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When Does Co-Rumination Facilitate Depression Contagion in Adolescent Friendships? Investigating Intrapersonal and Interpersonal Factors

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Abstract

Objective: Research supports the notion that adolescents' mental health is impacted by peers via contagion processes. A growing area of interest has been how co-rumination may influence depressive symptoms within friendships. The current study examined particular conditions under which co-rumination is especially likely to facilitate depression contagion.

Method: Participants were adolescents ($N=480$, 49% female, M age = 14.6 years, 59.5% European American) paired in friendship dyads and assessed over 9 months. Characteristics of the adolescent (personal distress), of the friend (excessive reassurance seeking), and of the friendship (friendship quality) were considered.

Results: Moderated mediation analyses indicated that co-rumination facilitated depression contagion only under conditions of adolescents' high personal distress, friends' high excessive reassurance seeking, and high positive friendship quality.

Conclusions: This research underscores the importance of attending to how and under what conditions depression contagion occurs within friendships in order to support adolescents' positive social and emotional development.

Keywords

depression contagion; co-rumination; adolescence; friendship

A sizeable body of research supports the notion that friends play a central role in adolescents' emotional development (Vitaro, Boivin, & Bukowski, 2009). Many studies suggest that adolescents' mental health can be directly impacted by the mental health of their friends via peer influence (i.e., contagion; see Brechwald & Prinstein, 2011). A growing area of interest has been whether and how depression contagion occurs within adolescent friendships (e.g., Prinstein, 2007; Stevens & Prinstein, 2005). The current study extends this important line of inquiry by examining conditions under which contagion is

especially likely to occur in a large sample of adolescent friendships. Better understanding peer influence in depression is essential to our ability to leverage this important developmental context to support adolescents' mental health.

Depression is a critical public health concern (Knifton & Quinn, 2013), and adolescents are at particularly high risk for developing depressive symptoms (see Hilt & Nolen-Hoeksema, 2009). Multiple biological, cognitive, and behavioral etiological factors have been implicated in the development of depressive symptoms (see Gotlib & Hammen, 2014; Hyde, Mezulis, & Abramson, 2008). One area of research that has garnered significant interest is interpersonal influences on the development of depression in adolescence. Specifically, increasing attention has been paid to the role of peer influence (Prinstein & Dodge, 2008). Research suggests that many forms of maladjustment (e.g., externalizing problems, body image issues) are subject to peer influence within friendships, a process that has been referred to as contagion (Brechwald & Prinstein, 2011). Similarly, several studies have documented depression contagion, namely that friends' depressive symptoms predict increases in adolescents' own depressive symptoms over time (e.g., Prinstein, 2007; Schwartz-Mette & Rose, 2012; Stevens & Prinstein, 2005).

This research on interpersonal contributions to depression fits within the strong conceptual framework of Coyne's interpersonal theory of depression (1976) which posits that one risk factor for developing depression is interaction with a depressed person (i.e., contagion). The theory points to a cyclical pattern wherein difficulties in relationships give rise to depression, being depressed leads to the development of aversive interpersonal behaviors, and in turn, these behaviors result in increased interpersonal difficulties. Building on this theory, others have noted that depressive symptoms, aversive interpersonal behaviors, interpersonal rejection, and depression contagion are all components of the interpersonal context of depression and are all mutually influential (Joiner & Timmons, 2009). These scholars have called for more research examining these interrelations and mechanisms of influence (Joiner & Timmons, 2009).

Beyond documentation of peer influence on depressive symptoms within adolescent friendships, researchers have more recently sought to identify mechanisms of contagion, or the processes by which friends' depressive symptoms may predict increases in adolescents' own symptoms over time. Surprisingly, despite long-standing assertions regarding the fundamental importance of understanding how contagion occurs (e.g., Joiner, Alfano, & Metalsky, 1992; Joiner, 1994; Stevens & Prinstein, 2005), only one study has documented a mechanism for depression contagion in adolescence. In a study of 548 youth, co-rumination was found to mediate contagion of depressive symptoms between friends (Schwartz-Mette & Rose, 2012).

Co-rumination is characterized by excessively discussing and rehashing problems, speculating about problems, and focusing on negative affect with a conversation partner (Rose, 2002). While the initial work identifying co-rumination as a mediator was promising, it was important for future studies to replicate this finding. The current study seeks to replicate the mediating effect of co-rumination in a large sample of adolescent friends. As with Schwartz-Mette and Rose (2012), the current study included two time points (i.e.,

friends' depression and co-rumination assessed at Time 1). Although the best test of mediation would be a study with three time points, past research does indicate that depression predicts increased co-rumination over time (Rose, Carlson, & Waller, 2007), and the current study lays the ground work for longer-term prospective studies that fully establish temporal ordering of variables.

While research on processes (mediators) that may explain depression contagion has been scarce, there is important existing work documenting moderators of depression contagion, or conditions under which contagion effects are especially likely to occur. For example, Prinstein (2007) found that girls' higher levels of social anxiety were associated with greater vulnerability to depression contagion. Having friends that were perceived as more popular was associated with greater susceptibility to depression contagion for boys (Prinstein, 2007). Others have found that depression contagion effects are exacerbated in youths' closest friendships (Giletta et al., 2011; Giletta et al., 2012; Stevens & Prinstein, 2005). Importantly, this work demonstrates that aspects of the adolescent (e.g., social anxiety), the friend (e.g., popularity), and the friendship (e.g., friendship closeness) may impact the likelihood of depression contagion in particular friendships.

Despite efforts to investigate potential mediators and moderators of depression contagion in adolescence, research has yet to consider ways in which these may operate conjointly to influence depression contagion. Specifically, no studies to date have examined potential moderators of the mediating effect of co-rumination. There may be aspects of the adolescent, friend, or friendship which increase the likelihood that co-rumination will serve as a mechanism of depression contagion. Such information will be useful for increasing specificity in identifying youth at risk for experiencing depression contagion in their friendships.

The current study provides an important extension of past work by testing conditions under which co-rumination may be especially likely to facilitate depression contagion (moderated mediation). It is likely that both intrapersonal and interpersonal characteristics contribute to priming adolescent friendships for contagion. As such, aspects of the adolescent, the friend, and the friendship are considered. Specifically, the adolescent's tendency to experience personal distress (i.e., maladaptive empathy), the friend's excessive reassurance seeking, and positive friendship quality are tested as moderators of the mediating effect of co-rumination on depression contagion.

