence, our hypotheses were mainly derived from the relatively larger literature based on adolescents and adults. We tentatively hypothesized that (a) sadness will predict later rumination more strongly than fear and anger, (b) high sadness in combination with low IC will exert the strongest effect on rumination risk relative to high fear or anger in conjunction with low IC, and (c) negative parenting will predict rumination. Interactions between parenting and temperament (IC, sadness, fear, anger) were also explored. Due to limited research and inconsistent findings examining interactions between parenting and temperament (Hilt et al., 2012), we were unable to make firm predictions about the directions of these effects. Child cognitive ability was included as a covariate in analyses to reduce the influence of nuisance variables. Depressive symptoms in middle childhood were also controlled for in order to take into account any overlap between measures of rumination and concurrent depression (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Finally, we also explored potential sex differences because prior research has found gender differences in temperament (e.g., Olino, Durbin, Klein, Hayden, & Dyson, 2013) and rumination (Jose & Brown, 2008).

METHOD

Participants

Participants were a subsample of 559 families from a larger longitudinal study on preschool temperament and risk for depression that took place in Stony Brook, New York (Dougherty et al., 2011; Olino, Klein, Dyson, Rose,
Durbin, 2010). The subsample consisted of families who completed an initial assessment during early childhood (age 3) and who were successfully followed up in middle childhood (age 9). The study was approved by the Stony Brook University Institutional Review Board. Families with a 3-year-old child who lived within 20 miles of Stony Brook, New York, were recruited using commercial mailing lists. Children with at least one English-speaking biological parent and no significant medical disorders or developmental disabilities were eligible to participate. Study procedures were explained to parents, and written informed consents were collected at each assessment wave. Families were compensated $320 for both lab visits. The present analyses were based on a subsample of 425 parents and children (47.1% female) who had complete data on all measures for our study. The large sample size had adequate power to detect small effect sizes.

At the initial assessment when children were 3 years old, most parents were married (94.8%) and middle class as indicated by a mean Hollingshead level of 2.2 (SD = 0.9; Hollingshead, 1975). The mean age of children was 3.5 (SD = 0.3 years), and the racial-ethnic backgrounds of children were White (94.4%), African American (3.1%), Asian American (2.4%), Native American (0.2%), Hispanic (8.7%), and Non-Hispanic (91.3%). Children had an average cognitive ability level (M = 102.8, SD = 13.5) as indicated by the Peabody Picture Vocabulary Test (Dunn & Dunn, 1997). There were no significant differences between our subsample and the larger sample in terms of child sex, socioeconomic status, temperamentality (sad, fear, anger), parenting, or cognitive ability. However, there were more White children in the participating sample as compared to nonparticipants (M = .057, SD = .23 vs. M = .23, SD = .42 years), t(557) = −5.33, p < .01. Thus, race was controlled for in further analyses. Log transformations were applied to the sadness, anger, fear, and IC variables to reduce skewness and kurtosis and all variables were standardized.

**Measures**

**Child Temperamental Emotionality**

At age 3, child NE was assessed through coding 12 videotaped tasks from the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley, & Prescott, 1995). Each episode was designed to elicit a range of emotional displays and behaviors (see Olino et al., 2010, for a detailed description of each episode). Examples of episodes included Transparent Box and Stranger Approach. In Transparent Box, sadness and anger were elicited by leaving the child alone briefly to unlock a transparent box containing an attractive toy with a set of keys that were ostensibly functional. In Stranger Approach, fear was elicited by leaving the child alone briefly in an empty room and having a male research assistant enter the room and speak to the child while slowly walking closer. Episodes that elicited similar affective reactions did not follow one another, and there were brief rest periods between episodes to control for carryover effects (for details, see Dougherty et al., 2011; Olino et al., 2010).

Emotional variables were coded from facial cues, verbal expressions, and bodily posture in every episode, which were standardized and summed to create total scores of sadness, fear, and anger across episodes. Ratings were made on a 3-point scale (low, moderate, high) for each mode of expression (facial, vocal, bodily) and reflected the frequency and magnitude of each emotion display. Coefficient alphas were .83 (sadness), .62 (fear), and .78 (anger; N = 541). Interrater reliability (n = 35) was .79 (sadness), .64 (fear), and .73 (anger) as assessed by intraclass coefficients (ICCs). The Lab-TAB has reliably distinguished between sadness, anger, and fear in children (Durbin, Hayden, Klein, & Olino, 2007), and these components have prospectively predicted different symptoms of psychopathology (Kopala-Sibley et al., 2016).

