ADOLESCENTS’ CO-RUMINATION AND STRESS PREDICT AFFECTIVE
CHANGES IN A DAILY DIARY PARADIGM

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INTRODUCTION

Adolescence is a transition period involving an abundance of social, emotional, physical and intellectual challenges. Social pressures change as friendships evolve, intimate relationships become more important, and adolescents strive to fit in among their peers and develop a sense of personal identity. Adolescents are actively undergoing significant cognitive maturation of higher-order processes, (e.g., critical thinking, decision-making, reasoning), becoming more competent emotion regulators and problem-solvers than children, but are not yet as competent or equipped to cope with life stressors as adults (Keating, 1990). During this transition, many adolescents experience difficulty adjusting emotionally to these challenges (Blanchard-Fields & Coats, 2008).

Consequently, affective disorders are among the most frequently diagnosed psychological disorders during this developmental period (Albano, Chorpita, & Barlow, 2003; Lewinsohn, Rohde, & Seeley, 1998)

Although depression is seen across the lifespan, the average age of first onset falls between fourteen and nineteen years of age (Kuyken, Watkins, Holden, & Cook, 2006). Epidemiological studies have revealed a dramatic peak in first onsets of depressive disorder in adolescence (Kessler et al., 1994; Kessler & Walters, 1998; Lewinsohn & Essau, 2002). One such study evidenced lifetime rates of MDD among up to 28% of adolescents (Lewinsohn, Rohde et al., 1998). Thus, episodes of depression among
adolescents are highly prevalent, and pose increased risk for recurrent episodes throughout the lifespan. In fact, once an individual experiences one episode, their lifetime risk of experiencing a second episode rises to 60%. Further episodes continue to elevate this risk to the point where 90% of individuals will experience a fourth depressive episode following their third episode (Solomon et al., 2000). Importantly, females are at particular risk for the development of depression, with prevalence rates roughly twice that of males (Kessler et al., 1994; Lewinsohn, Gotlib, Lewinsohn, Seeley, & Allen, 1998). Furthermore, this gender difference in risk emerges in adolescence; prior to this developmental period, rates of depression are comparable between males and females (Lewinsohn et al., 1998; Nolen-Hoeksema & Girgus, 1994). Thus, adolescence is a critical period in the emergence of depression, particularly among females. As such, continued research examining risk factors and gender differences in this age group is needed.

Several resilience and risk factors have been theorized to influence depressive vulnerability among adolescents. Chief among resiliencies, social support is thought to buffer the effects of adversity (Bukowski, Newcomb, & Hartup, 1996; Cohen & Wills, 1985). Friendship is particularly salient, as high quality friendships may protect children from experiencing peer victimization and emotional distress (Bukowski et al., 1996; Hodges, Boivin, Vitaro, & Bukowski, 1999). This type of social support may be particularly important to consider among adolescent girls, as they report higher quality friendships and more self-disclosure than boys of the same age. Additionally, girls tend
to spend more time in dyads, whereas boys report spending more time in groups (Parker & Asher, 1993). Yet despite their higher quality and more intimate friendships, adolescent girls are significantly more vulnerable to depression. Thus, various other factors may account for the variability of depressive symptoms among adolescent girls.

Nolen-Hoeksema (1991) proposed the Response Styles theory in part to help account for such gender differences in depression. According to this theory, individuals differ in their typical responses to adversity, and these responses are predictive of risk for depression. More specifically, individuals who ruminate, or passively dwell on feelings of distress are likely to prolong and exacerbate these feelings. Prior research has demonstrated that rumination predicts depression among young adults and adolescents, and moderates the effects of stress (Jose & Brown, 2008; Nolen-Hoeksema & Morrow, 1991). Furthermore, females report a greater tendency to engage in rumination, and this may account for the observed gender differences in depression (Nolen-Hoeksema, 1987).

Rose (2002) proposed a new construct, co-rumination, or an extensive engagement in discussion of one’s problems with a close confidant. Co-rumination combines the social support element of seeking comfort from others with the passive and excessive focus on feelings of distress characteristic of rumination. In such discussion, events and negative emotions are shared and dwelled upon with a focus on revisiting past events as well as speculating about causes and consequences. Co-rumination has been related to high quality same-sex friendships, and increases in friendship quality over time (Rose, Carlson, & Waller, 2007). Co-rumination has been both correlated with depressive symptoms, (Calmes & Roberts, 2008; Rose et al., 2007; Rose, 2002; Starr &
Davila, 2009) and related to increases in internalizing symptoms (Rose et al., 2007) among girls. Additionally, higher levels of co-rumination have been linked to longer and more severe depressive episodes. Importantly, it has evidenced unique influences on depression over and above the effects of friendship quality and rumination (Calmes & Roberts, 2008). In this way, co-rumination creates a trade-off of increased friendship quality and disclosure for increased depression and anxiety.