First, the current study tests whether the mediating effect of co-rumination on depression contagion differs based on the adolescent's tendency to experience personal distress. Personal distress is a maladaptive form of empathy characterized by aversive emotional overarousal in response to the pain or discomfort of others (Davis, 1980). Proclivity to personal distress is theorized to arise from genetic vulnerability to emotion dysregulation and has been empirically linked to internalizing symptoms (see Tone & Tully, 2014 for a review). Excessively talking about problems with friends may be an especially powerful affective trigger for personal distress. If an adolescent is prone to feelings of personal distress when faced with the friend's depressed affect through co-rumination, then this may increase the likelihood of depression contagion.

Next, whether the friend's excessive reassurance seeking exacerbates the mediating effect of co-rumination on depression contagion was considered. Excessive reassurance seeking refers to repetitive requests for assurance from others of one's worth and lovability that persist despite previous provisions of such assurance (Joiner et al., 1992). Past research has revealed that excessive reassurance seeking is associated with depression (Starr & Davila, 2008) and co-rumination (Starr, 2015) and has negative repercussions for interpersonal relationships (Stewart & Harkness, 2015). Although excessive reassurance seeking has been linked to the reassurance seeker's depression and to poorer relationship quality (Prinstein, Borelli, Cheah, Simon, & Aikins, 2005), no identified studies have considered the emotional impact on the relationship partner. When a friend engages in excessive reassurance seeking, it is likely to be emotionally burdensome for the adolescent. As such, co-rumination accompanied by friends' excessive reassurance seeking may yield especially strong depression contagion effects for adolescents.

Finally, co-rumination may elicit particularly strong contagion effects in the context of high positive friendship quality wherein youth are more likely to share intimate thoughts and feelings (Buhrmester & Prager, 1995), experience more emotional closeness (Rose, 2002), and feel more empathy (Smith, 2015; also see Meyer et al., 2013 for a study of adults). Indeed past research has demonstrated that peer influence is strongest in high quality friendships (Urberg, Luo, Pilgrim, & Degirmencioglu, 2003). In particular, studies on depression contagion have indicated that friendship closeness moderates contagion, with the strongest effects in reciprocal and very best friendships (Giletta et al., 2011; Giletta et al., 2012; Stevens & Prinstein, 2005; but see also Prinstein, 2007). The current study provides the first test of whether the mediating effect of co-rumination on depression contagion differs based on the positive quality of the friendship.

The current study also considered the roles of gender and grade. First, mean-level gender and grade differences were tested. Previous studies have found no gender differences in excessive reassurance seeking (see Starr & Davilla, 2008). However, in line with past research documenting gender differences favoring girls for depression (e.g., Hankin, Wetter, & Cheely, 2008; Zahn-Waxler, Crick, Shirtcliff, & Woods, 2006), co-rumination (e.g., Hankin, Stone, & Wright, 2010; Rose, 2002; Schwartz-Mette & Rose, 2012; Smith & Rose, 2011; Stone, Hankin, Gibb, & Abela, 2011), empathy (e.g., Eisenberg, Fabes, & Spinrad, 2006; Smith, 2015; Van der Graaff et al., 2014), and friendship quality (e.g., Rose, 2002; Smith & Rose, 2011), girls were expected to report higher levels of depressive symptoms, co-rumination, personal distress, and friendship quality than boys. Also in line with previous research (Hankin et al., 2010; Smith & Rose, 2011; Stone et al., 2011), youth in middle adolescence (10th grade) were expected to report greater co-rumination in their friendships than youth in early adolescence (7th grade).

Finally, the current study examined whether gender or grade would further impact the relations of interest (e.g., basic, mediation, and moderated mediation models). Previous findings regarding gender effects for depression contagion have been inconsistent (cf., Giletta et al., 2011; Giletta et al., 2012; Prinstein, 2007; Schwartz-Mette & Rose, 2012; Stevens & Prinstein, 2005) and age effects across adolescence have not been tested. As such,

no specific hypotheses were made regarding gender or grade group differences in the basic contagion, mediation, and moderated mediation effects to be tested.

Method

Participants and Procedure

Data for the current study were drawn from a larger project involving adolescents and their same-sex friends (see [Rose, Schwartz-Mette, Glick, Smith, & Luebbe, 2014] for information regarding participant recruitment). A subsample of 482 participants was identified based on the availability of data regarding variables of interest. Of these, one dyad ($n = 2$) was excluded because the participants did not self-identify as friends (see below). The final sample included 480 adolescents (240 dyads) in the seventh and tenth grades (seventh: 112 female, 120 male, M age = 13.03, $SD = 0.40$; tenth: 122 female, 126 male, M age = 16.04, $SD = 0.45$). Participants reported on race: 59.5% European American, 32.5% African American, 6.3% Multiracial, 1% Asian American, and less than 1% each American Indian/Alaskan Native and Pacific Islander/Hawaiian Native. Regarding ethnicity, 3.4% of the sample self-identified as Latino/a.

Adolescents and friends (paired in dyads) attended a lab visit together on a university campus. Members of the dyad were separated and completed a series of questionnaires. One item was used to confirm that the pair were friends. All participants indicated that the adolescent with whom they participated was a friend except in one dyad (one participant in the dyad reported that they were not friends and the other skipped the friendship status item), and this dyad ($n = 2$) was excluded from analyses. Approximately 9 months after the lab visit (Time 1), participants completed a follow-up (Time 2) questionnaire assessment in the lab or via mail.

