Co-Rumination Mediates Contagion of Internalizing Symptoms within Youths' Friendships

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Abstract

Peer contagion of internalizing symptoms was examined within youths' friendships over six months. Children (grades 3 and 5) and adolescents (grades 7 and 9) paired in 274 reciprocal same-sex friendship dyads completed measures of depressive and anxiety symptoms, co-rumination, and self-disclosure. Depression contagion was present for all youth, and anxiety contagion was found in the sample of girls and older boys. Although normative self-disclosure did not mediate the contagion effects, co-rumination mediated the depression contagion effect for adolescents and the anxiety contagion effect in the sample of girls and older boys. Implications for interventions with youth at risk for developing internalizing symptoms are discussed.

Keywords

Depression; anxiety; contagion; co-rumination; friendship

Friendships provide youth with many benefits. Both having friends and having friendships of high quality are related to positive adjustment (Bukowski, Newcomb, & Hartup, 1996). However, not all friendships are beneficial, and acknowledging that having friends with undesirable characteristics can *negatively* impact youths' adjustment is important (Vitaro, Boivin, & Bukowski, 2009). In fact, numerous studies indicate that friends' deviance is strongly associated with youths' own deviant behaviors (e.g., Dishion, Spracklin, Andrews & Patterson, 1996). Less attention has been paid, though, to the idea that having friends with *internalizing* symptoms confers risk. Studying this pathway to the development of internalizing symptoms is important given that depression and anxiety are relatively common and increase risk for other problems such as substance use, academic problems, and other psychopathology (e.g., Hammen & Rudolph, 2003; Strauss, Frame, & Forehand, 1987). The current research extends past work on the contagion of internalizing symptoms, or the idea that having friends with internalizing symptoms predicts increases in youths' own symptoms by: (a) considering anxiety contagion in addition to depression contagion, (b) testing whether contagion effects are present in children as well as adolescents, and, most importantly (c) examining *mechanisms* that may help explain depression and anxiety contagion. Specifically, the current study tests the hypothesis that co-rumination helps to account for depression and anxiety contagion.

Contagion of Internalizing Symptoms in Friendships

Considerable research supports peer socialization in adolescence (Brechwald & Prinstein, 2011). Peer contagion has been documented for deviancy (e.g., Dishion et al., 1996), self-

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injury (e.g., Heilbron & Prinstein, 2008), and internal states such as body image (e.g., Paxton, Schutz, Wertheim, & Muir, 1999). Moreover, there is a strong conceptual basis for predicting contagion of internalizing symptoms in youths' friendships. Coyne's interpersonal theory of depression (1976) posits that a risk factor for depression is contact with a depressed person. In fact, among adults, depression contagion has been documented between strangers (e.g., Strack & Coyne, 1983), roommates (e.g., Joiner, Alfano, & Metalsky, 1992), spouses (e.g., Ruscher & Gotlib, 1988), and friends (e.g., Rook, Peitromonaco, & Lewis, 1994). Fewer studies have tested depression contagion in youth. Stevens and Prinstein (2005) tested contagion over 11 months with 398 sixth and eighth graders, and Prinstein (2007) tested the effect over 18 months with 100 eleventh graders. In both studies, friends' depressive symptoms did predict increases in youths' own depressive symptoms over time.

In addition, although Coyne's theory (1976) focused on depressive symptoms, it is entirely likely that friends' anxiety could incite anxious symptoms in youth. Through social contact with anxious friends, youth may come to share friends' worries or develop their own. However, whether having anxious friends confers risk for the development of youths' own anxiety symptoms is unknown. In the only study we identified that tested anxiety contagion (Joiner, 1994), having a college roommate with anxiety symptoms did not predict increases in students' own anxiety over three weeks. However, this null result may be due to the short time period or because roommates may have been acquaintances and not friends. The current study considers anxiety contagion over a longer time period in close friendships in childhood and adolescence, developmental periods during which peer influence may be especially salient.

The current study extends past work, then, by testing depression and anxiety contagion among both children and adolescents. Although depression contagion has been documented in adolescents, whether children are susceptible is unknown. Whether anxiety contagion is present for either children or adolescents is unknown. Depression and anxiety contagion may not have been studied in childhood if children's friendships were assumed not to be close enough for contagion to occur. However, given that even childhood friendships involve intimate disclosure and feelings of closeness (Buhrmester & Furman, 1987), contagion may represent a previously unexplored pathway to the development of internalizing symptoms for children.

The study also extends previous work on contagion by employing a rigorous statistical approach to address the challenges of dyadic data. Past studies of depression contagion relied on traditional techniques (e.g., regression) that assume observations are independent. Such techniques do not account for interdependence caused by friends' similarity (Campbell & Kashy, 2002) and can result in biased tests that overestimate the significance of effects (e.g., Kenny, 1995). Therefore, adopting statistics designed for dyadic data is important. Another benefit is that the approach controls for initial similarity between friends' symptoms. Because the current approach controls for friends' initial similarity and examines changes over time, the results speak specifically to socialization effects, namely depression and anxiety contagion.

Co-Rumination as a Mediator of the Contagion of Internalizing Symptoms

Perhaps the most important extension is the consideration of mediators. Little is known about processes that account for contagion, which has practical implications for intervening with youth whose friendships confer risk. Stevens and Prinstein (2005) tested depressogenic attributional style as one potential mediator of depression contagion but attributional style did not mediate contagion, perhaps because overt social interactions are more likely to

mediate contagion than social cognitions. In the current study, friends' talk about problems was considered as a mediator. The role of friends' conversations in the development of externalizing problems has long been acknowledged. That is, conversations in which friends reinforce talk about deviant topics predict increased externalizing symptoms over time (e.g., "deviancy training," Dishion et al., 1996). If friends' deviant talk escalates externalizing symptoms, friends' talk about worries and concerns may serve a similar function for internalizing symptoms.

In particular, the current study examined co-rumination as a mediator of depression and anxiety contagion. Co-rumination is a conversational style characterized by extensive problem talk, including rehashing problems, speculating about problems, and focusing on negative affect (Rose, 2002). Although normative disclosure involves sharing thoughts and feelings, co-rumination is more extreme and involves an excessive focus on negative affect. Interestingly, although co-rumination is related to internalizing symptoms concurrently (Calmes & Roberts, 2008; Rose, 2002; Rose, Carlson, & Waller, 2007; Starr & Davila, 2009) and over time (Hankin, Stone, & Wright, 2010; Rose et al., 2007; Starr & Davila, 2009), it also is related to positive friendship quality (Rose, 2002; Rose et al., 2007). Thus, co-rumination may draw friends together, creating a close relationship context in which internalizing symptoms may spread.