Notably, some researchers have not found co-rumination to predict these negative outcomes. In a longitudinal study of seventh and eighth grade girls, Starr and Davila (2009) did not find co-rumination to predict internalizing symptoms. This may be attributed to the large differences in sample sizes of each study, with Rose and colleagues including data on over 800 participants, and Starr and Davila reporting a sample size of 83. Additionally, Calmes & Roberts (2008) found evidence of friend-based co-rumination predicting depressive symptoms, but not in parent-child, roommate-based, or romantic relationship-based co-rumination. In fact, these researchers found that parent-child co-rumination was related to anxiety, whereas co-rumination between roommates and romantic partners was unrelated to internalizing symptoms. Thus, there are some mixed findings for risk for internalizing disorders, and evidence for relationship differentiation, but more work is needed to replicate the findings.

Multiple gender differences have also been inconsistently found for co-rumination in previous studies. For example, studies have found that females report higher levels of co-rumination in their relationships than males (Rose et al., 2007; Rose, 2002; Stone, Hankin, Gibb, & Abela, 2011), though see Stone and colleagues (2010) for an exception.
However, these studies utilized the original Co-rumination Questionnaire, which specifically asks respondents to report only on co-rumination that occurs within a single, same sex friendship. Thus, the questionnaire restricts itself to 1) the assessment of co-rumination between female-female and male-male dyads, 2) co-rumination only within friendships, 3) co-rumination specific to one relationship. Yet, it is likely that co-rumination occurs between male-female dyads, outside of friendships (e.g., within romantic relationships, between siblings, or in parent-child dyads), and in multiple relationships. Thus, the narrow focus of the original co-rumination questionnaire may prevent complete assessment of the overall amount of co-rumination in which individuals engage. This may have particular implications for the study of gender differences in co-rumination.

In order to examine co-rumination in multiple contexts, Calmes and Roberts (2008) created four versions of the original measure, assessing co-rumination separately in a same-sex friendship, in a romantic relationship, with a parent, and with a roommate. These authors found a significant interaction between participant gender and relationship type when predicting levels of co-rumination. That is, women engaged in greater co-rumination compared to men, only with respect to same-sex friendships. In fact, their data suggest that women co-ruminate most frequently with same sex friends whereas men co-ruminate most frequently with romantic partners. As such, the original three restrictions in the instructions of the Co-rumination Questionnaire may be problematic in the study of gender differences and may reflect an assumption that people are most likely to co-ruminate within their own gender. The instructions direct women to focus on the type of
relationship in which they are most likely to ruminate (i.e., same gender friends). However, men are directed to ignore the type of relationship in which they are most likely to ruminate (i.e., romantic relationships). As such, it remains unknown whether the gender differences in co-rumination would be observed if these restrictions were removed.

In addition to mean level differences in co-rumination between males and females, research has also suggested that gender may moderate the effects of co-rumination. More specifically, Rose and colleagues (2007) found that co-rumination was predictive of changes in anxiety and depression among females but was not among males. However, no gender moderation of co-rumination’s impact on depression was found in two other studies (Stone et al., 2010; Stone et al., 2011). Additionally, interactive results from these studies must be interpreted with caution due to the aforementioned potential measurement bias across genders. Thus, research is needed to examine the potential moderating influence of gender, after modifying the exclusive focus on a single same-sex friendship of the Co-Rumination Questionnaire.

As its name suggests, co-rumination may be considered an interpersonal form of depressive rumination. These constructs certainly share characteristics, but the extent of their unique contributions to the prediction of internalizing symptoms is still unclear. To date, three studies have addressed this issue. Rose (2002) posited that co-rumination leads to maladjustment through the process of rumination. Alternatively, Calmes and Roberts (2008) demonstrated that co-rumination and rumination were factorially distinct constructs. Furthermore, co-rumination has evidenced unique influences on depression
over and above the effects of rumination that are distinct from that of depressive
rumination (Calmes & Roberts, 2008; Stone et al., 2011). Thus, whether these constructs
consistently make distinct contributions to the prediction of negative outcomes requires
further investigation.

To understand the effects of co-rumination on depressive symptoms, researchers
have borrowed from theories of depressive rumination. In this more developed literature,
stress has been shown to moderate the relationship between rumination and depressive
symptoms (Jose & Brown, 2008; Nolen-Hoeksema & Morrow, 1991). In such diathesis-
stress models, stressful life events in the presence of high levels of negative cognition are
more predictive of major depression than in the presence of low levels of negative
cognition (Beck, 1967; Robinson & Alloy, 2003). Among adolescents, the study of stress
reactivity in relation to depression is limited. However, existing research supports that
high trait ruminators are more stress-reactive, and that one’s trait response style predicts
response to negative emotions and stressful events, as well as the duration of depressive
symptoms following an event (Nolen-Hoeksema, Morrow, & Fredrickson, 1993; Nolen-
Hoeksema & Morrow, 1991). Thus, the presence of stressors is an important
consideration in determining the influence of rumination on depressive onset. Likewise,
we might expect stress to moderate the influence of co-rumination on depressive onset.
However, the literature on life stress and co-rumination is very limited. Hankin and
colleagues (2010) investigated the generation of interpersonal stressors over time, but no
studies to date have tested a diathesis-stress model of co-rumination. As we have
evidence of both constructive (i.e., positive friendship quality) and unconstructive (i.e.,
internalizing symptoms) outcomes of co-rumination, it may be beneficial to examine co-
rumination in the context of individuals’ vulnerabilities and stressors. As depressive
diathesis-stress theories suggest, individuals vary in their capabilities to cope with daily
hassles, social pressures and chronic difficulties, thus it is important to investigate co-
rumination as a coping strategy in the presence of stress. Furthermore, much of the
current literature is limited to cross sectional and one-time point retrospective studies,
which limit the direction of effect in findings. Therefore, longitudinal studies of both
rumination and co-rumination pertaining to depressive vulnerability among adolescents
are needed.