Missing Data and Data Imputation

Some participants in the sample had missing data. In particular, of the 480 adolescents who participated at Time 1, 333 participated at Time 2. Analyses compared the 333 adolescents who participated at both time points with the 147 youth who participated only at Time 1. The two groups did not differ with regard to Time 1 depressive symptoms, co-rumination, personal distress, or excessive reassurance seeking. Youth who participated at both time points reported higher levels of positive friendship quality than did youth who participated only at Time 1, $t = 2.18$ (282), $p < .05$, but this difference was small [Time 1 and 2 M (SD) = 3.08 (.63); Time 1 only M (SD) = 2.92 (.74), Cohen's $d = .22$]. Additionally, Little's test indicated that any missing data were missing completely at random [MCAR; χ^2 (25823) = 25665.30, $p = .76$]. Imputing missing data was considered a preferable alternative to listwise or pairwise deletion (Allison, 2002; Widaman, 2006), and a multiple imputation procedure was used to impute missing data in Mplus so the full sample of 480 adolescents could be retained and used in all primary analyses.

Measures

Depressive symptoms.—Participants reported on current depressive symptoms by responding to the 20 items of the Center for Epidemiological Studies Depression Scale

(CES-D; Radloff, 1977). Each item was rated on a 4-point Likert scale ranging from 0 *Rarely or none of the time* to 3 *5 to 7 days* reflecting the degree to which each statement was characteristic of participants' experience over the past week. At both Time 1 ($\alpha = .86$) and Time 2 ($\alpha = .90$), each participant received a score for depressive symptoms that was the sum of their responses. The CES-D has been used in community settings with younger and older adolescents (e.g., Garrison, Addy, Jackson, McKeown, & Waller, 1991; Prinstein, Boergers, & Spirito, 2001).

Co-rumination.—Participants rated the 27 items of the Co-Rumination Questionnaire (Rose, 2002) which assess the degree to which respondents rehash and speculate about problems, dwell on negative affect, and encourage mutual problem talk with friends. Each item was rated on a 5-point Likert scale ranging from 0 *Not at all true* to 4 *Really true*. A sample item is “When we talk about a problem that one of us has, we spend a long time talking about how sad or mad the person with the problem feels.” Participants' scores were the mean of their responses at Time 1 ($\alpha = .93$). The Co-Rumination Questionnaire is used with younger and older adolescents in clinical and community samples (e.g., Dirghangi et al., 2015; Waller, Silk, Stone, & Dahl, 2014).

Adolescents' personal distress.—Participants completed the Personal Distress (PD) subscale of the Interpersonal Reactivity Index (IRI; Davis, 1980). The IRI is a measure of empathy with subscales assessing cognitive and affective aspects of empathic responding. The PD subscale was of interest for the current study. This 7-item scale assesses the tendency to become emotionally over-aroused in response to others' distress. An example item is “When I see someone who badly needs help in an emergency, I go to pieces.” Participants indicated how well each item describes them using a 5-point Likert scale ranging from 0 *Does not describe me at all* to 4 *Describes me very well*. Total scores for the measure were calculated as the mean of adolescents' scores at Time 1 ($\alpha = .68$). Past research has demonstrated the internal reliability of the PD subscale (males, $\alpha = .78$; females, $\alpha = .78$), as well as test-retest reliability (males, $\alpha = .68$; females, $\alpha = .76$; Davis, 1980). The PD subscale has been used in community studies of younger and older adolescents (e.g., Hawk et al., 2013).

Friends' excessive reassurance seeking.—Participants responded to a revised version of the Reassurance-Seeking Scale (Joiner & Metalsky, 2001) that was adapted for use with adolescents (Joiner, 1999; Prinstein et al., 2005). The youth version includes four questions that assess the degree to which youth seek reassurance from family and friends. Each item is rated on a 3-point scale ranging from 0 *Not very much* to 2 *Very much*. For the current study, items were personalized such that participants reported specifically on their reassurance seeking behavior with the friend who accompanied them to the lab [e.g., “I always need to ask (friend's name) if (he/she) likes me”, “I always need to ask (friend's name) if (he/she) cares about me”, “Sometimes when I ask (friend's name) if (he/she) likes me, (he/she) tells me to stop asking”, “Sometimes when I ask (friend's name) if (he/she) likes me, (he/she) gets mad”]. Reassurance seeking scores were the mean of friends' responses to the four items at Time 1 ($\alpha = .83$).

Adolescents' reports of positive friendship quality and closeness.—

Participants' rated the 22 positive friendship quality items of Rose's 2002 revision of the Friendship Quality Questionnaire. In this measure, 15 items are taken from the original Friendship Quality Questionnaire (Parker & Asher, 1993). Of these, three items each assessed companionship and recreation, conflict resolution, help and guidance, intimate exchange, and validation and caring. Seven additional items were drawn from measures that assess emotional closeness between friends (Bukowski, Hoza, & Boivin, 1994; Camarena, Sarigiani, & Petersen, 1990). Questionnaires were customized to include the name of each adolescent's friend in each item. Items were rated on a 5-point Likert scale ranging from 0 *Not at all true* to 4 *Really true*. Each participant received a score for positive friendship quality that was the mean of their responses to the items at Time 1 ($\alpha = .93$). This measure has been used with both younger and older adolescents (Rose, 2002; Rose et al., 2014).

Data Analysis

Given that participants were nested within dyads, significant interdependence was observed for each variable: Time 1 depressive symptoms $ICC = .19, p < .0001$; Time 2 depressive symptoms $ICC = .31, p < .0001$; co-rumination $ICC = .33, p < .0001$; personal distress $ICC = .13, p < .01$; excessive reassurance seeking $ICC = .07, p = .05$; positive friendship quality $ICC = .55, p < .0001$. As in past research on contagion within friend dyads (e.g., Schwartz-Mette & Rose, 2012), the current study used the Actor-Partner Interdependence Model (APIM; Kenny, 1996), which accounts for interdependence in data and allows for estimation of effects attributable to the adolescent (i.e., actor effects) and friend (i.e., partner, or contagion, effects)¹. Within a structural equation modeling framework, all APIM models were tested using Mplus Version 7.4. Bootstrap estimates were requested. Fit indices computed for structural equation models included chi-square, the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the root mean-square error of approximation (RMSEA). Smaller values of chi-square and RMSEA ($< .05$) and larger values of CFI and TLI ($> .95$) indicate good model fit (Byrne, 2010, Hu & Bentler, 1999).