**Child Inhibitory Control**

At age 3, IC was assessed through coding two Lab-TAB tasks: Tower of Patience and Snack Delay (Lab-TAB; Goldsmith et al., 1995). For Tower of Patience, the child and experimenter alternated turns in building a tower out of cardboard blocks. The child was instructed to wait until the experimenter finished placing a block before completing the child’s own turn for 14 total trials. For Snack Delay, the experimenter put a piece of chocolate candy underneath a downward turned transparent cup in front of the child. The child was instructed to wait until the experimenter rang a bell before she or he could eat the candy for seven total trials. The coding criteria were adapted from Carlson (2005) and included the numbers of times that the child prompted the experimenter and failed to wait. Prompt and fail behaviors were averaged for a total IC score, which was reverse-coded to ease interpretation; higher scores indicated greater IC. Alphas were .70 for fails and .75 for prompts (N = 541), and ICCs were .98 for fails and .99 for prompts (n = 8).

**Child Cognitive Ability**

The Peabody Picture Vocabulary Test (Dunn & Dunn, 1997) is a widely used measure of receptive vocabulary that is highly reliable (α = 0.95), has high correlations with other measures of verbal ability (Dunn & Dunn, 1997), and has a test–retest validity, videotapes of 35 children were independently coded by a second rater (only eight children were used to assess interrater reliability of Inhibitory Control because it uses simple count variables).
Parenting Behavior

At age 3, parenting behavior was assessed from coded videotaped parent–child interactions based on six standardized tasks adapted from the Teaching Tasks Battery (Egeland et al., 1995): (a) Book Reading—the parent and child read a book together and then discussed it, (b) Wheels—the parent tried to get the child to name as many things with wheels as possible, (c) Blocks—the parent worked with the child to use small square blocks to build larger ones, (d) Matching—the parent worked with the child to match pieces on a board by color and shape, (e) Maze—the parent worked with the child to complete a maze on an Etch A Sketch, and (f) Gift—the parent gave the child a small gift and then they looked at toys. Most of the parents were mothers (93.9%). Altogether, the interaction lasted approximately 30 min.

Parental behavior rating scales included positive affectivity (PA), negative affectivity (NA), supportive presence, hostility, and quality of the parent–child relationship. PA encompassed parental expressions of positive affect (e.g., smiling, laughing, hugging), whereas NA reflected parental expressions of negative affect (e.g., anger, shouting, grabbing child) during the interactions. Parental support was indicated by expressed positive regard toward the child and emotional support. Parental hostility was indicated by expressions of frustration, discounting, and rejection of the child. The quality of relationship was based on the dyadic interaction and rated for mutual aspects of the parent–child relationship such as affective/verbal sharing, conflict/distress resolution, and ease of interaction. Scores for each variable for each episode were averaged across all episodes. Parental PA (ICC = .66) and NA (ICC = .73) were rated on a 3-point scale (low, moderate, high); supportive presence (ICC = .85), hostility (ICC = .83), and quality of relationship (ICC = .79) were rated on a 7-point scale (none/very low to very high; N = 55). All parenting variables had significant correlations with one another ranging from .31 to .79. A single parenting quality variable was created by summing PA, NA, support, hostility, and overall quality of relationship. Prior to aggregation, all variables were standardized, and hostility and NA were reverse-coded. Higher scores on the parenting composite (α = .85) indicated better (or more positive) parenting behaviors and lower scores indicated poorer (or more negative) parenting behaviors.

Child Depression

At age 9, child depressive symptoms were assessed with the widely used Children’s Depression Inventory (Kovacs, 1992). The child is instructed to select the response for each item that best describes how they were thinking and feeling during the past week. Items are scored on a 3-point scale (0–2), where higher scores indicate greater depressive symptoms. The mean was 4.77 (SD = 4.11), and the alpha was .74.

