Rumination on Anger and Sadness in Adolescence: Fueling of Fury and Deepening of Despair

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We examined anger rumination and sadness rumination in clinic-referred adolescents (N = 121). Factor analysis indicated that items from analogous anger and sadness rumination measures loaded onto 2 factors tapping anger rumination and sadness rumination, respectively. Structural equation modeling confirmed unique relations between each form of rumination and specific emotional or behavioral problems. Anger and anger rumination were independent predictors of aggression, suggesting that both the affective component of anger (i.e., angry feelings) and the cognitive process (i.e., recurrent thoughts about anger) are important in predicting aggressive behavior. Girls reported higher levels of both forms of rumination compared to boys; however, no sex differences were found in the relations between either form of rumination and outcomes.

Rumination is a maladaptive cognitive process involving repetitive thoughts that are intrusive and aversive (e.g., Carson & Cupach, 2000; Nolen-Hoeksema, 1987, 1991, 1996). Although many studies have been conducted on sadness rumination and depression, particularly in adults, few have focused on anger rumination. Further, the existing research on anger rumination has centered only on adults. This study examined rumination on anger and sadness in a sample of clinic-referred adolescents struggling with problems of anger, aggression, and depression. The goal was to extend research on anger rumination to adolescents and to assess if anger rumination and sadness rumination have distinct emotional and behavioral correlates consistent with those we have found in adults (Peled & Moretti, 2006). Evidence of specificity could warrant the conceptualization of anger rumination and sadness rumination as two distinct constructs.

Rumination on sadness, studied extensively but mainly in adults, refers to thinking continually about one's sadness and attempting to understand the causes and meaning of the negative affect (Conway, Csank, Holm, & Blake, 2000). Sadness rumination is highly correlated with depression and is believed to prolong and exacerbate depressed mood by increasing the salience of negative emotions and maladaptive cognitions (Morrow & Nolen-Hoeksema, 1990). Women have been found to engage in more sadness rumination than men even when statistically controlling for the more intense feelings of sadness that women report compared to men (e.g., Nolen-Hoeksema & Jackson, 2001; Nolen-Hoeksema, Larson, & Grayson, 1999). Nonetheless, the relation between sadness rumination and depression has not been found to differ significantly for women and men. The strong association between sadness rumination and depression found in adults has also been found in adolescents (Park, Goodyer, & Teasdale, 2004; Silk, Steinberg, & Morris, 2003) and preadolescents (Ziegert & Kistner, 2002). Further, adolescent girls (Broderick & Korteland, 2002; Schwartz & Koenig, 1996) and preadolescent girls (Broderick, 1998; Ziegert & Kistner, 2002) report more sadness rumination than boys even when controlling for depressive symptoms.

In contrast to the extensive research on sadness rumination, relatively few studies have focused on anger rumination. Rumination on anger has been conceptualized as thinking repeatedly about one's anger, which may be partially responsible for the maintenance and intensification of anger (Sukhodolsky, Golub, & Cromwell, 2001). Anger rumination in adults is positively correlated with anger (Bushman, 2002; Gerin, Davidson, Christenfeld, Goyal, & Schwartz, 2006; Rusting & Nolen-Hoeksema, 1998; Sukhodolsky et al., 2001), and there is also evidence suggesting a positive association with aggressive behavior (Bushman, Bonacci, Pedersen, Vasquez, & Miller, 2005; Caprara, 1986; Collins & Bell, 1997; Maxwell, 2004; Verona, 2005).

In general, women and men appear to engage in comparable levels of anger rumination (Maxwell, 2004; Rusting & Nolen-Hoeksema, 1998; Sukhodolsky et al., 2001). Maxwell, Sukhodolsky, Chow, and Wong (2005) found an exception in Hong Kong, where

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Chinese men engaged in more anger rumination compared to women. Within North American samples, some sex differences have been found in certain domains of anger rumination. For example, men compared to women report higher levels of "thoughts of revenge," one component of anger rumination (Sukhodolsky et al., 2001). Further, Rusting and Nolen-Hoeksema found that women were more likely to ruminate on anger when not provoked but to distract from anger when provoked, whereas men were equally likely to ruminate or distract regardless of whether they were provoked. It is notable that women distract from anger instead of ruminating on it when they are provoked, which runs counter to how they cope with sadness and may stem from gender-role socialization (e.g., Zahn-Waxler, Cole, & Barrett, 1991).