Results

Descriptive Statistics and Correlations

Means, standard deviations, and bivariate correlations among all study variables are presented in Table 1. The mean level of depressive symptoms in the current study was similar to mean levels reported in past research with community samples (e.g., Prinstein et al., 2001). Using criteria outlined by Radloff (1977), 23% of the sample was identified as having clinically significant depressive symptoms. There was a significant positive correlation between adolescents' depressive symptoms at Time 1 and Time 2, indicating stability in symptoms over time. Both Time 1 and Time 2 depressive symptoms were significantly and positively correlated with Time 1 co-rumination, adolescents' Time 1 personal distress, and friends' Time 1 excessive reassurance seeking. Also of note, Time 1

¹In each APIM contagion model, a random intercept was estimated, and all other effects were fixed. Depressive symptoms, adolescents' personal distress, friends' excessive reassurance seeking, and adolescents' reports of positive friendship quality were measured at Level 1. Co-rumination, gender, and grade were Level 2 variables.

co-rumination was significantly related to Time 1 positive friendship quality and adolescents' Time 1 personal distress.

Mean-Level Gender and Grade Differences

Multilevel models tested for mean-level gender and grade differences in each variable. Specifically, five separate models were tested in which each variable (Time 1 and Time 2 depressive symptoms, Time 1 co-rumination, Time 1 personal distress, Time 1 excessive reassurance seeking, and Time 1 positive friendship quality) was predicted from gender, grade, and the interaction between gender and grade. Results of these tests are presented in Table 2.

The effect of gender was significant for Time 1 and Time 2 depressive symptoms, such that girls reported higher levels of symptoms than boys at both time points. The effects of gender and grade were significant in predicting co-rumination, whereby girls and 10th graders reported higher levels of co-rumination with friends than did boys and 7th graders, respectively. Gender also significantly predicted personal distress, such that girls reported higher levels of personal distress than did boys. There was a significant interaction between gender and grade in predicting positive friendship quality. Tenth-grade girls reported the highest levels of positive quality, followed by seventh-grade girls, seventh-grade boys, and tenth-grade boys. None of the effects predicting excessive reassurance seeking (gender, grade, interaction) were significant.

Depression Contagion

First, the basic depression contagion model was tested (see Figure 1 Panel A). Adolescents' Time 2 depressive symptoms were predicted from their Time 1 symptoms to control for within-person symptom stability (actor effect). Adolescents' Time 2 depressive symptoms also were predicted from friends' Time 1 symptoms (partner effect). This model had excellent fit [$\chi^2(6) = .10, p = 1.00$; CFI = 1.00; TLI = 1.02; RMSEA = .00]. The actor effect was significant, indicating stability of depressive symptoms ($\beta = .53, p < .0001$). Importantly, the partner effect also was significant, providing evidence of contagion ($\beta = .09, p < .01$).

Multiple group comparisons tested whether the basic contagion model was invariant across gender and grade groups. An unconstrained model (all parameters allowed to vary across groups) was compared to a series of models, each of which contained the constraints of the previous model plus an additional constraint. The models were the structural weights (structural weights, i.e., actor and partner effects, constrained to be equal), structural intercepts (structural intercepts also constrained), structural means (structural means also constrained), structural covariances (structural covariances also constrained), and structural residuals (all parameters constrained to be equal) models. The most parsimonious model that did not differ significantly from the unconstrained model was adopted. Comparisons for gender [$\chi^2(4) = 5.88, p > .05$] and grade [$\chi^2(4) = 1.30, p > .05$] suggested that the structural residuals model (all parameters constrained to be equal across gender and grade) should be adopted, indicating no gender or grade moderation of the basic contagion effect.

Co-Rumination Mediates Depression Contagion

Analyses next tested whether co-rumination mediated depression contagion. Co-rumination was treated as a latent variable indicated by each friends' report of co-rumination with friends (association of adolescents' and friends' reports $r = .32, p < .0001$). The mediation model was identical to the basic depression contagion model except that paths were added from friends' Time 1 depressive symptoms to co-rumination and from co-rumination to adolescents' Time 2 depressive symptoms (see Figure 1 Panel B). Model fit was excellent [$\chi^2(7) = 9.71, p = .21$; CFI = .99; TLI = .98; RMSEA = .03]. The actor effect was significant, indicating stability ($\beta = .48, p < .0001$). Friends' Time 1 depressive symptoms significantly predicted the latent co-rumination variable ($\beta = .26, p < .0001$), which in turn predicted adolescents' Time 2 depressive symptoms ($\beta = .25, p < .0001$). The partner (contagion) effect was reduced to $\beta = .00, (p = .99)$ with co-rumination in the model. The specific indirect effect (IE) was significant [IE = .066; 95% confidence interval (CI): .038, .113], indicating that mediation was significant.

Multiple group comparisons then tested whether the mediation model was invariant across gender and grade groups. Because the mediation model included the latent co-rumination variable, comparison models included the measurement weights model (measurement weights constrained to be equal), measurement intercepts model (measurement intercepts also constrained), the five structural models previously described (see above), and the measurement residuals model (all parameters constrained to be equal). Results suggested that the measurement residuals model best fit the data for comparisons involving gender [$\chi^2(6) = 1.73, p > .05$] and grade [$\chi^2(6) = 2.49, p > .05$], indicating that the mediation model did not differ by group.

Personal Distress, Excessive Reassurance Seeking, and Positive Friendship Quality

The final set of analyses tested whether adolescents' personal distress, friends' excessive reassurance seeking, and/or positive friendship quality moderated co-rumination's impact on adolescents' later depression. Moderated mediation hypotheses were tested by evaluating the significance of conditional indirect effects with appropriate constraints employed for multilevel models (Bauer, Preacher, & Gil, 2006; Preacher, Rucker, & Hayes, 2007). Models testing conditional indirect effects were identical to the mediation model except that two paths were added: a path from the moderator of interest to adolescents' Time 2 depressive symptoms and a path from the interaction variable (product of the latent co-rumination variable and moderator) to adolescents' Time 2 depressive symptoms. Of interest was whether the interaction was significant in each model. See Figure 2 for the model diagram and Figure 3 (Panels A-C) for results.

