

Spring 5-1-2014

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## Recommended Citation

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### Abstract

Anxiety disorders increase in prevalence from childhood into adulthood. Although cognitive theories are prominent in the etiology and maintenance of anxiety, peer relationships are emerging as salient interpersonal risk factors. This study investigates the effects of specific interpersonal interchanges on anxiety symptoms in college students. 60 undergraduates attended the experiment with a same-sex best friend, and were randomly assigned to the co-worry or neutral conversation condition. Each person completed self-report measures of state anxiety, negative affect and positive affect prior to and following an 8-minute conversation about self-generated worry topics such as exams or neutral topics such as the weather. Conversations were videotaped for coding. Results analyzed pre- to post-conversation anxiety and affect to examine whether worrying with a friend, termed co-worry, increased state anxiety and negative affect compared to the control condition. A 2 (within subject variable of time) by 2 (between subjects factor of experimental condition) repeated measures ANCOVA was conducted with state anxiety, negative affect, and positive affect as the dependent variables. A significant interaction across time was noted for state anxiety,  $F(1, 104) = 11.62, p = .001$ , negative affect,  $F(1, 108) = 4.40, p = .038$ , and positive affect,  $F(1, 108) = 4.74, p = .032$ . Participants in the neutral condition evidenced a decrease in state anxiety and negative affect across time and an increase in positive affect, whereas participants in the worry condition maintained a more negative anxious mood state across time.

### Co-Worry in Friendship Dyads

The prevalence of internalizing disorders increases as adolescents move into adulthood (Silberg et al., 1999). Cognitive theories of internalizing disorders, such as depression and anxiety, are well supported and theorize cognitive mechanisms to account for the disorders' high comorbidity, whereas interpersonal factors contributing to the etiology and maintenance of internalizing disorders have been primarily explored in the depression literature (Rose, 2002). During this same developmental time period, peer relationships gain salience as correlates of positive adjustment, school outcome, and psychosocial health (Wentzel & McNamara, 1999). Although overall friendship circles and the quality of friendships during adolescence are protective factors from internalizing disorders, recent empirical evidence has examined circumstances under which peers may have a detrimental impact on psychosocial adjustment (Rose, 2002). Considering the buffering effects of friendships for psychosocial health, particularly in girls, and the increase of peer salience during adolescence, the increase of internalizing disorders during this time period is somewhat puzzling. Whereas cognitive theories point to cognitive vulnerability in the types of attributions and schemas utilized in interpreting the world (Ingram & Kendall, 1987), which would account for individual differences in internalizing distress, others have focused on potential interpersonal factors that increase this vulnerability. Recently, a link between the peer literature and internalizing literature theorized that particular peer interactions between best friends involving conversations that focus on negative mood state and past negative life events are associated with increased internalizing symptoms, and depression in particular (Rose, 2002; Rose, Carlson, & Waller, 2007). The extent to which this interactional pattern is specific to depression, or is associated with anxiety as well, has yet to be defined. Given the distinct components of anxiety and depression, there may be

distinct interpersonal factors in the development and maintenance of anxiety symptoms similar to the interpersonal factors associated with depressive symptoms. This paper explores the potential interpersonal factors between friends that may serve as a risk factor for anxiety specifically.

Anxiety has distinct cognitive patterns that are theorized to contribute to its etiology. These patterns include schemata roles, disproportionate emphasis on the future, and task irrelevant thoughts (Ingram & Kendall, 1987). Anxious individuals are prone to alternate between schemata in which evaluation is self-generated and schemata in which evaluation is generated by others. They also tend to spend a disproportionate amount of time with future-focused cognitions. Where depressive thinking is characterized by declarative past-oriented statements, anxious thinking is characterized by future-oriented questions concerning threat and an inability to cope with that threat. Such manners of thinking share in common the fact that they are repetitive as well as irrelevant to whatever topic on which the individual should be focused. Anxious cognitions prohibit individuals from functioning in an adaptive fashion, as compared to non-anxious individuals.