There are several ways in which co-rumination might mediate contagion effects. Exposure to friends' symptoms during co-rumination could increase youths' own symptoms. This idea fits with research on the "costs of caring," which indicates that individuals can become distressed as a result of knowing about the troubles of close others (Kessler & McLeod, 1984). In fact, recent research indicates that youth can experience "empathetic distress" in response to friends' problems, meaning that they strongly share in friends' distress to the point of taking on the distress as their own (Smith & Rose, 2011). Therefore, youth who repeatedly are exposed to friends rehashing and speculating about problems and expressing negative affect through co-rumination may become distressed themselves. As another possibility, youth may become distressed as a result of discussing their own problems with a friend with internalizing symptoms who may offer particularly pessimistic perspectives. This could make the problems seem even more serious and harder to resolve, which could increase youths' own symptoms. Third, time spent co-ruminating detracts from time youth could spend in more positive activities that offset negative affect. Although the current design cannot tease apart these possibilities, they all converge on the hypothesis that co-rumination will mediate contagion effects.

Importantly, the current research also tests whether co-rumination is a unique mediator of contagion or whether the effects also are mediated by normative self-disclosure about problems. Given that normative self-disclosure typically is defined as sharing thoughts and feelings (Derlega, Metts, Petronio, & Margulis, 1993), self-disclosure and co-rumination are similar in that they both involve sharing personal information. However, unlike co-rumination, normative self-disclosure does not necessarily entail extensive problem talk, rehashing problems, speculating about problems, or focusing on negative affect. As such, normative self-disclosure is considered an adaptive component of adolescents' friendships that is related to positive emotional outcomes (e.g., Parker & Asher, 1993; see Buhrmester & Prager, 1995). Nonetheless, if simply sharing problems facilitates contagion, then even normative self-disclosure should mediate contagion. In contrast, if it is the unique features of co-rumination (e.g., rehashing, focusing on negative affect) that confer risk, then only co-rumination should mediate contagion.

The Role of Gender

Finally, gender also was considered. Although past work on depression contagion in adolescence did not find gender differences (Stevens & Prinstein, 2005), these effects are nonetheless worthy of consideration. Theory (e.g., Rudolph, 2002) and research (e.g., Hankin, Mermelstein, & Roesch, 2007) suggest that females are particularly interpersonally oriented and sensitive to interpersonal stress, especially in adolescence (Rose & Rudolph, 2006). Therefore, as compared to boys and younger girls, contagion may be especially strong for adolescent girls, who also are most prone to developing internalizing symptoms (e.g., Twenge & Nolen-Hoeksema, 2002). Given that co-rumination also is more common among adolescent girls (Rose, 2002) and may be an especially salient process in girls' friendships, the mediating effect of co-rumination also may be stronger for adolescent girls than for boys and younger girls.

Method

Participants

The current study is a re-analysis of the Rose et al. (2007) dataset. Participants were third, fifth, seventh, and ninth graders from four Midwestern school districts. Of 1,383 eligible students, 1,048 received consent and participated in the Fall at Time 1. The Time 2 Spring assessment, approximately six months later, included 999 of these youth. Because processes within friendships were examined, youth had to have at least one reciprocal same-sex friend at Time 1 to be included (see *Friendship nominations* section), which limited the sample to 711. Although, for each measure, over 80% of youth had complete data, some data were missing. Little's test (Little, 1988) indicated that data were missing completely at random, $\chi^2 (100) = 106.45$, $p = .31$, and missing data were imputed with an expectation-maximization procedure.

Although 711 youth had at least one reciprocal friend at Time 1, our analytic approach required that participants were nested in mutually exclusive friendship dyads (each youth in one and only one dyad). As discussed below, this limited the final sample to 548 youth in 274 friend dyads: 152 third graders (36 male dyads, 40 female dyads), 166 fifth graders (41 male dyads, 42 female dyads), 96 seventh graders (21 male dyads, 27 female dyads), and 134 ninth graders (32 male dyads, 35 female dyads). Due to small cell sizes for gender within grade, third and fifth graders were combined in a sample of 318 children (77 male dyads, 82 female dyads), and seventh- and ninth-grade youth were combined in a sample of 230 adolescents (53 male dyads, 62 female dyads). The final sample was 85.5% European American, 11% African American, 1.3% Hispanic American, .4% Native American, .4% Asian American, and 1.4% "other."

Representative Analyses

Two sets of representative analyses were conducted. The first compared the 548 youth in the final sample with the 288 youth excluded because they had no identified reciprocal friendship at Time 1. Excluded youth reported slightly higher internalizing symptoms than included youth [Time 1 depression: included M(SD) = 9.93 (8.35); excluded: M(SD) = 12.74 (9.26); $t(782) = 4.23$, $p < .0001$; Time 2 depression: included M(SD) = 10.08 (8.57); excluded: M(SD) = 11.59 (8.87); $t(775) = 2.28$, $p < .05$; Time 1 anxiety: included M(SD) = 2.28 (.85); excluded: M(SD) = 2.49 (.90); $t(783) = 3.00$, $p < .01$; Time 2 anxiety: included M(SD) = 2.18 (.83); excluded: M(SD) = 2.36 (.88); $t(772) = 2.47$, $p < .05$]. The two groups did not differ significantly on Time 1 co-rumination or self-disclosure. The second set of analyses compared the 548 included youth with the 163 youth who had at least one

reciprocal Time 1 friend but could not be paired into a mutually-exclusive dyad. These groups did not differ significantly on any study variable.

Procedure

Questionnaires were administered in the classroom by trained research assistants at two time points about six months apart. Items were read aloud to students. Research assistants returned to schools at least once to collect data from students who were initially absent.

Measures

Friendship nominations—Similar to past studies (e.g., Parker & Asher, 1993), at Time 1 youth were given a roster of peers, asked to circle their three best friends, and to star the one of the three who was their very best friend. Third and fifth graders' rosters included participating students in their classrooms. Because seventh and ninth graders changed classes during the day, their rosters included participating grademates. Reciprocal friends were those in which youth selected one another as a best or very best friend. As noted, 73% of youth ($n = 711$) had at least one same-sex reciprocal friend, which is similar to past studies (e.g., Parker & Asher, 1993).

Identifying mutually-exclusive dyads was necessary given the analytic approach. The dyads were chosen with the following criteria. First, dyads in which both youth starred each other (very best friend-very best friend) were selected. Next, dyads in which one youth starred a friend who circled the youth (very best friend-best friend) were selected. Finally, friendships in which both youth circled each other (best friend-best friend) were selected. As noted, some youth ($n = 163$) with reciprocal friends could not be included because their friend was paired in a higher-priority friendship. This process resulted in the final sample of 548 youth in 274 dyads.

Depression symptoms—Depression was assessed with 26 of 27 items from the Children's Depression Inventory (Kovacs, 1992) at Times 1 and 2. The suicidality item was dropped, as in some past research (e.g., Prinstein, 2007). Item scores ranged from 0 to 2, and depression scores were the sum of the items. Cronbach's alpha was high at Time 1 ($\alpha = .86$) and Time 2 ($\alpha = .88$).