Analyses first tested the moderating effect of personal distress. The interaction between the co-rumination and adolescents' personal distress was significant, $\beta = .13, p < .05$. The conditional indirect effect of co-rumination was calculated at low (-1 SD) and high (+1 SD) levels of adolescents' personal distress. Analyses indicated that at low levels of personal distress, the conditional indirect effect of co-rumination was not significant (IE = .04; 95% CI: .00, .09). However, under conditions of high personal distress, the conditional indirect effect of co-rumination was significant (IE = .09; 95% CI: .05, .15), suggesting that

adolescents may be more susceptible to contagion via co-rumination in the context of high levels of their own personal distress (see Figure 3 Panel A).

Analyses next tested the moderating effect of friends' excessive reassurance seeking. These analyses were identical to the analyses testing the moderating effect of personal distress except that excessive reassurance seeking was used in place of personal distress in each model. The interaction between the latent co-rumination variable and friends' excessive reassurance seeking was significant $\beta = .08, p < .05$. The conditional indirect effect of co-rumination at low levels of friends' excessive reassurance seeking was not significant (IE = .06, 95% CI: $-.01, .14$). However, the conditional indirect effect of co-rumination was significant at high levels of friends' excessive reassurance seeking (IE = .14, 95% CI: $.04, .26$) suggesting that adolescents may be vulnerable to contagion via co-rumination when their friend is high in excessive reassurance seeking (see Figure 3 Panel B).

Analyses then tested the moderating effect of positive friendship quality. These analyses were identical to the analyses described above except that friendship quality was the moderator of interest. The interaction between co-rumination and Time 1 positive friendship quality was significant $\beta = .12, p < .01$. Examination of conditional indirect effects suggested that co-rumination facilitated contagion only when the friendship was high in positive quality, (IE = .10, 95% CI: $.05, .17$), not when the friendship was low in positive quality (IE = .02, 95% CI: $-.02, .06$). These results suggest that adolescents may be more susceptible to depression contagion via co-rumination when they are in high quality friendships (see Figure 3 Panel C).

Lastly, the potential for the conditional indirect effects to be further moderated by gender or grade was considered. Specifically, each of the six conditional indirect effects at both levels of gender (male, female) and both grade levels (seventh, tenth) was calculated, and the significance of each effect was evaluated. Of the 24 additional conditional indirect effects tested, none were significant indicating that the conditional indirect effects did not differ by gender or grade.

Discussion

The current study provides important new information about depression contagion in adolescent friendships. In a large sample of adolescent friendship dyads, this research sought to replicate the mediating effect of co-rumination for depression contagion, as well as test particular conditions under which co-rumination was especially likely to facilitate contagion effects.

While depression contagion has been established as an important interpersonal pathway to depression in adolescence (Giletta et al., 2012; Prinstein, 2007; Stevens & Prinstein, 2005), very few studies have examined processes by which contagion occurs. To date, only one study (Schwartz-Mette & Rose, 2012) has identified such a process—co-rumination, the dyadic process of excessively discussing problems with friends. Importantly, the current study replicated Schwartz-Mette & Rose (2012)'s initial findings, indicating that co-rumination may help explain depression contagion among friends. Replication in the current

study enhances our confidence that co-rumination plays a significant role in the contagion of depressive symptoms.

More importantly, the current study provides evidence that co-rumination facilitates peer influence on depressive symptoms within friendships only in certain contexts. This research explored intrapersonal and interpersonal conditions under which co-rumination may render adolescents especially susceptible to peer influence within dyadic friendships. While past studies have examined characteristics of the adolescent and the friend, or characteristics of the friendship (e.g., Giletta et al., 2011; Stevens & Prinstein, 2005) that may enable stronger contagion effects, no studies to date had examined the potential for these characteristics to operate conjointly with co-rumination to facilitate contagion within adolescents' friendships. It was hypothesized that aspects of the adolescent (e.g., proclivity to experience personal distress when confronted with others' distress), the friend (e.g., tendency to excessively seek reassurance from the adolescent), and the friendship itself (e.g., high positive quality) would enhance the mediating effect of co-rumination for depression contagion. These hypotheses were supported by study results.

Regarding characteristics of the adolescent, the current study examined whether adolescents' personal distress, or their tendency for their emotions to be negatively activated by others' distress, would enhance the mediating effect of co-rumination on depression contagion. Indeed, co-rumination most strongly predicted increases in adolescents' own depressive symptoms over time for adolescents who reported high levels of personal distress. This suggests that perhaps individuals who are easily triggered by and drawn into others' distress are more susceptible to contagion processes via co-rumination than others whose emotions are more boundaried. This result is in line with previous research which found that youth who co-ruminated with friends were more susceptible to taking on the friend's distress as their own in the form of empathetic distress (Smith & Rose, 2011). Empathetic responses to friends that are exaggerated and emotionally over-involved may be detrimental to adolescents' own well-being. In fact, a recent study found that empathetic distress in youths' friendships was associated with more internalizing symptoms (Smith, 2015).

It could be that there is an optimal level of empathic response in friendships. Too little empathy may not contribute to feelings of close connection among friends and may have negative implications for the relationship (Smith, 2015). Yet results of the current study suggest that too much of an empathic response to others' distress may render individuals particularly susceptible to experiencing an increase in depressive symptoms themselves.

Regarding characteristics of the friend that may enhance co-rumination's role in depression contagion, the current study suggests that adolescents whose friends who are high in excessive reassurance seeking may experience increases in their own symptoms over time. This may be an important finding because it suggests that contagion of depressive symptoms within friendships may not only occur as a result of mere *exposure* to the friends' distress (see discussion of the role of adolescents' personal distress above) but may also be due to adolescents' negative response to friends' irritating behavior. In the context of co-rumination, friends' excessive requests for reassurances from the adolescent that they are truly liked and cared for are likely to elicit fatigue, irritation, and a sense of helplessness in

the adolescent (e.g., see Swann & Bosson, 1999). Adolescents may initially indulge these requests and provide assurance to the friend. However, when their assurances continually are met with repeated requests for additional assurances, adolescents may experience an increase in negative affect because the process is tiring, aversive, and piques feelings of low self-efficacy regarding their ability to support and comfort a friend in need.