Data Analyses

Hypotheses were tested with hierarchical linear multiple regression. Step 1 contained mean-centered child sadness, fear, anger, IC, and parenting, as well as the covariates of child race, cognitive ability, and depressive symptoms. Racial categories were coded 0 for White, non-Hispanic and 1 for Hispanic and/or Non-White due to the low proportion of racial minorities in our sample. Child sex was coded 0 for male and 1 for female. In Step 2, seven multiplicative pairwise interactions were included—four were between each temperament factor (sadness, anger, fear, IC) and parenting, and the remaining three were composed of temperament factors (sadness, anger, fear, IC). Significant interactions were probed by (a) plotting and testing simple slopes for significance at 1 SD above and below the mean for the moderator (Aiken & West, 1991), and (b) identifying the regions of significance (at values of the independent variable) where the two slopes were significantly different (Johnson & Neyman, 1936). Sex differences were explored with independent samples t tests and by including child sex in pairwise interactions with each of the variables in Step 1 and in three-way interactions in Step 2. No significant sex differences emerged, so these interactions were dropped from the model.

RESULTS

Descriptive Statistics

Bivariate correlations between temperament, parenting, demographic variables, covariates, and rumination revealed that higher anger, more negative parenting, lower child cognitive ability, and higher depressive symptoms were associated with higher levels of rumination (Table 1).
A few sex differences were found with independent samples t tests. Girls exhibited greater fear than boys in preschool (M = .72, SD = .36 vs. M = .62, SD = .34), t(423) = −2.86, p = .004. On the other hand, boys exhibited lower IC at age 3 (M = 4.59, SD = 1.04, vs. M = 4.88, SD = .98), t(423) = −2.96, p = .003, and reported greater depressive symptoms at age 9 as compared to girls (M = 5.25, SD = 4.34 vs. M = 4.23, SD = 3.79), t(423) = 2.60, p = .009. There were no significant sex differences for sadness, anger, parenting, or rumination.

Early Childhood Temperament and Parenting Predicting Rumination in Middle Childhood

When temperament, parenting, and the covariates were considered simultaneously in Step 1, the bivariate associations of child anger and parenting with rumination (Table 1) became nonsignificant (β = .09, p = .09 and β = −.08, p = .10, respectively) (Table 2). However, child cognitive ability (β = −.10, p = .04) and depressive symptoms (β = .38, p < .001) were significantly associated with rumination. In Step 2, there were two significant interactions of IC with anger (β = −.15, p = .01) and IC with parenting (β = .11, p = .04). No other interactions were significant (ps > .05).

First, among children with high IC, there was no relationship between anger and rumination (β = −.32), t(409) = −.21, p = .83 (Figure 1a). In contrast, for children with low IC, those with low anger had lower rumination, whereas those with high anger had greater rumination (β = 4.91), t(409) = 3.50, p < .001. The regions of significance on anger were at −.52 or more standard deviations below the mean (−18) and at 2 or more standard deviations above the mean (18). Second, among children with high IC, there was no relationship between parenting and rumination (β = .05), t(409) = .34, p = .73 (Figure 1b). In contrast, children with low IC had lower rumination when parenting was positive (β = −.23), t(409) = −2.61, p = .009. The region of significance for parenting was at 1.34 or more standard deviations above the mean (5.18).

DISCUSSION

The present study examined the developmental antecedents of rumination. Rumination has been consistently linked to psychopathology, particularly depression, across studies of children, adolescents, and adults. However, research examining etiological influences (e.g., temperament, parenting) on rumination is limited. Only one previous study (Hilt et al., 2012) has examined the effects of early childhood temperament and parenting on the development of rumination. We examined the independent and interactive effects of specific facets of negative temperamental emotionality (sadness, fear, anger), effortful control (inhibitory control; IC), and parenting during early childhood on the development of rumination in middle childhood. Two main findings of the current study highlight the importance of the joint effects of child temperamental emotionality and regulation, as well as temperament in conjunction with parenting on the formation of ruminative tendencies.