Studying rumination in adolescence and how it relates to anger, aggression, and depression offers an opportunity to better understand how cognition and affect unfold developmentally. Adolescence is a period of significant biological, cognitive, and social change. Changes in neurological structure and function, cognitive systems, and socioemotional processes occur at different rates, and disjointed coordination among the developing systems may increase youths' vulnerability to psychopathology (Steinberg, 2005). Adolescence is in fact associated with the onset or intensification of a number of problems, including depression (Birmaher, Ryan, & Williamson, 1996) and antisocial and delinquent behavior (Moffitt, 1994). Biological changes during adolescence include developments in the prefrontal cortex implicated in improvements in executive functioning (e.g., Giedd et al., 1999). Executive functioning encompasses abilities such as emotion regulation, coordination of affect and cognition, and response inhibition (Keating, 2004), processes that seem closely linked to rumination, which can be regarded as a maladaptive emotion-regulation strategy (Broderick & Korteland, 2002; Papageorgiou & Wells, 2001).

There are other changes in the lives of adolescents that may give rise to increased vulnerability to rumination. Adolescents spend less time with family and more time with peers (Larson, Richards, Moneta, & Holmbeck, 1996), and they struggle with balancing their striving for autonomy and maintenance of connection with parents (e.g., Moretti & Peled, 2004). With developing autonomy and the simultaneous need for connectedness comes the search for meaning and understanding of oneself and others. The pursuit of understanding and meaning is implicated not only in adolescent identity development but also in rumination (Segerstrom, Stanton, Alden, & Shortridge, 2003). Thus, it would not be surprising to find that rumination increases during adolescence, given the rapid and pervasive changes that occur in biological, cognitive, and social–psychological processes. In fact, there is some evidence that this is the case. Hampel and Petermann (2005) found a rise in general rumination (e.g., "The situation rushes into my mind over and over again") from late childhood (ages 8 to 10 years) to adolescence (ages 11 to 13 years).

This study extends previous research by examining rumination in adolescence more closely. We examined rumination on anger and sadness, assessing the specificity of their relations with different types of emotional and behavioral conditions, namely anger, aggressive behavior, and depression. Our research utilizes a clinical sample of adolescents with identified problems in these domains of functioning. This allowed for sensitively testing unique relations in a population in which we would expect significant peaks in rumination, emotional difficulties, and behavioral problems. Our study builds on previous findings (Peled & Moretti, 2006) supporting the existence of unique relations among anger rumination, anger, and aggressive behavior and between sadness rumination and depression in young adults. In our earlier work, we developed a measure to tap anger rumination and sadness rumination using analogous items, except for the words *anger/angry* and *sadness/sad*. This approach enabled systematic comparison of the two forms of rumination without concern about item differences. Finding distinct factor loadings and unique correlates for each type of rumination in this study—despite the use of parallel measures—would be a compelling demonstration of the distinctiveness of the two forms of rumination and would confirm findings based on our study of young adults.

In this study, rumination was examined in relation to anger, overt aggression, relational aggression, and depression. Overt aggression refers to direct behaviors intended to hurt others, including insults, threats, and physical abuse. Relational aggression refers to indirect, socially based behaviors intended to harm others, such as spreading rumors or ostracizing individuals from social groups (Little, Jones, Henrich, & Hawley, 2003). We predicted that anger rumination, controlling for sadness rumination, would be uniquely related to anger, relational aggression, and overt aggression. In contrast, sadness rumination, controlling for anger rumination, was expected to be correlated with depression. Two additional predictions were made. First, based on our previous findings, increased sadness rumination was expected to be associated with decreased overt aggression when controlling for anger rumination. In other words, we expected that among individuals with comparable levels of anger rumination, those with higher levels of sadness rumination would display less overt aggression. Second, we expected that anger rumination would predict both relational and overt aggression even when angry affect was controlled. This finding emerged in our previous research and suggests that the relation between rumination and aggressive behavior is not due to heightened feelings of anger

(i.e., anger does not mediate the relation between anger rumination and aggression). Rather, the rumination process appears to have direct relations with aggression, independent of the generation of angry affect.

In terms of sex differences, we expected adolescent girls to demonstrate more sadness rumination compared to boys, as has been found in previous research with adolescents and adults (Broderick & Korteland, 2002; Nolen-Hoeksema & Jackson, 2001; Schwartz & Koenig, 1996). However, sex differences were not expected in the relation between sadness rumination and depression (i.e., moderation was not predicted). Girls and boys were expected to engage in equivalent levels of anger rumination, based on previous findings for adults (Maxwell, 2004; Rusting & Nolen-Hoeksema, 1998; Sukhodolsky et al., 2001), and no sex differences were expected in the relations among anger rumination, anger, and aggression.