Regarding positive friendship quality, the current study presents new evidence that co-rumination may predict increases in adolescents' depressive symptoms under conditions of high positive friendship quality. Although past research demonstrated that peer influence regarding substance use was strongest in high quality friendships (Urberg et al., 2003), studies of depression contagion (Giletta et al., 2011; Giletta et al., 2012; Stevens & Prinstein, 2005) have only examined level of friendship closeness (i.e., whether the friendship was reciprocal or a very best friendship) as a proxy for friendship quality and have not assessed positive friendship quality directly. The only exception is a past study by Prinstein (2007) which found that depression contagion was more likely to occur in lower quality friendships; however, this finding emerged for boys only and co-rumination was not considered. In contrast, our findings illuminate the additional role of co-rumination and indicate that co-rumination mediates depression contagion only in friendships characterized by high positive quality.

It could be that high quality friendships wherein youth feel very close to and supported by one another initiate depression contagion, but that once contagion has occurred, the friendship difficulties typically experienced by depressed youth (Rose et al., 2011) become apparent. Adolescents who are depressed may withdraw from the friendship or engage in aversive behaviors such as conversational self-focus (Schwartz-Mette & Rose, 2016) or negative feedback seeking (Borelli & Prinstein, 2006), which ultimately may lead to the demise of the friendship. This may set in motion a cycle of increased depression symptoms, as friendship dissolution is associated with loneliness and sadness among adolescents (Bowker, 2011). Future research should incorporate additional assessments (e.g., third time point) in order to appropriately test the hypothesis that depression contagion may ultimately lead to friendship difficulties.

Interestingly, the current study did not provide evidence that the mediating effect of co-rumination or the additional moderated effects were stronger for females versus males, or for older versus younger adolescents. These results are consistent with past studies of depression contagion finding nonsignificant age (Giletta et al., 2012; Schwartz-Mette & Rose, 2012) or gender (Schwartz-Mette & Rose, 2012; Stevens & Prinstein, 2005; c.f. Giletta et al., 2012) moderation effects, and of co-rumination's mediating effect on depression contagion (Schwartz-Mette & Rose, 2012), which also found no significant gender or developmental differences. Thus, despite the fact that gender differences favoring girls often are found for many of the variables involved (e.g., depression, positive friendship quality, co-rumination), it may be that contagion operates similarly for both boys and girls.

Limitations of this research are noted. First, although the current research investigated multiple variables thought to magnify the mediating effect of co-rumination on depression contagion, there may be additional variables not considered in this study that serve as risk

factors. For example, youth with identity disturbance tend to be chameleon-like, taking on the mannerisms and behavior of those with whom they are interacting (Westen, Betan, & Defife, 2011). These youth may take on a friend's depressed mood, perhaps in an effort to be liked. Future work on depression contagion could test whether impaired identity development or poor self-concept increases youths' susceptibility to peer influence.

In addition, the current study involved only a subsample with clinically significant depressive symptoms. Future research should investigate contagion processes in larger clinical samples. Understanding whether and how co-rumination corresponds to the onset of clinical depression will have implications for prevention and intervention efforts. Moreover, depression contagion potentially may operate differently in the friendships of clinically depressed youth. Perhaps friends with depressive disorders find it more difficult to engage in the reciprocal interactions characteristic of co-rumination and instead withdraw socially. Adolescents also may be more apt to dissolve friendships with clinically depressed youth, thereby curbing further opportunities to co-ruminate. This may have negative effects for the depressed friend, but may in part protect the adolescent from increased depression over time.

Relatedly, the current study examined factors that may enhance co-rumination's effect on contagion and did not evaluate resilience factors. Future research should address this. Youth with more optimal levels of empathy and adaptive emotion regulation strategies may fare better with regard to contagion. These attributes may enable adolescents to avoid becoming enmeshed in friends' distress by actively regulating any distress that may arise in themselves.

Finally, the inclusion of only two time points in the current study is an important limitation that highlights the need for longer-term prospective studies. A study with three or more time points could more fully establish temporal ordering of variables in the mediation model and could better evaluate the potential for bidirectional effects. Interpersonal theories of depression describe transactional processes (e.g., relationship problems lead to depression which leads to relationship problems and/or depression contagion, etc.) but few studies have tested this.

Despite the need for future research, the current study has important clinical implications for adolescents with depressed friends. Results shed light on potential "red flags" that may indicate an adolescent is at enhanced risk for experiencing depression contagion in close friendships. Adolescents high in personal distress would benefit from learning adaptive emotion regulation strategies to help set healthy boundaries between friends' emotions and their own. Additionally, adolescents may benefit from psychoeducation about depression-related behaviors such as excessive reassurance seeking. Knowing that it is not their "fault" that a depressed friend continues to experience distress, despite a great deal of reassurance, may help attenuate any unwarranted feelings of responsibility or guilt that may arise.

It may be more difficult, however, to target positive friendship quality as a point of intervention. Along with conferring risk for depression contagion, co-rumination is likely to also encourage feelings of closeness and support within friendships (Rose, 2002). A goal for interventions, then, may be to teach ways of balancing problem talk with positive activities

to help youth avoid a perseverative focus on negative affect. It also may be possible to harness and redirect youths' perseverative focus towards more positive topics. Recent findings indicate that the experience of empathetic joy (i.e., sharing in a friend's positive emotions) is associated with fewer depressive symptoms (Smith, 2015). As such, interventions may work to encourage co-ruminating youth to revisit their joys and successes with friends as they would their problems.

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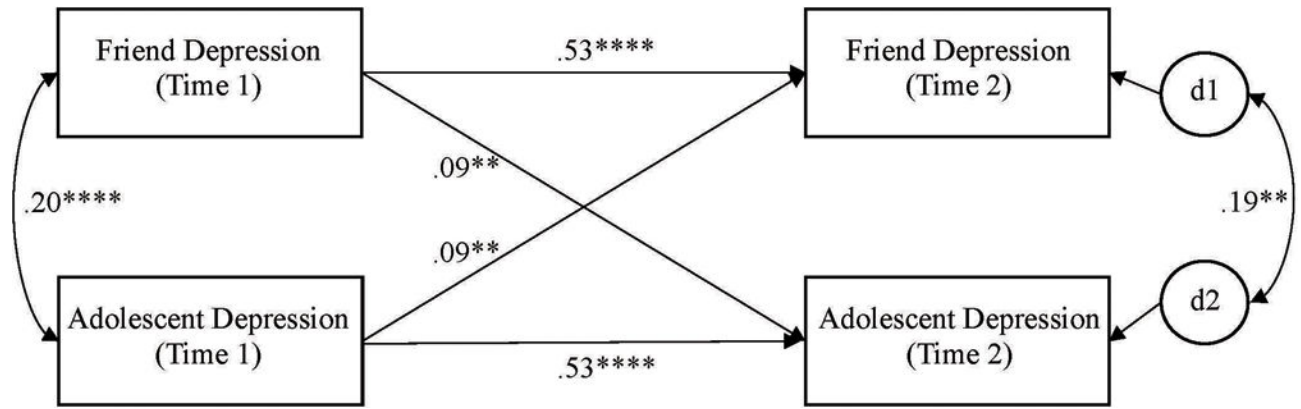


Figure 1 Panel A.