Anxiety symptoms—Anxiety was assessed with the 28 items of the Children's Manifest Anxiety Scale (Reynolds & Richmond, 1985) at Times 1 and 2. In the original measure, a dichotomous (yes/no) response scale was used for each item, but in the current study items were rated on a 1–5 Likert scale to increase variability in the scores. Anxiety scores were the mean of the 28 responses. Cronbach's alpha was high at Time 1 ($\alpha = .95$) and Time 2 ($\alpha = .95$).

Co-rumination—At Time 1, youth completed the Co-Rumination Questionnaire (Rose, 2002), a 27-item measure that assesses co-rumination with close same-sex friends in general. The measure assesses nine content areas related to co-rumination with close same-sex friends: a) frequently discussing problems, b) discussing problems instead of engaging in other activities, c) encouragement from the youth of the friend discussing problems, d) encouragement from the friend of the youth discussing problems, e) discussing the same problem repeatedly, f) speculating about problem causes, g) speculating about problem consequences, h) speculating about parts of the problem that are not understood, and i) focusing on negative feelings. Items were designed to assess more extreme levels of disclosure compared to normative self-disclosure (e.g., "When we talk about a problem that one of us has, we usually talk about that problem every day even if nothing new has happened" and "When we talk about a problem one of us has, we'll talk about every part of

the problem over and over"). Items were rated on a 5-point Likert scale. Youth received a mean score for all 27 items ($\alpha = .97$).

Self-disclosure—At Time 1, youth responded to three items assessing their engagement in normative disclosure about problems in same-sex friendships (Rose, 2002, adapted from Parker & Asher, 1993). An example is "We talk about the things that make us sad." Items were rated on a 5-point Likert scale. Self-disclosure scores were the mean of the items ($\alpha = .83$).

Results

Descriptive Statistics and Correlational Analyses

Descriptive statistics are presented in Table 1. On average, youth reported low to moderate levels of internalizing symptoms with some youth reporting more extreme symptoms. For depressive symptoms, the possible range of scores was 0 to 52. The sample means were 9.92 at Time 1 and 10.10 at Time 2 with observed high scores of 47 and 43 at Times 1 and 2, respectively. For anxiety scores, the possible range was 1 to 5. The sample means were 2.29 at Time 1 and 2.20 at Time 2 with observed high scores of 5 at both time points. Youth reported moderate levels of co-rumination and self-disclosure (see Table 1 for sample means). Correlations among study variables also are presented in Table 1.

Homophily was evaluated with intraclass correlations. Friends showed some similarity to one another in terms of depressive symptoms (Time 1: ICC = .14, $p < .0001$; Time 2: ICC = .13, $p < .0001$), anxiety symptoms (Time 1: ICC = .19, $p < .0001$; Time 2: ICC = .16, $p < .0001$), Time 1 co-rumination (ICC = .35, $p < .0001$), and Time 1 self-disclosure (ICC = .36, $p < .0001$).

Mean-Level Gender and Grade Group Differences

Hierarchical linear models tested mean-level gender and grade group differences. Six separate random coefficient models in which youth were nested within dyads were tested. One model was tested for each dependent variable (Time 1 depression, Time 2 depression, Time 1 anxiety, Time 2 anxiety, Time 1 co-rumination, and Time 1 self-disclosure). In each model, the dependent variable was predicted from gender, grade group, and their interaction. Standardized parameter estimates are presented in Table 2. For depression, no gender or grade group effects were significant. Gender predicted anxiety at both time points, with girls reporting greater symptoms than boys. Grade group predicted anxiety at Time 1, with children reporting greater symptoms than adolescents. For co-rumination, the interaction between gender and grade group was significant. Hierarchical linear models tested within grade group indicated that girls reported greater co-rumination than boys in both childhood ($\beta = -.45$, $p < .001$) and adolescence ($\beta = -.65$, $p < .0001$). The interaction also was significant for self-disclosure with girls predicting greater self-disclosure in both childhood ($\beta = -1.07$, $p < .0001$) and adolescence ($\beta = -1.28$, $p < .0001$).

Data Analytic Approach for Examining Contagion and Mediation of Contagion Effects

The Actor-Partner Interdependence Model approach was used to examine contagion (Kenny, 1996). This approach investigates effects of each person's predictor variables on their own outcomes (actor effects) and their partner's outcomes (partner effects) while controlling for similarity between dyad members. Because members of the friend dyads are indistinguishable, all model parameters were constrained to be equal for both dyad members (Olsen & Kenny, 2006). Standardized parameter estimates for the SEM models were obtained using AMOS 19.0.

Given that traditional estimation procedures (e.g., maximum likelihood) in SEM assume univariate normality, skew and kurtosis were examined for all variables. All values fell within an acceptable range (skew range, –.16 to 1.33; kurtosis range, –.92 to 2.00). Also, for all models, multivariate kurtosis was tested. For some models, small but significant multivariate kurtosis was found. When multivariate kurtosis was not significant, maximum likelihood estimation was used. For models with significant multivariate kurtosis, bootstrap estimation was used (Byrne, 2010). Fit indices computed for SEM models included the Tucker-Lewis index (TLI), the comparative fit index (CFI), the expected cross-validation index (ECVI), and the root mean square error of approximation (RMSEA). Larger values of TLI and CFI (> .95) indicate good fit, as do smaller values of RMSEA (Hu & Bentler, 1999) and ECVI (Byrne, 2010).

Contagion of Depressive and Anxiety Symptoms

The depression contagion model was tested first (see Figure 1, Panel A). To control for initial symptoms, each youth's Time 2 depressive symptoms were predicted from their own Time 1 depression (actor effect; B1). Youths' Time 2 depressive symptoms also were predicted from their friends' Time 1 depression (partner effect; B2). The model also estimated the correlation between the friends' Time 1 depressive symptoms in order to control for initial homphily. The depression contagion model had excellent fit (TLI = 1.01, CFI = 1.00, RMSEA = .001, ECVI = .02; see Figure 1, Panel B). The actor effect was significant, indicating stability in depressive symptoms. Most important, the partner effect was significant, indicating contagion.

Whether the basic depression contagion model was invariant across gender and grade groups was tested with a series of multiple-group comparisons. Specifically, an unconstrained model (all parameters were allowed to vary across groups) was compared to a series of models, each of which contained the constraints of the previous model plus one more constraint. The models were: the structural weights model (structural weights, i.e., actor and partner effects, were constrained to be equal), the structural intercepts model (structural intercepts also were constrained), the structural means model (structural means also were constrained), the structural covariances model (structural variances/covariances also were constrained), and the structural residuals model (residual variances/covariances also were constrained). The unconditional model was compared to each other model. The most parsimonious model that did not differ significantly from the unconstrained model (according to chi-square tests) was adopted.