Method

Participants

This study was part of a larger project on gender and aggression in which 140 adolescents (75 girls, 65 boys) participated. Participants had been referred to an assessment program for youth with severe conduct problems (n = 60; 31 girls, 29 boys) or admitted to youth correctional facilities (n = 80; 44 girls, 36 boys) in British Columbia, Canada. Of those, 121 participants (65 girls, 56 boys) completed the measures relevant to this study; 58 (30 girls, 28 boys) were from the assessment program and 63 (35 girls, 28 boys) were from the correctional facilities. Reasons for noncompletion (19 participants; 17 from forensic sites, 2 from the assessment program) included insufficient time allotted for protocol completion (11 forensic youth), withdrawal due to disinterest (4 forensic youth, 2 assessment youth), and transfer to another institution (2 forensic youth). Participants in the correctional facilities were older (M = 15.95, SD = 1.25) than those in the assessment program (M = 14.34, SD = 1.12), $t(119) = 7.44$, $p < .001$, and rated themselves as engaging in more overt aggression (M = 26.76, SD = 9.10) compared to youth in the assessment program (M = 21.74, SD = 6.79), $t(119) = 3.42$, $p = .001$. Otherwise, participants across referral sources did not differ ($p > .05$) on the variables of interest (i.e., levels of anger rumination, sadness rumination, anger, relational aggression, and depression).

Participants ranged in age from 12 to 18 years (M = 15.18, SD = 1.43) and the majority were under the legal care of their biological parents (60%). Youth not under the care of their biological parents indicated social workers (22%), foster parents (8%), another relative (e.g., grandparent; 7%), or adoptive parents (3%) as their legal guardians. Participants were of Caucasian (64%), First Nations (23%), African Canadian (1%), and mixed ethnic backgrounds (12%). Based on the Computerized Diagnostic Interview for Children and Adolescents–IV (Reich, Welner, & Herjanic, 1997), administered by trained interviewers, 59% of youth met *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994) criteria for conduct disorder (59% of boys and 58% of girls), 42% for marijuana dependence (41% of boys and 43% of girls), 36% for alcohol dependence (33% of boys and 39% of girls), 24% for major depressive disorder (15% of boys and 32% of girls), and 15% for generalized anxiety disorder (10% of boys and 19% of girls). Similar percentages of girls compared to boys met criteria for all disorders except major depressive disorder, in which a greater proportion of girls than boys met criteria, $t(119) = 2.15$, $p = .03$.

Participation was voluntary and adolescents received $30 or the equivalent in gift certificates and snacks for their participation. Given that more boys than girls enter these facilities, all eligible girls were approached first to maximize the number of girls in our sample, and then boys were matched with the girls at each site, based on chronological age. The exclusionary criterion for participation was a Full Scale IQ of less than 70 as measured by the Wechsler Intelligence Scale for Children–Fourth Edition (Wechsler, 2003). Nine otherwise eligible participants were excluded on this basis.

Measures

Sadness and Anger Rumination Inventory. Existing rumination scales were reviewed to identify key items that could be modified to create two parallel scales for anger rumination and sadness rumination for this study. Care was taken to avoid redundancy among the items and overlap between the items and predicted outcomes (i.e., items directly tapping depression, anger, or aggression were not included). Although the wording of some items was modified, their meaning remained the same. With permission of the authors, we included five items with high factor loadings (ranging from .65 to .78) from Conway et al.'s (2000) Rumination on Sadness scale and four items with high factor loadings (ranging from .67 to .85) from Sukhodolsky et al.'s (2001) Anger Rumination scale. One intensification item from Caprara's (1986) Dissipation–Rumination scale was used ("When I am angry [sad], the more I think about it, the angrier [sadder] I feel"), and a new intensification item was created ("When I think about my anger [sadness], I become more upset").

The final version of the Sadness and Anger Rumination Inventory thus consisted of 11 items for each type of rumination. Items are analogous, with the words *angry* and *anger* in the anger rumination measure replaced with *sad* and *sadness* in the sadness rumination measure. Participants indicate on a 5-point

scale of 1 (*never*), 2 (*almost never*), 3 (*sometimes*), 4 (*almost always*), or 5 (*always*) how often they "do the following things" when they are angry (anger rumination questionnaire) or sad (sadness rumination questionnaire).

The Integrated Measurement Framework of Aggression (Little et al., 2003) is a unique self-report instrument because it enables independent examination of the forms of aggressive behavior (overt and relational) and functions of aggression (instrumental and reactive). The forms (items adapted from Crick & Grotpeter, 1995) and functions (items adapted from Dodge & Coie, 1987) were incorporated into six subscales, three tapping overt aggression (pure overt, reactive overt, instrumental overt) and three tapping relational aggression (pure relational, reactive relational, instrumental relational). Overt aggression includes physical and verbal behaviors intended to harm another person whereas relational aggression involves purposeful damage to another's social relationships. Little et al. found strong support for the validity of their measure, including good model fit; generalizability across sex, age cohort, and ethnicity; and criterion validity (i.e., the different types of aggression were found to have differentiated patterns of relations with outcome variables). The original 36-item measure was reduced to 25 items (12 overt and 13 relational aggression) on the basis of maintaining items with the highest factor loadings (T. Little, personal communication, April 25, 2003). Participants rated on a 4-point scale how true each statement is for them, with anchors of 1 (*not at all*), 2 (*somewhat*), 3 (*mostly*), and 4 (*completely*). Sample items tapping overt aggression were "I'm the kind of person who hits, kicks, or punches others" and "I'm the kind of person who puts others down." Sample items measuring relational aggression include "I'm the kind of person who gossips or spreads rumors" and "I'm the kind of person who tells my friends to stop liking someone." In this study, internal consistency was acceptable for overt aggression (α = .93) and relational aggression (α = .91).