Additional considerations in the study of co-rumination involve the manifestation
of internalizing symptoms. Depression is generally characterized by sad, hopeless, and
discouraged mood, or by a lack of positive or negative emotional experience, but
individuals may present with feelings of anxiety and irritability rather than low mood.
These latter symptoms appear particularly prevalent in the manifestation of depression
among children and adolescents. Anxiety and depression are often observed with high
comorbidity among adolescents, and with such overlap, are sometimes theorized to be
part of the same overarching disorder. Further, adult depression frequently first manifests
itself in anxious symptomatology in adolescence and childhood (Brady & Kendall, 1992).
Thus, developmentally sensitive investigations of adolescent risk for mood disorders
benefit from the assessment of angry and anxious symptoms in addition to depression.
Study Aims

The present study aims to examine the role of co-rumination, stress and daily affect among high school students. We sought to examine the following hypotheses: 1) daily levels of co-rumination will be predictive of subsequent days’ levels of negative affect (sadness, anxiety, and hostility) after controlling for the previous days’ levels of affect, 2) co-rumination will interact with stressful life events such that co-rumination has a larger and more negative effect on high stress days, 3) daily levels of co-rumination will continue to predict changes in affect, even after daily levels of rumination are controlled. Additional exploratory analyses will examine whether 4) females report higher levels of daily co-rumination than males, and 5) co-rumination has a larger influence on females’ negative affect than males.
METHOD

Participants & Measures

Participants are 78 9th-12th grade adolescents between ages 14 and 18 (M = 16.77) from Northeast Ohio. Students were recruited during the school day by morning announcements followed by project staff visiting study halls, homerooms, and classrooms. All students were eligible to participate and had equal opportunity to enroll in the study. Participants were 60.7% female. Of the adolescents, 92.3% were Caucasian, 3.8% Native American, 2.6% biracial, and 1.3% other. Participants completed a one-time set of questionnaires including demographic variables and other measures to be used in other investigations. Adolescents were then asked to complete daily questionnaires using an internet-based assessment over the duration of one week. This study received ethics approval in advance by an Institutional Review Board.

Daily Stress: On each day, participants were asked to report the number of major stressful events that occurred each day, i.e., “How many stressful events occurred in your life today (in the past 24 hours)?” Responses were recorded from “zero” to “three or more”.

Positive and Negative Affect Scale (PANAS-X; Watson, Clark, & Tellegen, 1988): Daily affect ratings were measured with a shortened version of the PANAS-X using 3 to 5 items each from the sadness (i.e., sad, blue, downhearted, unhappy, lonely),
fear (i.e., nervous, afraid, scared, worried), and hostility (i.e., angry, hostile, irritable) subscales. Participants were asked “to what extent did you feel _____ today?” Responses were recorded on a five-point likert scale, ranging from “very slightly or not at all”, to “extremely”. Each scale evidenced internal consistency measured by Cronbach’s alpha, of .89, .84, and .80, respectively.

Daily Co-rumination Questionnaire (Rose, 2002): A subset of 4 questions from the Co-rumination Questionnaire were modified to pertain to daily co-rumination behaviors, such that participants were asked to report actual co-rumination rather than trait-like co-rumination. Additionally, participants were asked to report on any co-rumination regardless of the relationship(s) in which it occurred. Participants were asked to respond to each question on a 1 to 4 scale from “not at all” to “most of the day,” (e.g., “We talked in great detail about the problems that we have,” or “We talked about old problems even though nothing new had happened”). Cronbach’s alpha was .83 for this measure.

Rumination (Nolen-Hoeksema & Morrow, 1991): As prior research has suggested that this measure assesses three related aspects of rumination: rumination on depressive symptoms, reflective pondering, and brooding (Treynor, Gonzalez, & Nolen-Hoeksema, 2003), a subset of four items from each of these scales from the Response Styles Questionnaire were re-worded for daily use to create a brief, 12-item, state rumination scale. Participants were asked “How frequently have you done each of the following today?”, with items including “Thought ‘Why do I always react this way?’”, “Analyzed
recent events to try to understand your feelings”, and “Thought about all your shortcomings, faults, and mistakes.” Items from each individual’s first assessment were subjected to an exploratory factor analysis using principal axis factoring with Promax rotation. The resulting scree plot and eigenvalues suggested that this daily measure was best described by a single factor that accounted for 51% of the total variance. Each item had a significant loading (> .40) on this single factor. We conducted analyses with the unifactorial scale as well as using the three subscales suggested by Treynor and colleagues (2003) and found that the findings did not substantively differ; thus we present out findings only for the single scale. Cronbach’s alpha was .91 for this measure.