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2 To examine which aspects of parenting were driving the parenting and IC interaction, a regression model was conducted including covariates of cognitive ability, race, and depressive symptoms; components of parenting (PA, quality of relationship, support, NA, hostility); IC, and interactions for each of the parenting aspects with IC. Results showed that higher parent PA significantly predicted lower levels of rumination (β = −.11, p = .04). There was also a significant interaction between parent NA and IC (β = .30, p = .01). Children with high IC showed similar levels of rumination regardless of level of parent NA. On the other hand, children with low IC showed higher rumination at high levels of parent NA. These results suggest that parent PA and NA have the greatest unique effects on rumination.
First, we found a significant interaction between anger and IC during preschool on rumination in middle childhood such that children who were both high in anger and low in IC had elevated levels of subsequent rumination. On the other hand, children who were both low in anger and IC had lower levels of rumination. Second, early childhood parenting and IC jointly predicted rumination in middle childhood. Specifically, in the context of more positive parenting, children low in IC had lower levels of rumination. Child sex did not moderate any association.

The finding that high anger in conjunction with low IC predicted the highest levels of rumination extends prior work suggesting temperamental antecedents of rumination. On the other hand, children who were both low in anger and IC had low levels of rumination. Second, early childhood parenting and IC jointly predicted rumination in middle childhood. Specifically, in the context of more positive parenting, children low in IC had lower levels of rumination. Child sex did not moderate any association.

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Table 2: Regression Model Predicting Rumination in Middle Childhood From Early Childhood Temperament and Parenting Behavior

<table>
<thead>
<tr>
<th>Predictors</th>
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<th>df</th>
<th>R^2</th>
<th>ΔR^2</th>
<th>β</th>
<th>SE</th>
<th>t</th>
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<tr>
<td>Sadness</td>
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<td>Fear</td>
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<td>Child Race</td>
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<td>Child Depression</td>
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<tr>
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<td></td>
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</tr>
<tr>
<td>Fear</td>
<td>0.06</td>
<td>0.90</td>
<td>1.40</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Anger</td>
<td>0.10</td>
<td>1.08</td>
<td>2.02</td>
<td>.04</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Inhibitory Control</td>
<td>0.05</td>
<td>0.33</td>
<td>1.01</td>
<td>.31</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Parenting</td>
<td>—0.05</td>
<td>0.10</td>
<td>—0.89</td>
<td>.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Child Race</td>
<td>0.03</td>
<td>1.39</td>
<td>0.73</td>
<td>.47</td>
<td></td>
<td></td>
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<tr>
<td>Child Cognitive Ability</td>
<td>—0.08</td>
<td>0.02</td>
<td>—1.86</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Child Depression</td>
<td>0.38</td>
<td>0.08</td>
<td>8.55</td>
<td>.00</td>
<td></td>
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<tr>
<td>Parenting × Sadness</td>
<td>0.05</td>
<td>0.34</td>
<td>0.68</td>
<td>.50</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Parenting × Fear</td>
<td>—0.01</td>
<td>0.22</td>
<td>—0.22</td>
<td>.83</td>
<td></td>
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<tr>
<td>Parenting × Anger</td>
<td>0.13</td>
<td>0.26</td>
<td>1.86</td>
<td>.06</td>
<td></td>
<td></td>
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<tr>
<td>Parenting × Inhibitory Control</td>
<td>0.11</td>
<td>0.07</td>
<td>2.02</td>
<td>.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibitory Control × Sadness</td>
<td>0.09</td>
<td>1.29</td>
<td>1.61</td>
<td>.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibitory Control × Fear</td>
<td>0.00</td>
<td>0.95</td>
<td>—0.06</td>
<td>.95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibitory Control × Anger</td>
<td>—0.15</td>
<td>0.95</td>
<td>—2.70</td>
<td>.01</td>
<td></td>
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Note: N = 425. Bold p values are significant at p < .05.
**p < .01. ***p < .001.

First, we found a significant interaction between anger and IC during preschool on rumination in middle childhood such that children who were both high in anger and low in IC had elevated levels of subsequent rumination. On the other hand, children who were both low in anger and IC had lower levels of rumination. Second, early childhood parenting and IC jointly predicted rumination in middle childhood. Specifically, in the context of more positive parenting, children low in IC had lower levels of rumination. Child sex did not moderate any association.