Based on the multiple-group comparisons for gender, the structural residuals model (all parameters were constrained to be equal for boys and girls) was adopted [$\Delta\chi^2$ (8) = 5.38, p > .05], indicating the models did not differ by gender. For grade group, the structural means model was adopted [only the variances/covariances varied across grade groups; $\Delta\chi^2$ (4) = 5.23, p > .05]. This indicated that the primary parameters of interest (stability and contagion effects) did not differ across grade groups. Comparisons with all four groups (younger boys, younger girls, older boys, older girls) were not conducted due to small sample sizes.

Anxiety contagion was then tested with a model identical to the model for depression contagion except that anxiety variables were used in place of depression variables. The basic anxiety contagion model had excellent fit (TLI = 1.01, CFI = 1.00, RMSEA = .001, ECVI = .02). The actor effect was significant (β = .65, p < .001), indicating stability in anxiety over time. However, the partner effect was not significant (β = .04, p > .05).

Analyses then tested whether anxiety contagion was present in one of the gender or grade groups. Multiple-group comparisons for gender indicated that the unconstrained model had excellent fit (TLI = 1.02, CFI = 1.00, RMSEA = .001, ECVI = .06) and fit better than all

other models [all $\Delta\chi^2$ values, $p < .05$]. The contagion effect held for girls only (see Figure 2, Panel A,). One more comparison was then conducted to verify that the contagion effect differed across genders. The unconstrained model was compared to a model in which *only* the contagion effect was constrained across genders. When the contagion effect was constrained, model fit decreased [$\Delta\chi^2$ (1) = 4.95, $p < .05$], indicating that the contagion effect was stronger for girls than boys.

Comparisons for grade group also indicated that the unconstrained model fit the data well (TLI = 1.02, CFI = 1.00, RMSEA = .001, ECVI = .06) and better than all other models [for all $\Delta\chi^2$ values, $p < .05$]. The contagion effect held for adolescents only (Figure 2, Panel B). The unconstrained model was then compared to a model in which *only* the contagion effect was constrained. Constraining the contagion effect resulted in decreased model fit [$\Delta\chi^2$ (1) = 6.41, $p < .05$], verifying that the contagion effect differed across grade groups.

Because anxiety contagion did not hold for any group that included younger boys (i.e., the contagion effect was observed for females and for adolescents), the basic anxiety contagion model was recalculated without younger boys. Fit was excellent (TLI = 1.01, CFI = 1.00, RMSEA = .001, ECVI = .03; see Figure 2, Panel C), and the contagion effect increased from $\beta = .04$ ($p > .05$) in the model that included the younger boys to $\beta = .10$ ($p < .001$) in this model.

Co-Rumination as a Mediator of Contagion

Analyses next tested whether co-rumination mediated the contagion effects. For the mediation models, Time 1 co-rumination was treated as a latent variable indicated by each friend's report. The depression contagion mediation model first was tested with the full sample. The model was identical to the depression contagion model except that paths were added from friends' Time 1 depression symptoms to co-rumination and from co-rumination to youths' Time 2 depression symptoms (see Figure 3, Panel A). Of interest was whether the partner effect remained significant when co-rumination was controlled. Model fit was excellent (TLI = 1.02, CFI = 1.00, RMSEA = .001, ECVI = .06). The actor effect was significant ($\beta = .67$, $p < .001$), indicating stability. Friends' Time 1 depression also predicted co-rumination ($\beta = .14$, $p < .001$). However, the effect of co-rumination on youths' Time 2 depressive symptoms was not significant ($\beta = .04$, $p > .05$). Therefore, mediation could not be tested for the whole sample.

However, it was possible that mediation could be tested for one gender or grade group. The unconstrained model (all parameters were allowed to vary across groups) again was compared to a series of more parsimonious models. Because the mediational model included a latent variable, the comparison models were slightly different and included: the measurement weights model (only measurement weights, i.e., paths from the latent variable co-rumination to each youths' report of co-rumination, were constrained), the measurement intercepts model (measurement intercepts also were constrained), the structural weights model (structural weights also were constrained), the structural intercepts model (structural intercepts also were constrained), the structural means model (structural means also were constrained), the structural covariances model (structural variances/covariances also were constrained), the structural residuals model (residual variances/covariances also were constrained), and the measurement residuals model (measurement residuals also were constrained).

For gender, the measurement weights model best fit the data [$\Delta\chi^2$ (1) = .001, $p > .05$]. Model fit was excellent (TLI = 1.03, CFI = 1.00, RMSEA = .001, ECVI = .11). However, the pattern of significance observed for both genders was identical to that observed in the full sample. The actor effects were significant (girls: $\beta = .66$, $p < .001$; boys: $\beta = .69$, $p < $.

001) and friends' Time 1 depressive symptoms predicted co-rumination (girls: $\beta = .20$, $p < .01$; boys: $\beta = .18$, $p < .01$), but co-rumination did not predict youths' Time 2 depressive symptoms (girls: $\beta = .08$, $p > .05$; boys: $\beta = -.03$, $p > .05$). Therefore, mediation could not be tested for either gender.

For grade group, the most parsimonious model that fit the data was the measurement intercepts model [$\Delta \chi^2$ (3) = 6.60, $p > .05$; TLI = 1.02, CFI = 1.00, RMSEA = .001, ECVI = .12). Stability effects were significant for children ($\beta = .69$, $p < .001$) and adolescents: ($\beta = .65$, $p < .001$). For children, friends' Time 1 depressive symptoms predicted co-rumination ($\beta = .18$, $p < .001$), but co-rumination did not predict youths' Time 2 depressive symptoms ($\beta = -.02$, $p > .05$). For adolescents, friends' Time 1 depressive symptoms predicted co-rumination, which predicted youths' Time 2 depression. Thus, mediation was tested for adolescents. When co-rumination was controlled, the depression contagion effect was not significant (see Figure 3, Panel B).

In order to compare the contagion effect with and without co-rumination as a mediator, the basic depression contagion model was re-computed for only adolescents (see Figure 1, Panel C). The basic depression contagion model for adolescents had excellent fit (TLI = 1.02, CFI = 1.00, RMSEA = .001, ECVI = .07). The contagion effect was $\beta = .07$ ($p < .05$; Figure 1, Panel C). The contagion effect dropped to $\beta = .05$ ($p > .05$) in the previously described measurement intercepts model in which co-rumination was controlled (Figure 3, Panel B). The Asymmetric Confidence Interval (ACI) method (see MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) was used to estimate confidence intervals for mediated effects (95% asymmetric confidence intervals were calculated for the indirect effect using PRODCLIN; MacKinnon, Fritz, Williams, & Lockwood, 2007) and indicated that co-rumination did significantly mediate depression contagion in the adolescent sample (IE = .013; 95% CI = .002, .027).