Anger and depression were measured using items from the Ontario Child Health Study scales (Offord et al., 1992, 1987), a measure with good psychometric properties (for detailed information see Boyle et al., 1987, 1993), which was developed based on *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed.; American Psychiatric Association, 1980) descriptions of childhood disorders and items contained in the widely used and well-validated Youth Self Report (Achenbach & Rescorla, 2001). Four items tapping anger were summed to produce an anger score, with higher scores reflecting elevated anger. These included "I am angry and resentful," "I have a hot temper," "I am easily annoyed by others," and "I blame others for my mistakes." Respondents indicated whether items were true for them on a scale of 0 (*never or not true*), 1 (*sometimes or somewhat true*), or 2 (*often or very true*) based on their behavior and experiences within the past 6 months. In this study, a common factor analysis with varimax rotation and including only these four items indicated that all items loaded onto one factor (eigenvalue greater than 1) accounting for 38% of the variance (root mean square residual [RMR] = .03). Further, examination of the scree plot, eigenvalues (2.01, 0.89, 0.65), RMRs, residual variances, and factor loadings for a one- through three-factor solution supported the retention of one factor. Internal consistency was α = .70.

Nine items were summed to produce a depression score. Sample items included "I am unhappy, sad, or depressed" and "I get no pleasure from my usual activities." In this sample, a common factor analysis using varimax rotation indicated that all nine items loaded onto one factor, accounting for 43% of the variance (RMR = .05). Examination of the scree plot, eigenvalues (4.43, 0.88, 0.85, 0.78), RMRs, residual variances, and factor loadings for a one- through four-factor solution supported the retention of one factor. Internal consistency was α = .87.

Procedure

Measures were divided into three modules, with each module completed during a different session. The anger rumination and sadness rumination questionnaires were in separate modules. The order of the modules was randomly alternated, so that participants could start and finish with any one of the three. Each module took between 1 and 2 hr to complete, and participants received their honorarium on completion of the last module. Participants and their legal guardians provided signed consent prior to beginning the study. Participants were reminded at the start of each session about the limits of confidentiality and their right to withdraw at any time. Staff were not given access to participants' study information, except if youth disclosed information suggesting a risk of harm to themselves or others. In these instances, staff were informed with the participants' knowledge. All data were collected by trained graduate students.

Results

Preliminary Analyses

Distribution of rumination measures. Skewness values (G_1) for the distribution of responses to individual items on the anger rumination questionnaire ranged from –.14 to .38, and kurtosis values (G_2) ranged from –1.21 to –0.53. Total scores (sum of 11 items for each participant) ranged from 11 to 55, and the distribution approximated a normal distribution (skewness = .09; kurtosis = –.79). The mean total score

was $M = 31.79$ ($SD = 11.31$). Reliability analysis of the 11 anger rumination items yielded an internal consistency coefficient of $\alpha = .95$. Skewness values (G_1) for individual items on the sadness rumination questionnaire ranged from .05 to .60, and kurtosis values (G_2) ranged from –1.34 to –0.48. Total scores ranged from 11 to 55, and the distribution approximated a normal distribution (skewness = .27; kurtosis = –.66). The mean total score was $M = 29.10$ ($SD = 11.94$) and was significantly lower than the mean anger rumination total score in the overall sample, $t(120) = 3.43$, $p = .001$, and in separate analyses for girls, $t(64) = 2.27$, $p = .03$, and boys, $t(55) = 2.55$, $p = .01$. Reliability analysis of the 11 sadness rumination items yielded an internal consistency coefficient of $\alpha = .96$.

Factor Analysis

A common factor analysis (principal axis factoring) with direct quartimin oblimin rotation[1] was conducted on all 22 items of the Sadness and Anger Rumination Inventory rumination scales. Two factors emerged with eigenvalues greater than 1 (12.79, 2.15), accounting for 65.0% of the variance. The RMR for a one-factor solution was .09, and the RMR for a two-factor solution dropped to .04 (RMR values closer to zero reflect better fit). Examination of the scree plot, eigenvalues, RMRs, residual variances, and factor loadings for a one- through four-factor solution supported the retention of two factors. An item was considered to load onto a factor if its factor loading exceeded .40, and an item was considered to load onto more than one factor if the difference between the factor loadings was less than .10. As illustrated in Table 1, the sadness rumination and anger rumination items loaded onto two separate factors, tapping sadness rumination and anger rumination, respectively.