That early temperamental anger, but neither sadness nor fear, in conjunction with low IC predicted the development of rumination in middle childhood is a novel and somewhat surprising finding; however, it supports the idea that different aspects of NE might contribute to the onset of internalizing disorders through different pathways (Rothbart & Bates, 1998) and that rumination may mediate these pathways. Children can experience anger in different ways (see Vidal-Ribas et al., 2016, for discussion and review). Some children may “stew inside” and become irritable, which is a major manifestation of mood dysregulation (Vidal-Ribas et al., 2016). Irritability is common in internalizing problems like depression and anxiety and is included in the diagnostic criteria (Diagnostic and Statistical Manual of Mental Disorders, 5th ed.; American Psychiatric Association, 2013) for major depressive disorder in children and adolescents and generalized anxiety disorder for both youth and adults. Other children may act out (Vidal-Ribas et al., 2016). In either case, preschoolers who are prone to anger and who have difficulty regulating this response (i.e., have poor IC) may generate stress.
Stress and Social Rejection

Hilt et al. (2004) above the mean and 2009 below the mean. Figure 1 a-b. “High” is 1 SD above the mean and “Low” is 1 SD below the mean. Note: Independent variables are mean-centered. 1a. The relationship between anger and rumination as moderated by inhibitory control. The shaded portions indicate the regions of significance on anger at –.52 or more SDs below the mean (–.18) and 2 or more SDs above the mean (.68; p < .05). 1b. The relationship between parenting and rumination as moderated by inhibitory control. The shaded portion indicates the region of significance on parenting at 1.34 or more SDs above the mean (5.18; p < .05).

(e.g., peer rejection, academic failure), which could then lead to subsequent rumination and internalizing problems (i.e., the failure model; Capaldi, 1991; McLaughlin, Aldao, Wisco, & Hilt, 2014).

Indeed, recent longitudinal and meta-analytic evidence suggests that early anger predicts impairment across social and academic domains and precedes the onset of depressive and anxiety disorders (Dougherty et al., 2015; Rice et al., 2016; Vidal-Ribas et al., 2016). In addition, prospective work in adolescents has also shown that stress and social rejection (McLaughlin, Hatzenbuehler, & Hilt, 2009; Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013) predict increases in rumination and internalizing symptoms.

The other main finding in our study was a significant interaction between early childhood IC and parenting behaviors on rumination in middle childhood, which is consistent with the one other study that has examined this question (Hilt et al., 2012). However, the pattern of our finding differed from that of Hilt and colleagues (2012). This may have been due, in part, to differences between studies in how parenting was conceptualized and measured, as well as differences in what aspects of EC that tasks emphasized. Hilt et al. (2012) found that children with low IC had stable, high levels of rumination regardless of parenting quality, whereas children with high IC were at increased risk to ruminate if they also experienced negative parenting. In contrast, the present study found that preschool children with low IC and positive parenting reported lower levels of rumination in middle childhood. On the other hand, children with high IC reported intermediate levels of rumination regardless of parenting quality. This pattern is suggestive of the vantage sensitivity model (Pluess & Belsky, 2013), which proposes that there are individual differences in sensitivity to environmental influences that confer disproportionate benefits in response to positive environmental experiences. Indeed, some research has found that children with low EC are more responsive to positive parenting than children with high EC, though this pattern has not been consistently found (see Slagt, Dubas, Deković, & Van Aken, 2016 for a review).

Because our findings were partially consistent with prior literature, which was predominantly based on adolescent samples, it is important to consider whether rumination in childhood might be a distinct phenomenon from rumination in adolescence. For instance, many studies have reported gender differences in rumination in middle to late adolescence (e.g., Abela, Parkinson, Stolow, & Starrs, 2009; Broderick, 1998; Hampel & Petermann, 2005; Hankin, 2008, 2009; Hart & Thompson, 1996; Hilt et al., 2012; Jose & Brown, 2008). However, similar to the present study, gender differences in rumination have not been generally found in childhood or early adolescence (e.g., Abela et al., 2002; Abela & Hankin, 2011; Abela, VanderBilt, & Rochon, 2004; Broderick & Korteland, 2004; but see Hampel & Petermann, 2005; Jose & Brown, 2008; Ziegert & Kistner, 2002, for exceptions). In addition, some research has found that rumination increases and exhibits greater stability from late childhood through adolescence (Hampel & Petermann, 2005; Hankin, 2008).