Procedure

Participants were recruited from classrooms, study hall, or the school’s guidance office. Following informed consent, or assent for students under age 18, participants were asked to complete a packet of self-report questionnaires during free-time at school (i.e. study hall or homeroom) including the CESD, PANAS, LEQ-A, RSE, DAS, RSQ, ARS, Co-rumination Questionnaire, QRI and demographic information. One hundred and thirty participants completed this initial study, for which they were compensated $5 for participation. Each participant was invited to take part in an internet-based daily diary survey for the next seven days upon completion of the initial study, which included questions about daily stressors, affect, and co-rumination. One hundred and one participants agreed to take part in the daily study. Using a designated research computer
located in the school guidance department, or from the privacy of their own homes, students were directed to a website for an internet-based survey program, and instructed to complete the surveys on consecutive days. In the event of limited computer access, participants were given paper-and-pencil surveys. In an effort to minimize attrition, researchers delivered reminders to participants to complete the surveys through email, text-message, and study hall announcements. Compensation was provided up to $15 for completing the daily surveys, and as an added incentive, students completing five of the seven days were entered into a raffle to win an Apple iPod shuffle, with two chances to win with six days completed and three for all seven days completed.

**Analytic Plan**

Lagged effects multilevel modeling was used to investigate the present hypotheses. In this application of hierarchical linear modeling (HLM), predictors of daily negative affect are examined. Each day’s affect score is predicted by the previous day’s affect score as well as relevant predictor variables that themselves vary daily. As such, these models examine the degree to which daily fluctuating variables predict subsequent changes in negative affect, controlling for the previous day’s affect. Equation 1 below provides an example of such a model. In this equation, sadness (at time t) is predicted by the previous day’s sadness (at time t-1) as well as the previous day’s level of rumination. This method predicts daily fluctuations in affect rather than fitting a trajectory of change across the week, as we do not anticipate a consistent trajectory of change in affect in this
sample. Additionally, HLM has been shown to be robust to missing data, though to be conservative, we only included participants who contributed at least three days’ worth of data.

Separate lagged effects models were run to test whether and to what extent stress and co-rumination predicted changes in negative affect. Separate models for tests of main effects and interactive effects with stress are presented. These were done separately, as incremental, stepped approaches to multilevel modeling have not yet been developed. The model is described below:

\[
Sadness_{it} = \pi_{0i} + \pi_{1i} Sadness_{i(t-1)} + \pi_{2i} Corumination_{i(t-1)} + \pi_{3i} Age_i \\
+ \pi_{4i} Gender_i + \pi_{5i} Time_{it} + \zeta_{0i} + \epsilon_{it}
\]

In this equation, \( Sadness \) denotes an individual’s negative affect score, with \( Sadness_{i(t-1)} \) indicating the negative affect score at time \( t-1 \) for person \( i \). Co-rumination denotes an individual’s co-rumination score.

**Power analysis:** To determine appropriate sample size for proposed study hypotheses, a-priori analysis for sample size using G Power 3.0.10 (Faul, Ernfelder, Lang & Buchner, 2007) indicates that for detection of a medium effect size with 80% confidence at alpha =.05, a projected sample size of 55 participants is needed.
RESULTS

Preliminary analyses

Of the total sample, 78 adolescents met inclusion criteria by contributing at least three days of data. Data were screened by timestamp for compliance with daily instructions, allowing each participant one electronic submission per day. Participants who completed measures on at least three days were included in the present study. Participants completed a mean of 5.33 (SD=1.95) days, which was not significantly associated with any study variables (p’s>.52). We also examined, in the same HLM models, the possibility that participation in this study may be related to study variables. Time varying study variables were used as dependent variables and time (to measure reactivity or differences between early and late assessments) and number of days completed (study attrition) were used as predictors. In these models, time was associated with less co-rumination ($\pi = -.14, z=-3.54, p=.00$), stress ($\pi = -.06, z=-3.88, p=.00$), and fear ($\pi = -.15, z=-2.40, p=.02$), but not with sadness ($\pi = -.02, z=-.25, p=.80$) or hostility ($\pi = -.09, z=-1.68, p=.09$). Thus, time was entered as a covariate in all subsequent analyses. Finally, controlling for gender, age, and time, stress on the previous day did not predict an increase the following day in sadness ($\pi = -.11, z=-0.34, p=.75$), hostility ($\pi = -.02, z=-0.09, p=.93$), or fear ($\pi = .05, z=0.21, p=.84$).
Initial analyses examined potential differences on study variables with respect to gender, age, and ethnicity. These were conducted by examining each of these time-varying measures as an outcome in separate HLM models, with these demographic variables as predictors. Gender was not associated with stress ($\pi = .09, z = 0.71, p = .48$), sadness ($\pi = 1.15, z = 1.52, p = .13$), fear ($\pi = .57, z = 0.95, p = .34$), or hostility ($\pi = .59, z = 1.25, p = .21$). Age was not associated with daily co-rumination ($\pi = -.08, z = -.58, p = .57$), stress ($\pi = -.03, z = -.68, p = .50$), sadness ($\pi = -.33, z = -1.31, p = .19$), fear ($\pi = -.37, z = -1.90, p = .06$), or hostility ($\pi = -.30, z = -1.91, p = .06$). However, due to the large gender and developmental differences observed in risk for depression and anxiety (Lewinsohn et al., 1998; Nolen-Hoeksema & Girgus, 1994), age and gender were included as covariates in all subsequent models.