Analyses next tested whether anxiety contagion was mediated by co-rumination in the sample excluding younger boys. This model was identical to the mediation model for depression except that anxiety variables were used instead of the depression variables (see Figure 4). Model fit was good (TLI = .94, CFI = .95, RMSEA = .07, ECVI = .19). The stability was significant. Friends' Time 1 anxiety symptoms also predicted co-rumination, which predicted youths' Time 2 anxiety symptoms. The partner effect was no longer significant and dropped from $\beta = .10$ ($p < .001$) in the basic contagion model (see Figure 2, Panel C) to $\beta = .06$ ($p > .05$) in this model in which co-rumination was controlled. The ACI method indicated that co-rumination significantly mediated anxiety contagion (IE = .035; 95% CI = .00016, .07224).

Self-Disclosure as a Mediator of Contagion

Finally, whether normative self-disclosure mediated the contagion effects was tested. Mediation models were fit for self-disclosure that were identical to models fit for co-rumination, except that self-disclosure variables were used instead of co-rumination variables. For depression, the mediation model first was tested for the full sample. Model fit was good (TLI = 1.00, CFI = 1.00, RMSEA = .02, ECVI = .08). However, friends' Time 1 depressive symptoms did not predict self-disclosure ($\beta = .05$, $p > .05$). Thus, mediation could not be tested. Multiple-group comparisons indicated that the directional paths should not be constrained across genders or across grade groups. However, friends' Time 1 depressive symptoms did not predict self-disclosure for either gender or grade group so mediation could not be tested. Self-disclosure also did not mediate anxiety contagion. The model used to test self-disclosure as a mediator of depression contagion was fit again using anxiety variables instead of the depression variables. This model was fit to the sample excluding the younger boys. Model fit was good (TLI = 1.02, CFI = 1.00, RMSEA = .001,

ECVI = .10) and Time 1 anxiety symptoms predicted self-disclosure (β = .26, p < .001), but self-disclosure did not predict Time 2 anxiety symptoms (β = .08, p > .05). Therefore, mediation could not be tested.

Discussion

Although having friends generally is adaptive, the present study suggests some friends pose emotional risks. The current research provides important new information regarding the contagion of internalizing symptoms. The study replicates past work on depression contagion in adolescence (Prinstein, 2007; Stevens & Prinstein, 2005), increasing our confidence that the effect is robust. This study also was the first to document anxiety contagion in friendships, identifying a previously overlooked pathway to the development of anxiety symptoms. However, because the anxiety measure used in the current study assesses symptoms that overlap with depression (Seligman & Ollendick, 1998), replicating the findings with a measure designed to provide a purer assessment of anxiety (e.g., MASC; March, 1997) will further support the importance of attending to anxiety contagion in youths' friendships.

The current work also extends research on contagion in other important ways. Notably, the depression contagion effect did not differ by grade group, indicating that contagion was present in middle childhood, considerably earlier than previously documented. Further, anxiety contagion appeared to present in childhood, at least for girls. These findings highlight a previously unstudied risk factor for the development of internalizing symptoms in childhood. Perhaps contagion in childhood has not been previously tested because children's friendships were considered too superficial to facilitate the transmission of internalizing symptoms. However, the current study suggests that ignoring contagion among children would be a mistake.

Most importantly, a mechanism that helped to account for depression and anxiety contagion was identified. It is surprising that past studies have not identified mediators of contagion given their applied importance. Interestingly, simply talking about problems in the form of normative self-disclosure was not sufficient to facilitate contagion. Instead, co-ruminative conversations, which are extensive, repetitive, and speculative, mediated contagion. These results provide an interesting compliment to the well-known findings that deviancy training in boys' friendships confers risk for externalizing symptoms (e.g., Dishion et al., 1996). Together, the results speak to the importance of attending to friends' conversation in a detailed and nuanced manner in order to understand peer influence on adjustment problems.

Future studies should investigate in more detail how co-rumination accounts for contagion. As noted, research on the "costs of caring" (e.g., Gore et al., 1993) suggests that youth may take on friends' distress, which could lead to increased symptoms. This may be especially likely when the friend's distress is made salient through co-rumination (Smith & Rose, 2011). Exposure to a distressed friend's repetitive, negative problem talk also may enhance risk due to emotional mimicry (Hatfield, Cacioppo, & Rapson, 1994). Co-ruminating youth may unintentionally mimic distressed friends' expression of high negative affect and, over time, internalize the distress. Youth co-ruminating about their own problems with distressed friends also may contribute to symptoms. The current study could not distinguish between these possibilities because the measure (Rose, 2002) did not assess whose problems were the focus of the co-rumination (e.g., "We spend most of our time together talking about problems that my friend or I have."). Further, because the measure assessed co-rumination with close same-sex friends in general, the current study provided a conservative test of mediation. Assessing co-rumination in specific friendships likely would yield even stronger mediated effects.

Considering the stressors that youth experience and associated content of co-rumination also could help explain how co-rumination mediates contagion. For example, youth may be especially likely to co-ruminate about interpersonal stressors, as they are often multifaceted and difficult to resolve. Co-rumination about ambiguous problems for which there are no clear solutions may be particularly distressing and likely to facilitate contagion. Contagion also may be especially likely when co-rumination focuses on severe problems (e.g., a parental illness).

Important developmental differences also emerged in regards to co-rumination as a mediator. Although co-rumination mediated depression contagion for adolescents, the mediated effect was not significant for children. In childhood, youths' reports of co-rumination with friends do predict their own internalizing symptoms (Rose, 2002; Rose et al., 2007). However, in adolescence, friends may be more in sync with one another during co-rumination. Perhaps, in childhood, co-rumination is more analogous to parallel play in that one child's co-rumination about problems could increase that child's own symptoms while the friend may not be sufficiently engaged to be adversely affected. In addition, children may be less articulate in discussing their problems than adolescents. That is, when children co-ruminate, they may not clearly express the distressing details of their problems or the depth of their negative affect, and this type of clear expression may be necessary for contagion to occur. In future studies, observations of conversations may prove useful for examining these possibilities and identifying additional conversational processes that explain depression contagion in childhood.

Research with a larger sample also is needed to flesh out developmental and gender differences in regards anxiety contagion. Anxiety contagion was present for adolescents and girls, suggesting that it is not a salient process in boys' childhood friendships. However, the contagion effect was not tested specifically for male children given model specification problems associated with small sample sizes. Similarly, although co-rumination mediated anxiety contagion in the sample of adolescents and younger girls, whether co-rumination mediated anxiety contagion specifically for girls in childhood was not tested due to sample size. Given that co-rumination mediated depression contagion for adolescents but not children, research with a larger sample is needed to verify whether co-rumination mediates anxiety contagion specifically for younger girls. Although the current study could not provide definitive answers regarding these developmental and gender differences, they suggest that adverse effects of having anxious friends may be particularly pronounced for older youth and for girls.