Composite scores for each form of rumination were created by summing the 11 items from each rumination questionnaire. There was a positive correlation between anger rumination and sadness rumination in the overall sample ($r = .72$, $p < .001$), and in separate analyses for girls ($r = .71$, $p < .001$) and boys ($r = .65$, $p < .001$). As illustrated in Table 2, each form of rumination was positively correlated with anger, aggression, and depression. Age was not significantly correlated with any of the variables.

As expected, girls ($M = 33.24$, $SD = 10.92$) scored higher than boys ($M = 24.29$, $SD = 11.33$) on sadness rumination, $t(119) = –4.42$, $p < .001$, even after controlling for depression, $F(2, 118) = 4.93$, $p = .03$. Girls ($M = 35.51$, $SD = 10.15$) also scored higher than boys ($M = 27.48$, $SD = 11.12$) on anger rumination, $t(119) = –4.15$, $p < .001$, even after controlling for anger, $F(2,$

Table 1. *Sadness and Anger Rumination Inventory Factor Loadings and Item Descriptives*

Item	*M*	*SD*	Item–Total Correlation	Factor Loading[a] 1	2
Sad 5. I get absorbed in thinking about why I am sad and find it difficult to think about other things.	2.57	1.35	.88	**.95**	–.07
Sad 7. When something makes me sad, I turn this matter over and over again in my mind.	2.60	1.32	.86	**.92**	–.05
Sad 9. Whenever I feel sad, I keep thinking about it for a while.	2.67	1.26	.84	**.89**	–.04
Sad 3. I keep thinking about the reasons for my sadness.	2.57	1.27	.83	**.86**	–.01
Sad 4. When I think about my sadness, I become more upset.	2.85	1.35	.84	**.85**	.02
Sad 8. I tire myself out by thinking so much about myself and the reasons for my sadness.	2.36	1.29	.79	**.84**	–.03
Sad 2. I have difficulty getting myself to stop thinking about how sad I am.	2.46	1.27	.84	**.79**	.09
Sad 10. I think about certain events from the past and they still make me sad.	2.75	1.29	.75	**.76**	–.01
Sad 11. When I am sad, the more I think about it the sadder I feel.	2.91	1.48	.77	**.72**	.09
Sad 6. I search my mind for events or experiences in my past that may help me understand my sad feelings.	2.63	1.25	.67	**.62**	.09
Sad 1. I keep thinking about past experiences that have made me sad.	2.72	1.16	.70	**.61**	.15
Ang 4. When I think about my anger, I become more upset.	3.17	1.34	.83	–.08	**.93**
Ang 2. I have difficulty getting myself to stop thinking about how angry I am.	2.83	1.29	.80	–.10	**.90**
Ang 11. When I am angry, the more I think about it the angrier I feel.	3.15	1.36	.83	–.02	**.88**
Ang 3. I keep thinking about the reasons for my anger.	2.97	1.23	.76	–.12	**.87**
Ang 9. Whenever I feel angry, I keep thinking about it for a while.	2.88	1.27	.84	.10	**.78**
Ang 5. I get absorbed in thinking about why I am angry and find it difficult to think about other things.	2.84	1.40	.83	.11	**.78**
Ang 7. When something makes me angry, I turn this matter over and over again in my mind.	2.91	1.23	.78	.06	**.75**
Ang 10. I think about certain events from the past and they still Make me angry.	3.11	1.29	.74	.09	**.69**
Ang 8. I tire myself out by thinking so much about myself and the reasons for my anger.	2.51	1.26	.76	.35	**.52**
Ang 1. I keep thinking about past experiences that have made me angry.	2.69	1.20	.64	.21	**.51**
Ang 6. I search my mind for events or experiences in my past that may help me understand my angry feelings.	2.73	1.18	.52	.08	**.47**

[a]Absolute values greater than .40 are in boldface.

Table 2. *Intercorrelations Among Rumination, Anger, Aggression, Depression, and Age*

Variable	1	2	3	4	5	6	7
1. Anger Rumination	—	.72***	.50***	.48***	.46***	.52***	–.02
2. Sadness Rumination		—	.36***	.20*	.33***	.66***	–.06
3. Anger			—	.63***	.49***	.37***	.12
4. Overt Aggression				—	.65***	.18	.17
5. Relational Aggression					—	.28**	.10
6. Depression						—	–.15
7. Age							—

*$p < .05$. **$p < .01$. ***$p < .001$.

118) = 17.71, $p < .001$. This finding was inconsistent with the prediction that there would be no sex difference in overall levels of anger rumination.

Structural Equation Modeling Analyses

The question of whether anger rumination and sadness rumination are differentially associated with particular emotional and behavioral conditions was addressed using structural equation modeling (AMOS Version 5.0; Arbuckle, 2003). Structural equation modeling is a confirmatory approach to data analysis in which the expected set of relations among variables can be modeled simultaneously. Anger rumination was expected to be a positive predictor of anger, overt aggression, and relational aggression. Sadness rumination was expected to be a positive predictor of depression and a negative predictor of overt aggression. The two forms of rumination were specified as correlating with each other. Anger, overt aggression, and relational aggression also were specified as correlating with one another. Composite scores were used rather than latent indicators due to sample size considerations (i.e., Bentler, 1988, has suggested a ratio of at least 5:1 of subjects to estimated parameters).