Due to the very low percentage of minorities in the sample, it was not possible to statistically compare individual ethnic groups. However, we explored ethnic differences by recoding the data as non-minority (Caucasian) versus minority (i.e., African-American, Asian-American/Pacific Islander, Native American/Alaskan Native, Hispanic/Latino(a), Biracial, other). Minority status was not associated with daily co-rumination ($\pi = -.39, z = -0.56, p = .58$), stress ($\pi = -.20, z = -0.90, p = .37$), sadness ($\pi = -.67, z = -0.50, p = .62$), fear ($\pi = -.81, z = -0.78, p = .43$), or hostility ($\pi = -.14, z = -16, p = .87$).
H1: Co-rumination predicting subsequent days’ levels of negative affect

In the first set of analyses, controlling for gender, age, and time, co-rumination on the previous day did not predict changes in sadness ($\pi = .19, z=1.66, p=.096$), fear ($\pi = .11, z=1.35, p=1.78$), or hostility ($\pi = .004, z=0.06, p=.95$). Results are presented in Table 1.

H2: Co-rumination X Stress interaction

Next, we investigated whether the presence of stressful events was related to daily affective change. Controlling for gender, age, and time, daily co-rumination and stress interacted to predict changes in daily sadness, ($\pi =.258, z=2.21, p=.027$), fear ($\pi =.23, z=2.92, p=.004$), and hostility ($\pi =.15, z=2.06, p=.039$). Results are presented in Table 2.

We conducted simple slope analyses, examining the effects of co-rumination on affect under the conditions of either low stress (no stressors reported) and high stress (one standard deviation above the mean). In the absence of stressful events, co-rumination was not related to daily affective changes for sadness ($\pi =-.02, z=-.14, p=.89$), fear ($\pi =-.05, z=-0.46, p=.65$), or hostility ($\pi =-.11, z=-1.19, p=.236$). However, under high stress, co-rumination was significantly predictive of increases in sadness ($\pi =.32, z=2.50, p=.012$), fear ($\pi =.26, z=-3.02, p=.003$), but not hostility ($\pi =.09, z=1.15, p=.25$). These interactions and the plot of these simple effects can be seen in Figures 1-3.
H3: Tests of incremental utility

First, rumination predicted changes in negative affect for each sadness ($\pi = .12$, $z=2.31$, $p=.021$), fear ($\pi = .143$, $z= 4.14$, $p=.00$), and hostility ($\pi = .08$, $z=2.68$, $p=.007$). Results are listed in Table 3. Next, we found that when controlling for rumination in addition to gender, age, and time, co-rumination on the previous day did not predict changes in sadness, hostility or fear (all $p$’s>.20), which presented no change to our main effects. Finally, to test whether co-rumination accounts for the variance in affective changes over that of rumination, we placed rumination into the diathesis stress model previously tested with co-rumination. As a result, co-rumination by stress interaction was still a significant predictor of changes in negative affect. Thus, co-rumination demonstrated incremental validity over rumination in predicting sadness ($\pi = .279$, Table 1: Co-rumination predicting subsequent days’ levels of negative affect

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Note. * $p<.05$, ** $p<.01$, ***$p<.001$
Table 2: Co-rumination X Stress interaction

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<td>.04</td>
<td>.43</td>
</tr>
<tr>
<td>Affect$_{t-1}$</td>
<td>.42</td>
<td>6.81***</td>
<td>.22</td>
<td>3.54***</td>
<td>.52</td>
<td>9.01***</td>
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<tr>
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<td>-.14</td>
<td>-.11</td>
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<td>-2.05*</td>
<td>-.84</td>
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<td>-2.17*</td>
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<td>.26</td>
<td>2.21*</td>
<td>.15</td>
<td>2.06*</td>
<td>.23</td>
<td>2.92**</td>
</tr>
</tbody>
</table>

*Note. * p<.05, ** p<.01, ***p<.001
Figure 1. Co-rumination X Stress predicting changes in sadness

Figure 2. Co-rumination X Stress predicting changes in hostility
Figure 3: Co-rumination X Stress predicting changes in fear

Note. n.s. = non-significant; * p < .05

...results are listed in Table 4.