Future research also should consider the degree to which the results generalize to highly depressed or anxious youth. One possibility is that contagion processes are less relevant to highly distressed youth if they are less likely to have friends. In the current sample, youth who were excluded from analyses because they did not have friends did report greater internalizing symptoms. However, results are mixed across studies regarding whether friendless youth experience more internalizing symptoms than friended youth (e.g., Hogue & Steinberg, 1995; Rudolph, Ladd, & Dinella, 2007), suggesting that at least some highly distressed youth do have friends. As such, contagion should be considered in future studies of highly distressed youth. These youth may be too focused on their own distress to engage in the reciprocal interpersonal processes thought to characterize co-rumination. Instead, they may display more aversive conversational styles that are linked with internalizing symptoms, such as excessive reassurance-seeking (Joiner et al., 1992) or conversational self-focus (i.e., redirecting conversations to focus on the self, Schwartz-Mette & Rose, 2009). If so, friends of highly distressed youth may be vulnerable to contagion because their own needs are not met in the friendship rather than through co-rumination. Moreover, simultaneously considering multiple interpersonal behaviors characteristic of distressed

youth may account for more variance in the contagion effects than can be accounted for by considering single behaviors in isolation.

Finally, co-rumination may be important later in development as well. For example, studies of older adolescents or young adults could examine co-rumination in heterosexual romantic relationships. This research could test whether co-rumination in romantic relationships tends to resemble the co-ruminative processes of one of the partners in their same-sex same friendships or tends to represent a compromise between the partners. Given the greater prevalence of internalizing symptoms among females (Twenge & Nolen-Hoeksema, 2002), male partners may be at relatively greater risk for developing internalizing symptoms through co-ruminative contagion processes in romantic relationships than in their same-sex friendships.

In closing, despite limitations, there are applied implications. Encouraging moderation in youths' conversations with friends about problems likely is the best approach. Research on the risks of co-rumination is not intended to imply that youth should avoid discussing problems altogether. Disclosure provides an outlet for self-expression and exploration and can facilitate closeness and mobilize support (Buhrmester & Prager, 1995). Moreover, when problems are serious, keeping them to oneself could be problematic. Accordingly, youth need to be aware of the benefits of seeking help for serious problems, not only from friends, but also from adults who have a broader perspective and may be better able to help. Nevertheless, youth also need to understand that conversations about problems, perhaps especially with friends, can become "too much of a good thing." In fact, the current results suggest that steering distressed youth away from co-rumination not only should decrease risk for themselves but also for their friends. Teaching youth to be aware of when they co-ruminate, and strategies for disengaging from co-rumination, may be useful. For example, youth could learn socially-appropriate ways of truncating excessive talk about problems with friends and suggesting other, more positive activities in which they could engage. Encouraging youth to balance emotional expression and pleasant activities with friends may be a promising approach for decreasing co-rumination while allowing them to continue to reap the benefits of emotionally connecting with friends.

Acknowledgments

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Panel A. Depression contagion model with appropriate constraints for dyadic data
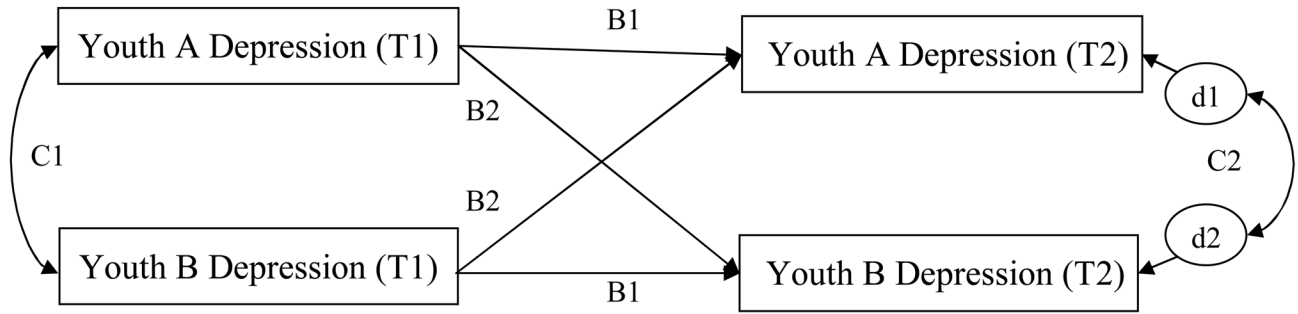
Panel B. Depression contagion model (full sample)
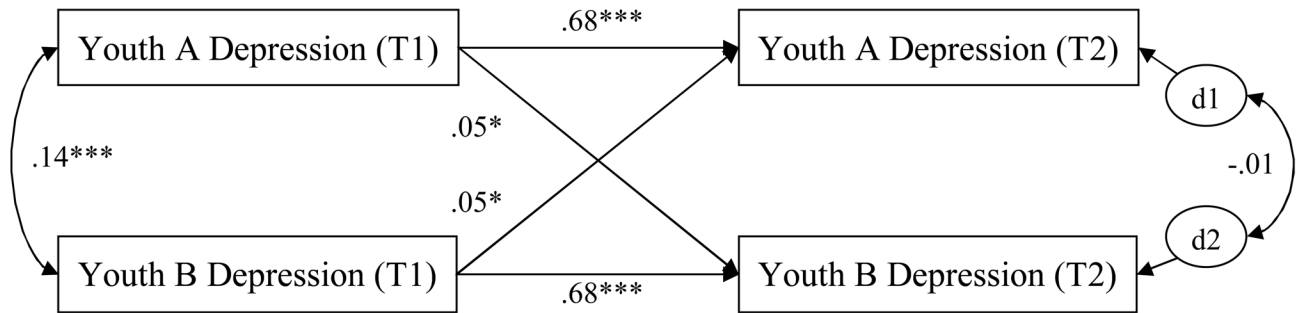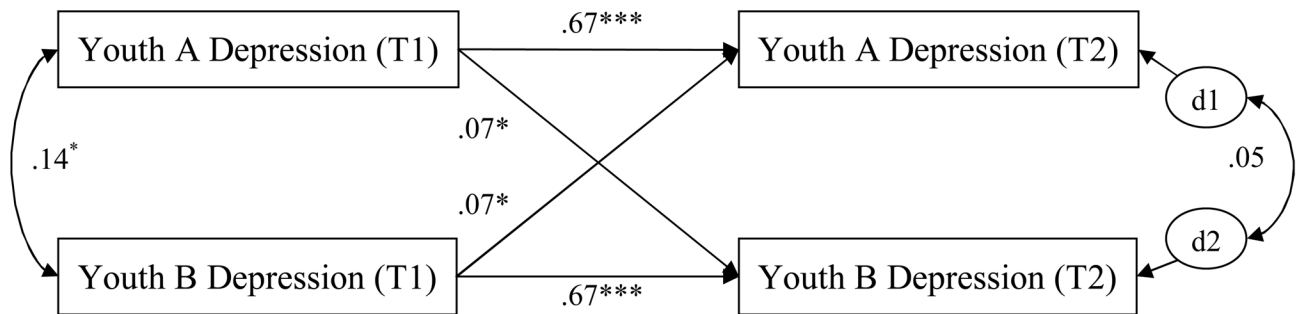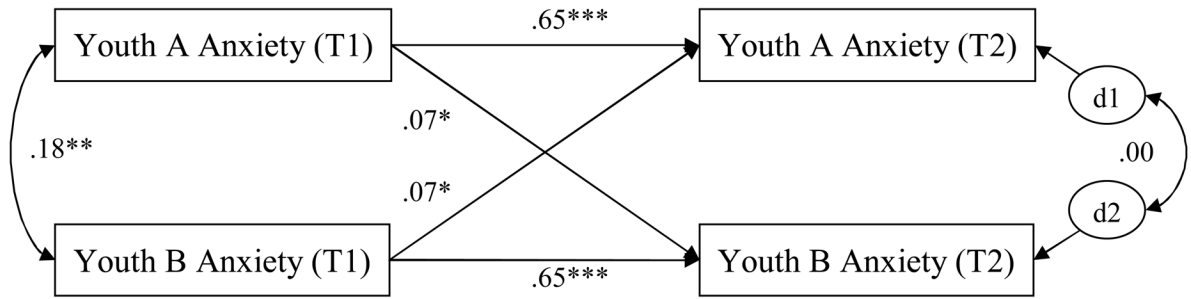