On the other hand, there is also evidence suggesting that rumination functions similarly in children and adolescents. In addition to the present study, research in children has

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3 According to the failure model, externalizing problems contribute to peer rejection and academic failures, which lead to increases in rumination and subsequent depression. 4 Although Hilt et al. (2012) examined the independent effects of self-reported overcontrolling parenting and negative-submissive family expressivity, the present study had a single dimension of parenting behaviors reflecting NA, PA, support, hostility, and the quality of the parent–child relationship, which were assessed observationally. Regarding EC, Hilt et al. (2012) utilized a task that may be more reflective of attentional modulation (i.e., staring at a pinwheel), whereas the tasks in the present study may be more reflective of behavioral inhibition (e.g., Tower of Patience).
consistently demonstrated that rumination is positively associated with depressive symptoms concurrently (Abela et al., 2002; Abela, Hankin, Sheshko, & Stolow, 2012; Abela et al., 2004; Broderick, 1998) and prospectively (Broderick & Korteland, 2004). Furthermore, several studies of youth have failed to find that age moderates the association between rumination and psychopathology (e.g., see Abela et al., 2012; Aldao, Noél-Hoeckema, & Schweizer, 2010; Olatunji et al., 2013; Roelefs et al., 2009; Rood, Roelefs, Bögels, & Alloy, 2010). Evidence also suggests that there could be overlapping (e.g., low self-esteem, hopelessness; Abela et al., 2002) and unique (e.g., low social support for seventh graders but not third graders; Abela et al., 2004) mediators of the relationship between rumination and depression in children and adolescents.

Altogether, these findings suggest that rumination may be forming throughout childhood and adolescence but maintains a consistent link to psychopathology across these developmental periods. There also appears to be both common and distinct mechanisms of the rumination-psychopathology link depending on age. Thus, our finding that early temperamental anger, but neither sadness nor fear, in conjunction with low IC is related to rumination in middle childhood does not preclude the possibility that other temperamental profiles (e.g., high sadness, low IC; high fear, low IC) might predict ruminative responses that could emerge later on in development.

Our findings indicate that interventions during early childhood aimed at enhancing child ER skills and the emotional climate of the family could help to prevent rumination, which in turn might disrupt two pathways to the development of internalizing disorders. Interventions aimed at reducing anger and enhancing IC (e.g., impulse inhibition) appear to be particularly relevant for reducing rumination risk. In addition, follow-up analyses (see Footnote 2) examining what specific aspects of parenting are most influential on child rumination suggest that efforts aimed at reducing negative emotional expressivity may help to prevent the development of rumination for children with low IC, and enhancing positive emotional expressivity should also prevent child rumination.

A major strength of the present study is the longitudinal design, which allowed us to examine the effects of child temperament and parenting during preschool on the emergence of rumination 6 years later, in middle childhood. In addition, we utilized observational measures of temperament and parenting, which might be less susceptible to reporting biases than questionnaire measures. One could argue that the finding of rumination being predicted by IC in conjunction with anger only (but not sadness or fear) might be due to the greater salience of anger to raters as compared to sadness and fear. However, significant bivariate associations between sadness at age 3 and depression at age 9 suggest that our observational measures sufficiently captured expressions of the affective traits of interest in the present study. Last, we focused on middle childhood, a period of development in which rumination has been understudied.

Limitations of our study are that our sample was predominantly White and middle class and that our assessment of parenting was largely restricted to mothers. In addition, it is not feasible to assess rumination in preschoolers. As a result, we could not examine predictors of change in rumination. Furthermore, the present study focused on depressive rumination and did not assess other forms of perseverative negative thinking (e.g., anger rumination; Peled & Moretti, 2010). It is also worth considering that the number of variables in the model could increase the likelihood of spurious findings. However, the analysis was already quite conservative given that each term was a test of unique variance and the interaction terms include the main effects. Finally, it will be necessary to continue to follow our sample to determine whether the variables that we identified as predicting rumination in middle childhood continue to predict rumination and internalizing psychopathology in adolescence.

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REFERENCES