**H4: Gender differences in co-rumination**

Next, we tested for gender differences in daily levels of co-rumination. In a multilevel model controlling for age and time, gender was not associated with daily co-rumination (π = .06, z = 0.16, p = .88). Females reported an average co-rumination of 5.53, whereas males reported an average of 5.47.
H5: Gender moderation

Six additional models were specified, the first set testing 2-way interactions between co-rumination and gender (predicting sadness, hostility, and fear in separate models), and the next set testing 3-way interactions of gender, co-rumination, and stress, controlling for gender, age, and time. Tests of 2-way interactions yielded non-significant results for predicting sadness, fear, and hostility (p’s>.53). Similarly, tests of 3-way interactions revealed non-significant results for sadness, fear, and hostility (p’s>.09).
Table 3: Co-rumination predicting subsequent days’ levels of negative affect, controlling for rumination

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<tr>
<th></th>
<th>Sadness</th>
<th></th>
<th></th>
<th>Hostility</th>
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<th></th>
<th>Fear</th>
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<tr>
<td></td>
<td>$\pi$</td>
<td>$z$</td>
<td>$\chi^2$</td>
<td>$\pi$</td>
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<td>$\chi^2$</td>
<td>$\pi$</td>
<td>$z$</td>
<td>$\chi^2$</td>
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<tr>
<td>Cons</td>
<td>6.18</td>
<td>1.91†</td>
<td>3.70</td>
<td>1.77</td>
<td>5.36</td>
<td>2.46*</td>
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</tr>
<tr>
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<td>1.11</td>
<td>.80</td>
<td>2.27*</td>
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<td>.64</td>
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<tr>
<td>Age</td>
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<td>-1.39</td>
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<td>3.93***</td>
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<td>6.20***</td>
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<td>2.31*</td>
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<td>2.68**</td>
<td>.14</td>
<td>4.14***</td>
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</table>

* $p<.05$, ** $p<.01$, *** $p<.001$, †=.056

Note.
<table>
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<td>Age</td>
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<td>Affect&lt;sup&gt;-1&lt;/sup&gt;</td>
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<td>5.36***</td>
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<td>-.65</td>
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<td>3.01**</td>
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<td>2.1*</td>
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Note: *, p < .05; **, p < .01; ***, p < .001.
DISCUSSION

The present study borrowed from the depressive rumination literature to investigate the negative costs associated with daily reports of both co-rumination and stress. We investigated the main and interactive effects of daily co-rumination and stressful life events on sadness, hostility and fear among adolescents. We also tested whether co-rumination demonstrated incremental utility above that of depressive rumination. Finally, we examined potential gender differences and gender moderation of the effects of co-rumination.

Main effects of co-rumination and stress were not observed; neither co-rumination nor stress alone predicted increases in the following day’s negative affect. Our findings support that engaging in co-rumination may not, by itself, be related to changes in sad, hostile or fearful feelings. That is, the data suggest that simply co-ruminating with others does not lead to negative affective outcomes. However, analyses revealed an interactive effect of co-rumination and stressful life events. Specifically, co-rumination was maladaptive in the presence of stress, but adaptive or neutral in the absence of stress. Thus, our investigation supports this diathesis-stress approach which posits that when adolescents co-ruminate on stressful life events, they experience increases in negative affect. However, simply experiencing stressful events may not be enough to lead adolescents to experience changes in their negative affect over the course of the week.
Likewise, simply co-ruminating with a friend without having suffered a stressful event may also not be enough to lead negative outcomes. This diathesis-stress model of co-rumination may explain why we have seen some discrepancy in the literature regarding the prediction of internalizing symptoms.

Next, our data demonstrated that co-rumination predicts negative affect, with incremental utility, above rumination. This finding suggests that depressive rumination and co-rumination are similar, but not redundant, processes. Our data support Calmes & Roberts’ (2008) findings that the two are distinct constructs, and are in support of Stone and colleagues’ (2010; 2011) evidence of co-rumination as a unique predictor of depression. While rumination and co-rumination are common in the excessive processing of events and negative emotions, co-rumination, unlike rumination, also involves the excessive processing of stressors that happen to other people. That is, co-rumination may reflect a mechanism for the depression contagion effect, in which one individual’s depressed mood may actually influence depressive symptoms in another (see Joiner & Katz, 1999, for a meta-analytic review. The disclosure of negative events and emotional distress characteristic of co-rumination between two individuals may produce this contagion effect, as a trade-off of positive relationship quality. Thus, distinguishing co-rumination from depressive rumination will allow for such study of the risk for depression at the inter-individual level.

Using a modification of Rose’s co-rumination questionnaire instructions, male and female adolescents of this sample did not report differences in mean levels of co-rumination throughout the week. This stands in contrast to much of the current literature
(Rose et al., 2007; Rose, 2002; Stone et al., 2011). The most likely explanations for this important difference concern the modification of the instructions for the co-rumination questionnaire. First, our instructions allowed participants to report on co-rumination that occurred in the context of any close relationship regardless of the gender of their confidant. As prior research has suggested that gender differences in co-rumination are only observed in same-sex friendships, but not in romantic, parental, or roommate-based relationships (Calmes & Roberts, 2008), this is perhaps not surprising. In other words, males appear just as likely to co-ruminate as females, but not with their male friends. As such, it is possible that previously repeated gender differences in co-rumination have been observed because prior studies have exclusively focused on co-ruminating within same-sex friendships. A second reason our findings may differ from previous studies is because we did not restrict participants to always reporting about co-rumination within a single relationship. In our investigation, a single individual was able to report on co-rumination that occurred with multiple confidants. It is possible that males and females differ with respect to their tendency to co-ruminate in single versus multiple relationships. Finally, in our study, we assessed daily actual levels of co-rumination rather than asking participants to self-report regarding their general tendencies to co-ruminate. It is possible that males underestimate (or females overestimate) their actual tendencies to co-ruminate. Further, this could reflect differences in gender role socialization, with males being less willing to acknowledge tendencies to co-ruminate.