Panel C. Depression contagion model (adolescents)

Figure 1.
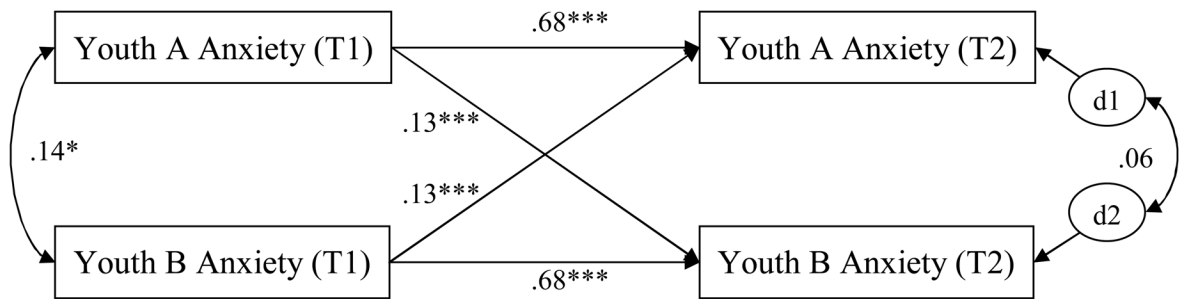*Panel A*. Depression contagion model with appropriate constraints for dyadic data
Panel B. Depression contagion model (full sample)
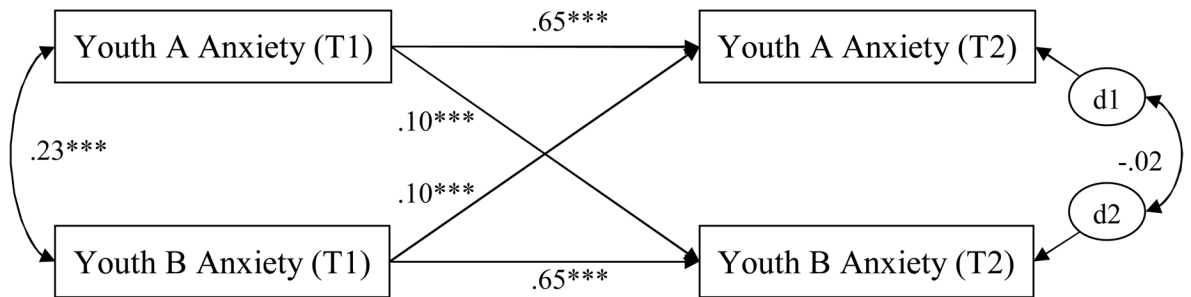*Panel C*. Depression contagion model (adolescents)

Panel A. Anxiety contagion model (girls)

Panel B. Anxiety contagion model (adolescents)

Panel C. Anxiety contagion model (sample excluding younger boys)

Figure 2.
Panel A. Anxiety contagion model (girls)
Panel B. Anxiety contagion model (adolescents)
Panel C. Anxiety contagion model (sample excluding younger boys)
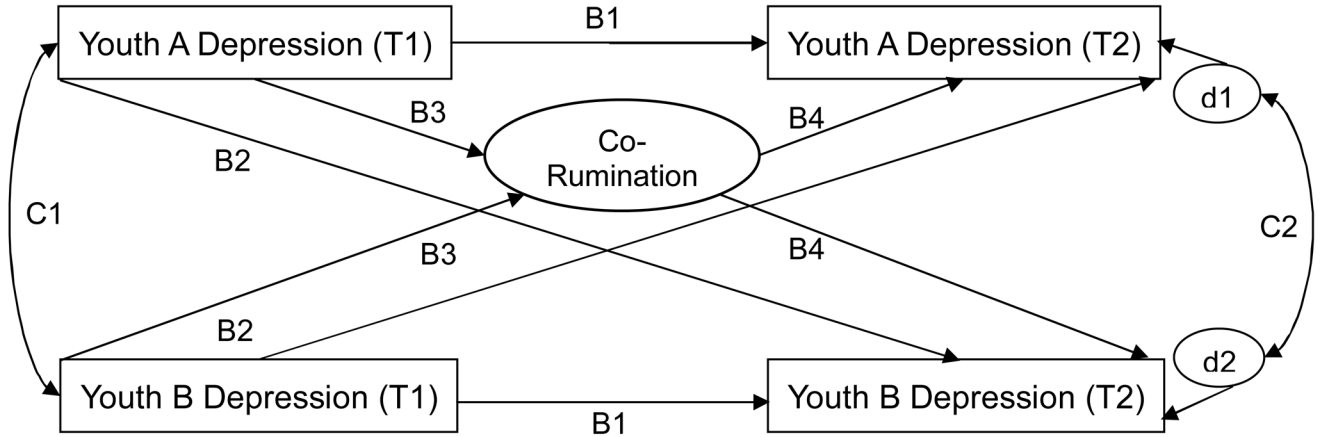
Panel A. Depression contagion mediation model with appropriate constraints for dyadic data

Note. Loadings for youths' and friends' reports of co-rumination (B5) not depicted.