The model was a good fit to the data, $\chi^2(6, N = 121) = 6.2$, $p = .41$; root mean square error of approximation (RMSEA) = .02 (.00–.12); comparative fit index (CFI) = 1.0.[2] As illustrated in Figure 1a, anger rumination predicted anger ($\beta = .50$, $p < .001$), overt aggression ($\beta = .69$, $p = .001$), and relational aggression ($\beta = .46$, $p < .001$). Sadness rumination was a positive predictor of depression ($\beta = .66$, $p < .001$) and a negative predictor of overt aggression ($\beta = –.29$, $p = .001$). Multiple-group analysis for sex indicated structural invariance, meaning that the same model held for girls and boys, producing comparable regression weights, $\Delta\chi^2(5, N = 121) = 4.0$, $p = .55$. Therefore, as expected, sex did not moderate the relations between rumination and the outcome variables. Multiple-group analysis for location indicated structural invariance, meaning that the same model held for participants at the forensic and assessment sites, $\Delta\chi^2(5, N = 121) = 4.1$, $p = .53$. When we slightly modified the model by removing anger as an outcome variable and included only the measures of adjustment (i.e., aggression and depression; Figure 1b), the model was still a good fit to the data, $\chi^2(4, N = 121) = 1.5$, $p = .83$; RMSEA = .00 (.00–.08); CFI = 1.0. Multiple-group analysis again indicated structural invariance for sex, $\Delta\chi^2(4, N = 121) = 3.8$, $p = .43$, and location, $\Delta\chi^2(4, N = 121) = 1.91$, $p = .75$.

The models were not worse fits than the saturated model that specifies all possible relations among the variables and fits the data perfectly ($p > .05$). Results were consistent when a general linear model multivariate regression was carried out with anger rumination and sadness rumination entered as covariates (i.e., predictor variables), and anger, overt aggression, relational aggression, and depression entered as dependent variables.[3] As illustrated in Table 3, anger rumination but not sadness rumination was a positive predictor of anger, overt aggression, and relational aggression. Sadness rumination but not anger rumination was a negative predictor of overt aggression and a positive predictor of depression.

Sadness Rumination and Overt Aggression

In light of the findings indicating a positive zero-order correlation between sadness rumination and overt aggression, yet a negative correlation when controlling for anger rumination, we explored possible moderation

[2]In structural equation modeling, a chi-square value that is not significant reflects good model fit (i.e., $p > .05$), whereas a significant chi-square value (i.e., $p < .05$) indicates lack of satisfactory fit. For the RMSEA fit index (90% confidence intervals reported in parentheses), Hu and Bentler (2001) suggested values less than or equal to .06 as the cutoff for a good model fit. There is adequate fit if RMSEA is less than or equal to .08. The CFI ranges from 0 to 1, with values closer to 1 indicating a better fit. By convention, the CFI should be equal to or greater than .90 to accept a model.

[3]Two highly correlated predictors, such as rumination on anger and sadness, could potentially pose problems associated with collinearity, whereby estimates of individual regression weights would not be reliable (the regression weights would be negatively correlated, with larger standard errors). However, the accuracy of the predictions would not be affected. Further, the Tolerance (.48), Variance Inflation Factor (2.10), and condition indexes (1, 6.09, 9.26) indicated that collinearity was not a problem in this study.