Additionally, contrary to one prior study (Rose et al., 2007), in which co-rumination was predictive among females but not males, gender did not interact with co-
rumination in the prediction of negative affect. Rather, co-rumination was predictive of changes in negative affect for both males and females. Our findings may differ from those of Rose and colleagues (2007) due to the measurement issues just described. However, we noted that multiple other investigations have found that gender did not moderate the effects of co-rumination (Stone et al., 2010; Stone et al., 2011). As such, with respect to interactive effects, our results are consistent with the majority of the literature.

Strengths & weaknesses, future directions:

As one of the first longitudinal studies, and the only known diathesis-stress model of co-rumination, our findings contribute to the understanding of co-rumination among adolescents. These findings highlight the importance of considering the influences, including potential negative influences, of sharing and discussing the negative aspects of an event with another, as a form of social support. While other investigations of co-rumination have supported its role as a double-edge sword that both promotes relationship quality but also poses a risk for depression and fear, our findings specify that in the absence of stressful events, co-rumination may not present immediate consequences.

Additionally, the present investigation is the first study to modify the instructions of Rose’s (2002) co-rumination questionnaire. In doing so, we allowed equal opportunity for male and female adolescents to report co-rumination with anyone close to them,
regardless of that individual’s gender. We also gathered daily reports of actual co-rumination to determine how much the adolescents were co-ruminating, rather than asking adolescents to describe their tendencies to co-ruminate. Lastly, participants were not limited to reporting co-rumination within one specific friendship, but rather, were asked to report on any co-ruminating they took part in throughout each day. This new approach was chosen in an effort to eliminate any potential measurement biases to allow for the best possible measure of the quantity of co-rumination in which our participants engaged, regardless of the relationship in which these conversations occurred.

However, the present study is limited in that we rely on self-report data. Additionally, we do not account for co-rumination in response to particular events. It is possible, for example, that co-ruminating about a friend’s stressful event may present a different outcome than would co-ruminating about one’s own stressor. Furthermore, it is possible that the detrimental effects of co-rumination may be moderated by the nature of the particular stressor (e.g., interpersonal versus achievement-oriented stressors). Thus, future investigations may consider accounting for such qualities of co-ruminative content in seeking to further explain the effects of social support-seeking.

Additionally, the present study did not investigate the potentially positive effects that prior research has shown. In addition to the positive relationship quality, it is important to understand any other benefits adolescents experience through the process of co-ruminating. Furthermore, the present study does not investigate whether other forms of social support seem to be more adaptive during times of stress than co-rumination, such as problem-solving, or distraction, and thus, should be investigated in more detail.
Finally, this study focuses on negative affect which may or may not translate into pathological symptoms. The PANAS-X fear subscale, for example, taps general feelings of anxiety, with words such as “nervous”, “afraid”, “scared”, “worried”, while anxiety disorders are highly heterogeneous. Thus, future studies should potentially examine the effects of co-rumination on specific affective symptoms of psychological disorders (e.g., worry, fear). Given the state of this body of literature, it may be premature to begin such an undertaking, but as we continue to investigate co-rumination, research may begin to focus more narrowly on co-ruminative coping in the context of various specific pathologies. Implicitly, co-rumination involves discussing problems with another, which may amplify the cognitive processing of an event by involving a socially evaluative component in a high-quality friendship, and hence, social anxiety may be of particular interest for such research.

Although the present study investigates the negative effects associated with daily co-rumination, it is important to note that positive effects have also been found in association with co-rumination, specifically, friendship quality. The notion of this concept as related to positive effects of social support in conjunction with risk for emotional adjustment raises interesting questions about risk for affective disorders, especially a developmental stage in which friendship intimacy and disclosure are increasing in importance. The present findings weigh in on some of the conflicting results within this small body of literature by providing evidence for the double edged sword effects prior research has observed co-rumination in a diathesis-stress model. With its association to positive friendship qualities, it may be an adaptive form of sharing
and discussing one’s problems with another, if outside the context of present life stressors and daily hassles. Thus, it does not appear to present a risk in and of itself, but rather, as a first-line defense in response to stressful events, adolescents may be better suited to engage in more adaptive forms of coping. Additionally, the present study supports the modification of Rose’s co-rumination questionnaire in assessing risk for internalizing symptoms. Overall, the present study adds to the growing body of co-rumination literature by addressing some of the inconsistent findings of prior research, but also highlights several questions for further investigation.
REFERENCES


doi:10.1007/s10608-008-9200-3


*Psychological Bulletin, 98*(2), 310-357. doi:10.1037/0033-2909.98.2.310


*Behavioral Research Methods, 39*(2), 175-191.


APPENDICES

Information Form

For each item below, please circle or fill in the answer that best applies to you.