Basic depression contagion model. $**** p < .0001$. $** p < .01$.

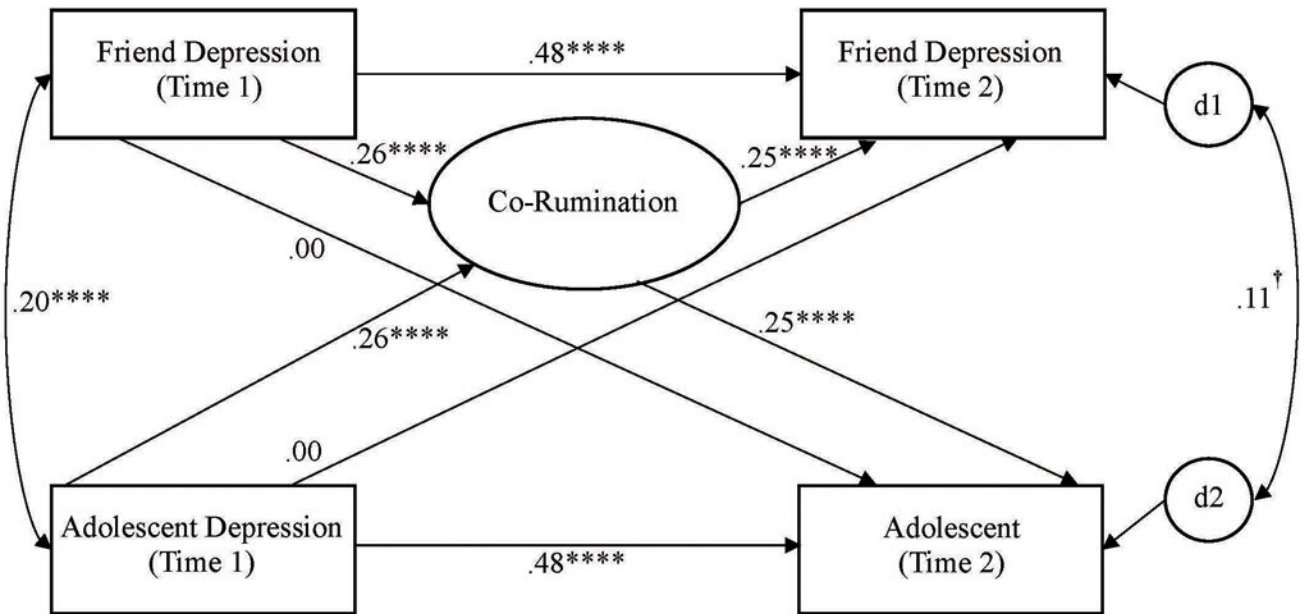


Figure 1 Panel B.

Mediation of depression contagion model. $^{****} p < .0001$. Loadings for adolescents' and friends' reports of co-rumination not depicted. Loadings were $\beta = .56$ and $\beta = .57$, respectively ($p < .0001$)

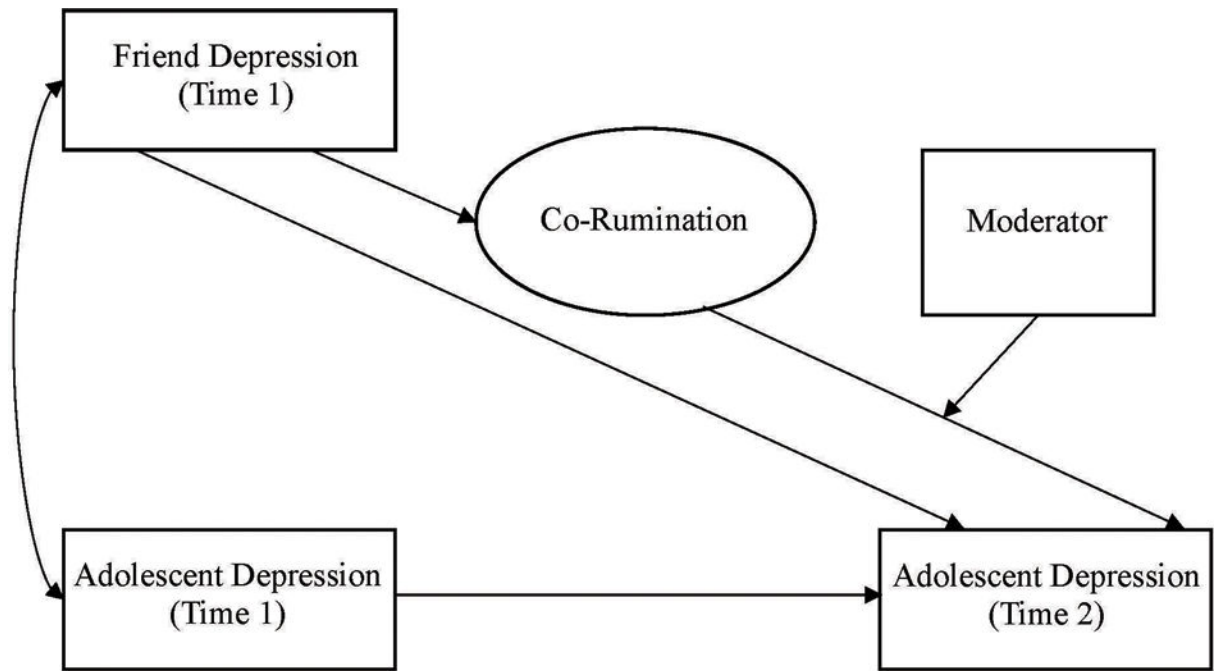
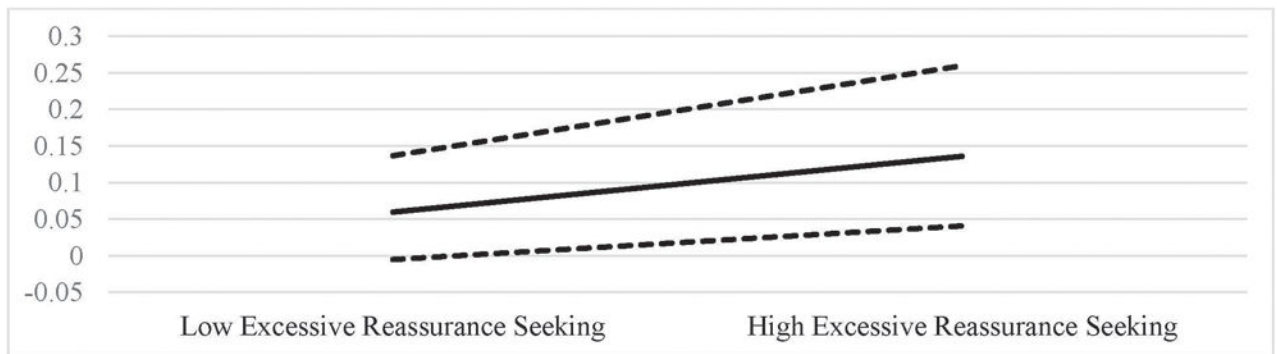