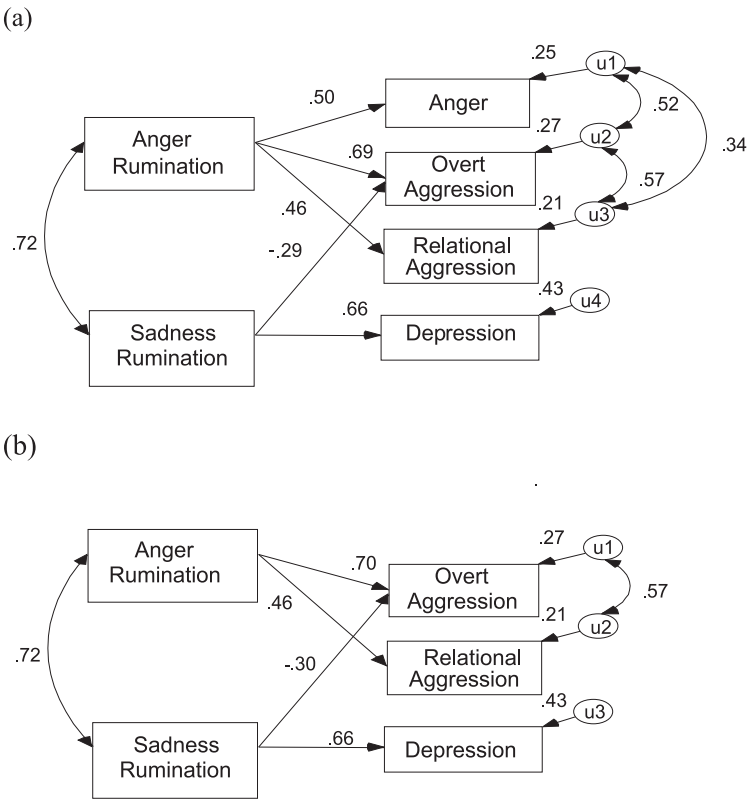

Figure 1. Structural equation models: (a) Anger rumination positively predicting anger, overt aggression, and relational aggression, and sadness rumination positively predicting depression and negatively predicting overt aggression. Root mean square error of approximation (RMSEA) = .02; $\chi^2 = 6.2$, $p = .41$. (b) Anger rumination positively predicting overt and relational aggression, and sadness rumination positively predicting depression and negatively predicting overt aggression. RMSEA = .00; $\chi^2 = 1.5$, $p = .83$.

Table 3. *Rumination on Anger and Sadness as Independent Predictors of Anger, Overt Aggression, Relational Aggression, and Depression*

	Anger Rumination				Sadness Rumination			
Outcome Variable	***B***	***SE B***	***T***	η^2	***B***	***SE B***	***t***	η^2
Anger	.09	.02	4.49***	.15	–.00	.02	–.18	.00
Overt Aggression	.52	.08	6.15***	.24	–.21	.08	–2.66**	.06
Relational Aggression	.29	.08	3.91***	.12	–.01	.07	–.09	.00
Depression	.04	.04	.09	.01	.21	.04	5.89***	.23

Note: $N = 121$. Anger $R^2 = .25$; overt aggression $R^2 = .27$; relational aggression $R^2 = .21$; depression $R^2 = .44$.
*$p < .05$. **$p < .01$. ***$p \leq .001$.

effects that could account for the change in direction of the correlation (Baron & Kenny, 1986). Anger rumination was not found to moderate the relation between sadness rumination and overt aggression when each form of rumination and the interaction term were entered into a regression (i.e., the interaction parameter was not significant), $t(120) = .40$, $p = .69$, $\eta^2 = .00$. Anger also did not moderate the relation, $t(120) = .91$, $p = .37$, $\eta^2 = .01$. An explanation for the change in direction of the correlation is that the positive zero-order correlation between sadness rumination and overt aggression is an artifact of the positive correlation between sadness rumination and anger rumination. In general, individuals who experience greater sadness rumination also engage in more, not less, overt aggression because increased sadness rumination is associated with increased anger rumination, which in turn is associated with increased overt aggression. However, among individuals who experience the same level of anger rumination (i.e., anger rumination is controlled), those with higher levels of sadness rumination exhibit less overt aggression.

Anger Rumination and Anger in Relation to Aggression

The next step was to evaluate whether anger rumination predicted aggression when anger was con-

trolled. A multivariate regression was conducted with anger rumination, sadness rumination, and anger entered as covariates (i.e., predictor variables) and overt aggression and relational aggression entered as dependent variables. The parameter estimates indicated that both anger, $t(120) = 6.59$, $p < .001$, $\eta^2 = .27$, and anger rumination, $t(120) = 4.10$, $p < .001$, $\eta^2 = .13$, were independent positive predictors of overt aggression, whereas sadness rumination was a negative predictor of overt aggression, $t(120) = -2.99$, $p < .01$, $\eta^2 = .07$. As well, anger, $t(120) = 3.92$, $p < .001$, $\eta^2 = .12$, and anger rumination, $t(120) = 2.33$, $p = .02$, $\eta^2 = .04$, were independent positive predictors of relational aggression. These analyses demonstrate that both the cognitive component of anger rumination (i.e., repetitive thoughts) and the affective component (i.e., angry feelings) independently contribute to predicting aggression.

Discussion

The goal of this study was to examine rumination on anger and sadness in a clinic-referred sample of adolescents and to determine whether these two forms of rumination are related to unique emotional and behavioral problems. Our results confirmed our previous findings (Peled & Moretti, 2006) and provide further evidence that anger rumination and sadness rumination are best conceptualized as two distinct constructs associated with unique emotional and behavioral problems. Factor analysis indicated that items from the Sadness and Anger Rumination Inventory rumination scales loaded onto separate factors, one tapping anger rumination and the other measuring sadness rumination. Further, each form of rumination had unique relations with emotional or behavioral problems. When shared variance was controlled, anger rumination but not sadness rumination positively predicted anger, relational aggression, and overt aggression. These results are consistent with previous research on adults demonstrating a link between anger rumination and anger (Bushman, 2002; Rusting & Nolen-Hoeksema, 1998) and anger rumination and aggression (e.g., Maxwell, 2004). These findings contribute to the field by extending the investigation of anger rumination to adolescents and demonstrating the specificity of anger rumination (i.e., controlling for sadness rumination) to overt and relational forms of aggression.