Panel B. Depression contagion mediation model (adolescents)

Figure 3.
Panel A. Depression contagion mediation model with appropriate constraints for dyadic data
Note. Loadings for youths' and friends' reports of co-rumination (B5) not depicted.
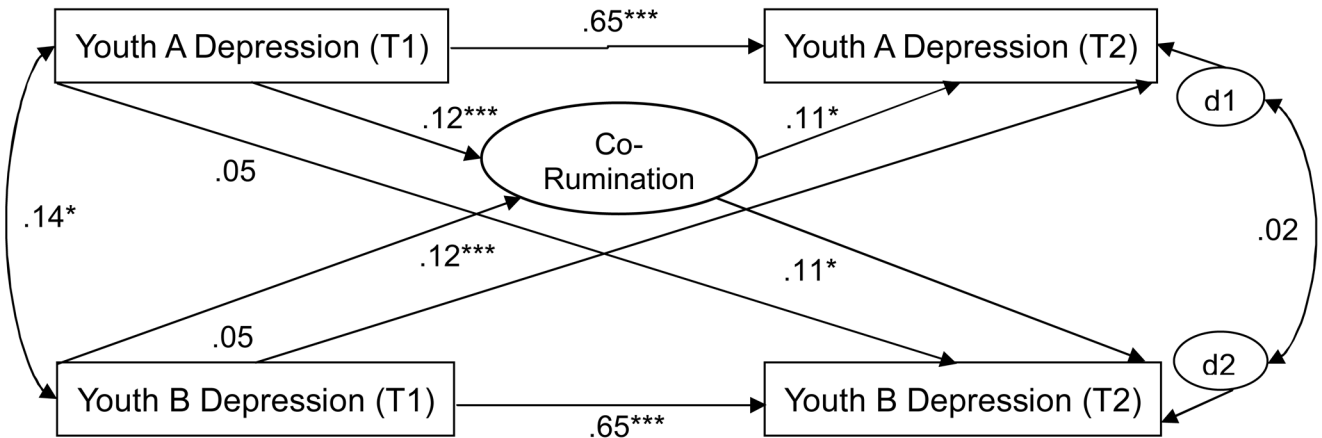*Panel B.* Depression contagion mediation model (adolescents)
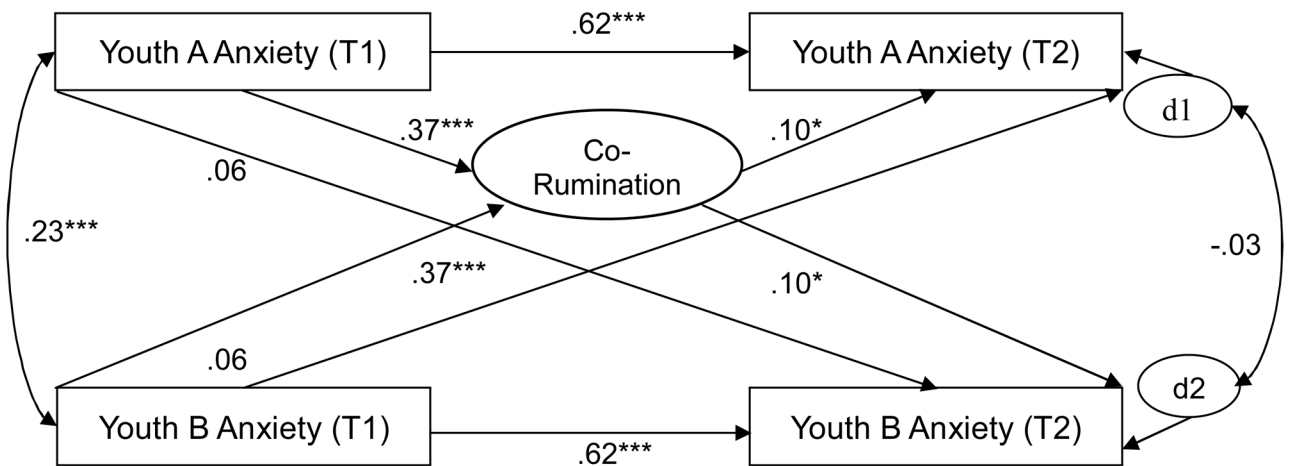*Note.* Loadings for youths' and friends' reports of co-rumination were $\beta = .73^{***}$.

Figure 4.
Anxiety contagion mediation model (sample excluding younger boys)
Note. Loadings for youths' and friends' reports of co-rumination were $\beta = .61***$.

Table 1

Sample Means and Correlations among Study Variables

| | Whole Sample | | | | | | | | | | |
	N	M (SD)	Observed Range	Possible Range	1.	2.	3.	4.	5.	6.
1. Depression (Time 1)	548	9.92 (8.29)	.00–47.00	.00–52.00	--	.68 ***	.66 ***	.49 ***	.11 **	−.03
2. Depression (Time 2)	548	10.10 (8.46)	.00–43.00	.00–52.00	--	--	.52 ***	.67 ***	.12 **	−.01
3. Anxiety (Time 1)	548	2.29 (.85)	1.00–5.00	1.00–5.00	--	--	--	.63 ***	.35 ***	.20 ***
4. Anxiety (Time 2)	548	2.20 (.80)	1.00–5.00	1.00–5.00	--	--	--	--	.29 ***	.18 ***
5. Co-Rumination (Time 1)	548	2.46 (1.00)	1.00–4.96	1.00–5.00	--	--	--	--	--	.57 ***
6. Self-Disclosure (Time 1)	548	3.20 (1.15)	1.00–5.00	1.00–5.00	--	--	--	--	--	--

Notes.

** $p < .01$.

*** $p < .001$.

Table 2

Mean-Level Gender and Grade Group Differences in Study Variables

	Girls M (SD)	Boys M (SD)	Gender PE	Grade Group PE	Interaction PE
Depression (Time 1)	9.81 (8.26)	10.04 (8.33)	.07	.13	−.12
Depression (Time 2)	10.25 (8.50)	9.93 (8.42)	.07	.12	−.26
Anxiety (Time 1)	2.43 (.84)	2.12 (.83)	−.35 **	−.29 *	−.06
Anxiety (Time 2)	2.37 (.83)	2.00 (.73)	−.45 ***	−.21	−.03
Co-Rumination (Time 1)	2.79 (.91)	2.09 (.95)	−.45 ***	.11	−.62 ***
Self-Disclosure (Time 1)	3.69 (.94)	2.65 (1.10)	−.65 ****	.34 **	−.63 ***

Notes.

*
$p < .05$.

***
$p < .001$.

****
$p < .0001$. PE = standardized parameter estimate. Gender was coded as 0 = Girls, 1 = Boys; grade group was coded as 0 = Children, 1 = Adolescents.