Figure 2. Moderated mediation of depression contagion model. Diagram has been simplified for presentation (duplicate paths not shown).

Panel A. Moderated mediation with adolescents' personal distress.



Panel B. Moderated mediation with friends' excessive reassurance seeking.



Panel C. Moderated mediation with positive friendship quality.

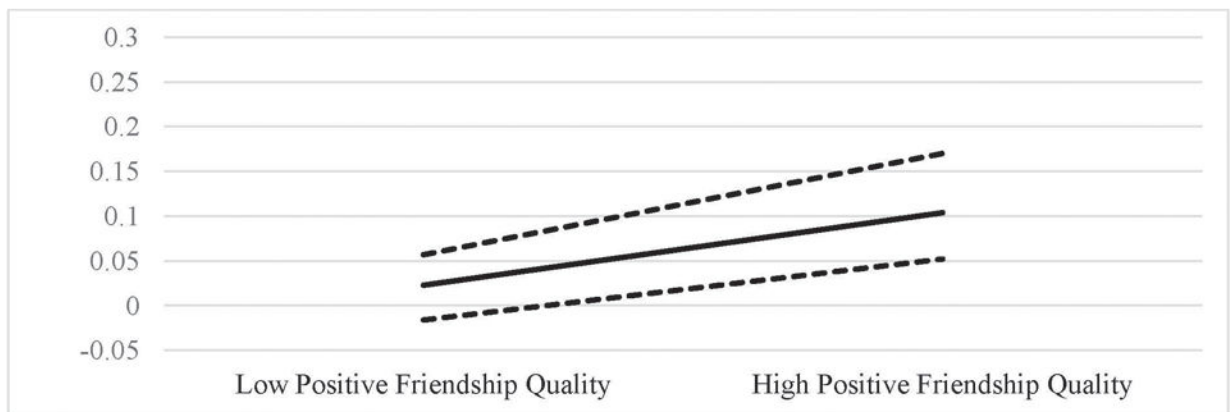


Figure 3. Indirect effect of co-rumination on adolescents' Time 2 depressive symptoms versus the moderator, with 95% confidence bands.

Table 1:
Descriptive Statistics and Correlations among Study Variables

	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	5.	6.
1. T1 Depressive Symptoms	31.53	8.29	--					
2. T2 Depressive Symptoms	34.42	10.50	.55****	--				
3. T1 Co-Rumination	2.9	0.84	.24****	.26****	--			
4. Adolescents' T1 Personal Distress	1.69	0.63	.15***	.15**	.20****	--		
5. Friends' T1 Excessive Reassurance Seeking	0.07	0.26	.22****	.14**	.03	.09*	--	
6. T1 Positive Friendship Quality	3.03	0.67	.004	0.11	.31****	.20****	-.06	--

* *Notes.* $p < .05$.

** $p < .01$.

*** $p < .001$.

**** $p < .0001$. $N = 480$.

Table 2:

Mean-Level Gender and Grade Differences in Study Variables

	Girls (<i>n</i> = 234)	Boys (<i>n</i> = 246)	Gender	Grade	Interaction
	<i>M</i> (SD)	<i>M</i> (SD)	β	β	β
T1 Depressive Symptoms	13.71 (9.05)	9.48 (6.90)	-0.25 ^{****}	0.08	-0.06
T2 Depressive Symptoms	17.12 (10.40)	11.69 (7.53)	-0.29 ^{****}	0.04	-0.05
T1 Co-Rumination	3.23 (0.73)	2.58 (0.83)	-0.38 ^{****}	0.12 ^{**a}	-0.05
T1 Personal Distress	1.88 (0.61)	1.50 (0.58)	-0.31 ^{****}	-0.08	-0.07
T1 Excessive Reassurance Seeking	0.08 (0.25)	0.07 (0.26)	0.02	-0.08	-0.08
T1 Positive Friendship Quality	3.34 (0.48)	2.73 (0.69)	-0.46 ^{****}	-0.02	-0.11 ^{*b}

Notes

*
p < .05.**
p < .01.****
p < .0001.^aMeans for co-rumination by grade: seventh graders *M*(SD) = 2.79 (0.84); tenth graders: *M* = 3.00 (0.84).^bMeans for positive friendship quality by gender and grade: seventh grade girls *M*(SD) = 3.27 (0.45), seventh grade boys *M*(SD) = 2.82 (0.69), tenth grade girls *M*(SD) = 3.41 (0.47), tenth grade boys *M*(SD) = 2.65 (0.68).