Results also confirmed that sadness rumination but not anger rumination was associated with depression, thereby replicating previous findings demonstrating a positive correlation between rumination and depression in adolescence (Park, Goodyer, & Teasdale, 2004; Silk, Steinberg, & Morris, 2003) and extending previous research by showing the unique relation of adolescent sadness rumination (i.e., controlling for anger rumination) with depressive symptoms. We also confirmed our previous finding with adults that elevated sadness rumination is related to lower levels of overt aggression but only when anger rumination is controlled (Peled & Moretti, 2006). Given the same amount of anger rumination, higher levels of sadness rumination might inhibit overt aggression because focusing on sadness may provoke feelings of self-blame as well as inhibited arousal, both of which could result in reduced hostility and overt aggression toward others.

As predicted and consistent with previous research (e.g., Broderick & Korteland, 2002; Schwartz & Koenig, 1996), adolescent girls reported higher levels of sadness rumination compared to boys, even when controlling for depressive symptoms. However, sex did not moderate the relation between sadness rumination and depression (i.e., the relation is comparable for boys and girls). Girls also reported higher levels of anger rumination compared to boys, which was inconsistent with our prediction that there would be no sex difference in reported levels of anger rumination. This unexpected finding may have been due to the use of a clinical sample of adolescents with high levels of anger, aggression, and depression. Use of this type of sample limits the generalizability of our findings to other populations and makes it unclear whether the sex difference in anger rumination found in this study stems from the nature of our sample and might otherwise not appear in a normative adolescent sample. Alternatively, it may be that anger rumination is particularly elevated during adolescence for girls and our findings simply reflect a normative developmental shift in sex differences that then shifts as adolescents move into adulthood. Future studies assessing clinical and normative adolescent samples will be valuable for determining the comparability of results in these two populations. Similar research with clinical adult populations with defining features of anger and aggression (e.g., forensic facilities) would be useful for determining whether women in these settings demonstrate higher levels of anger rumination compared to men.

Our use of rumination scales with analogous item stems reduces the possibility that the distinct factor loadings and differences in emotional and behavioral correlates we found for the two types of rumination are due to differences in the format of the items rather than their focus (i.e., sadness or anger). Establishing the validity of an analogous self-report measure was an important first step in examining the specificity of both forms of rumination. However, it is important to note that our study was limited by reliance on self-report measures, thereby introducing the possibility of response bias. Future studies using alternative assessment modalities such as a diary measure are necessary to supplement these findings. Diary methodologies (and, more recently, electronic diaries on handheld de-

vices) have been used to assess emotions and behaviors in youth and adults (e.g., Siemer, 2005; Whalen et al., 2006). Diary studies would enable investigation of both the intensity and frequency of people's ruminative thoughts and could shed light on the interplay between the two forms of rumination. For instance, rumination on anger and sadness were found to be highly correlated in this study, but the results do not address whether both forms of rumination are typically experienced concurrently or separately in different contexts or the extent to which one type of rumination temporally precedes the other.

It will also be important to tap outcome variables using measures other than self-reports, such as clinician-rated or parent-rated questionnaires. Further, future studies focusing on outcome variables that extend beyond those investigated in this study are important. Our intent was to integrate variables that have previously been examined in separate studies on anger rumination and sadness rumination (i.e., anger, aggression, and depression). However, future studies might include more parallel outcome variables, such as anger and sadness (rather than depression), or externalizing and internalizing disorders (e.g., conduct disorder, oppositional defiant disorder, major depressive disorder, and generalized anxiety disorder).

This line of research could have several important implications for understanding the developmental trajectories of mental health problems in children and adolescents. For example, these two forms of rumination may extend the duration and intensity of periods of poor functioning by "locking in" a dysfunctional pattern of thoughts, feelings, and behaviors. As a result, adolescents with higher levels of rumination may be at heightened risk for chronically poor adjustment. Research examining the roles of anger rumination and sadness rumination in the persistence of anger and aggression versus sadness and depression will shed light on the developmental repercussions of rumination as a vulnerability factor. Understanding the negative repercussions of rumination on healthy development may also offer insight into new prevention and intervention strategies. Certain components of mindfulness-based cognitive therapy—shown to be effective in reducing sadness rumination and depression in adults (Ma & Teasdale, 2004)—may effectively decrease rumination in adolescents. Our finding that anger rumination and anger are independent predictors of aggression suggests that interventions should target both the cognitive component (i.e., how to exit the rumination cycle) and affective component (i.e., reducing and controlling feelings of anger). Finally, extending rumination research into younger populations will help to elucidate the cognitive–affective roots of rumination and its impact on adjustment during adolescence and beyond.

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