1. What is today's date (DD/MM/YR): ____________

2. What is your birth date (DD/MM/YR): ____________

3. What grade are you in?
   a. 9th
   b. 10th
   c. 11th
   d. 12th

4. What is your gender?
   a. Female
   b. Male

5. What is your ethnicity of origin?
   a. Caucasian/White
   b. African American/Black
   c. Asian American/pacific Islander
   d. Native American/Alaskan Native
e. Hispanic/Latino(a)

f. Biracial

g. Other (please specify:_________________)

6. What is the highest level of education obtained by your mother?
   a. Doctoral degree
   b. Masters degree
   c. 4-year college degree
   d. 2-year college degree
   e. Some college
   f. Trade school
   g. High school
   h. Part of high school
   i. 8th grade
   j. Less than 8th grade

7. What is the highest level of education obtained by your father?
   a. Doctoral degree
   b. Masters degree
   c. 4-year college degree
   d. 2-year college degree
   e. Some college
   f. Trade school
   g. High school
   h. Part of high school
   i. 8th grade
   j. Less than 8th grade

8. What is your current paid work-status?
   a. Part-time
   b. Full-time
   c. I currently do not work (skip to question 10)
9. How many hours a week do you conduct paid work?
   a. 0-10 hours
   b. 11-20 hours
   c. 21-30 hours
   d. 31-40 hours
   e. 41 or more hours

10. Are you currently in a romantic relationship?
   a. Yes
   b. No (skip question 12)

11. How long have you been in your current romantic relationship?
   _______years ________months _______weeks _________days

12. Has your family recently experienced any of the following:
   a. job loss of a parent
   b. home foreclosure

13. Do you have any siblings? Yes No
   a. How many siblings do you have? ______
      - How many are biological siblings? ______
      - How many are step siblings? ______
      - How many are half siblings? ______
      - How many are adopted? ______
         Domestically adopted? ______
         Internationally adopted? ______
14. On average, how many hours per week do you spend on each of the following activities:

a) ________ Text messaging/chatting online/talking on the phone
b) ________ Watching TV/ playing video games/ surfing the web/ listening to music
c) ________ studying or reading
d) ________ spending time with family
e) ________ volunteering or religious activities
f) ________ sports team/cheerleading
g) ________ non-team exercise
h) ________ performing arts/school clubs
i) ________ working a job/babysitting
j) ________ hanging out with friends/partying
k) ________ spending time alone
l) ________ spending time with a boyfriend/girlfriend (romantic partner)

Daily Survey Questions

What is your study ID? ____________________

What day of the study is this survey for? (circle one only)

Day 1
Day 2
Day 3
Day 4

Day 5

Day 6

Day 7

What is today’s date? ________________________________
Stress

How many major stressful events occurred in your life today? (past 24 hours)

____ (0) None
____ (1) One
____ (2) Two
____ (3) Three or more

How much did this (these) stressful events upset you? (Skip question if no major events occurred)

____ (0) Not at all
____ (1) Somewhat
____ (2) Moderately
____ (3) A great deal

Thinking about the worst thing that happened to you, what did it involve? (Skip question if no major events occurred)

____ (0) School/Work
____ (1) Girlfriend/Boyfriend (romantic relationship)
____ (2) Friendships
____ (3) Possessions/Money
____ (4) Health
____ (5) Sports/clubs
Rumination

How frequently have you done each of the following today: (past 24 hours)

(0) Not at all
(1) Occasionally
(2) Often
(3) All the time

1. Thought “Why do I always react this way?” 0 1 2 3
2. Thought “What am I doing to deserve this?” 0 1 2 3
3. Thought “Why do I have problems other people don’t have?” 0 1 2 3
4. Thought “Why can’t I handle things better?” 0 1 2 3
5. Analyzed recent events to try to understand your feelings 0 1 2 3
6. Went away by yourself and thought about why you felt how you did 0 1 2 3
7. Wrote down what you are thinking and analyzed it 0 1 2 3
8. Analyzed your personality to try to understand why you are depressed 0 1 2 3
9. Tried to understand yourself by focusing on your depressed feelings 0 1 2 3
10. Thought about how sad you feel 0 1 2 3
11. Isolated yourself and thought about the reason you feel sad

12. Thought about all your shortcomings, faults, and mistakes
To what extent did you feel _______ today? (past 24 hours)

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<th></th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td></td>
<td>very slightly</td>
<td>a little</td>
<td>moderately</td>
<td>quite a bit</td>
<td>extremely</td>
</tr>
<tr>
<td>or not at all</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

1. sad  
2. blue  
3. downhearted  
4. unhappy  
5. lonely  
6. nervous  
7. afraid  
8. scared  
9. worried  
10. angry  
11. hostile  
12. irritable  
Co-rumination

How much did you do each of these today with a close friend or family member? (past 24 hours)

(1) Not at all
(2) A little
(3) Quite a bit
(4) Most of the day

1. We talked in great detail about the problems that we have 1 2 3 4

2. We talked about how sad or mad our problems make us feel 1 2 3 4

3. We talked about old problems even though nothing new had happened. 1 2 3 4

4. We talked about other bad things that may happen as a result of our problems. 1 2 3 4