Worry, the cognitive component of anxiety, reflects a pattern of thought focused primarily on future negative events, though it can at times contain ruminative thinking, accounting in part for the comorbidity between anxiety and depression (Borkovec, Ray, & Stöber, 1998; Nolen-Hoeksema, 1991). The literature indicates that the most common worries surround issues of family, finances, work/school, and health issues (Roemer, Molina, Borkovec, 1997). The evidence also suggests that high levels of worrying can lead to increased feelings of anxiety, particularly generalized anxiety disorder (Borkovec, Robinson, Prezinsky, & DePree, 1983). One aspect of this cognition is the tendency for anxious individuals to apply threat biases to ambiguous situations (Butler & Mathews, 1983). Rather than attending to multiple cues in

ambiguous situations, the anxious individual primarily focuses on perceptions or interpretations of threat, thus increasing the likelihood of an anxious response.

In contrast, cognitive theories of depression focus on negative schemata and attributions as well, but with a past-oriented focus (Lyubomirsky & Nolen-Hoeksema, 1995; Ingram & Kendall, 1987). Lyubomirsky and Nolen-Hoeksema's (1995) research on ruminative thought found that participants induced into ruminative states displayed more negative interpretations than those who were not. Most negative interpretations were focused on past events, and the attribution that future events would continue to be negative in nature. Lyubomirsky and Nolen-Hoeksema (1995) posit that such negative future thinking could be the result of dysphoric thinking recalling memories of past negative events. A feedback loop of negative thoughts bringing up negative memories, thus creating more negative thoughts, could be a significant contributing factor to account for the high correlation between rumination and depression. Butler and Mathews (1983) also found that both anxious and depressed individuals employ availability heuristics, recalling readily available memories of past anxious/depressed states, which in turn results in maintaining or enhancing their anxious/depressed mood. Given that cognitive theories posit a cognitive vulnerability to anxiety and depression, negative life events, and in particular interpersonal stressors, may activate cognitive schemata and dysfunctional attributions that interact to create anxious and/or depressive symptoms, depending on the specific content of the dysfunctional schema and attributions (Borkovec, Ray, & Stöber, 1998). The way in which individuals cognitively process their environment influences future thought, feeling, and behavior. The interaction between an individual and their interpersonal world can increase anxiety symptomology, which is why examining the role of peers may be emerging as an important interactional factor to consider.

Peer relationships become increasingly important as children move into adolescence. Individuals increasingly turn to peers during adolescence in times of turmoil or distress, and the peers' influential power increases during adolescence as well (Dishion & Tipsord, 2011; Prinstein, Borelli, Cheah, Simon, & Aikins, 2005). This increase in interpersonal/peer stressors has in part been theorized to contribute to adolescents' vulnerability to depressive symptoms, especially girls, who place large importance on the level of intimacy within a relationship (Furman & Buhrmester, 1992, La Greca & Harrison, 2005). As well, the potential impact of "emotion contagion" has begun to be studied in the interaction between interpersonal behaviors and cognitive processes, such that vulnerable adolescents are likely to be affected by the moods of their peers (Dishion & Tipsord, 2011). In a parallel fashion, depressogenic attributional styles also have a subsequent effect on the individual's depressive symptoms (Stevens & Prinstein, 2005). The extent to which peer stress contributes to anxiety symptoms has been far less explored.

To bridge the gap between the literatures examining friendship as a typical buffering factor in psychosocial health and the increase in prevalence of internalizing symptoms during adolescence, research has begun to examine the interactions between these realms. Specific interchanges between friends that were characteristic of ruminative cognitive processes associated with depression (Lyubomirsky & Nolen-Hoeksema, 1995), termed "co-rumination", were assessed via self-report (Rose, 2002). Co-rumination reflects a conversation style where problems are discussed, though not necessarily limited to the self, as is the case of individual rumination (Rose, 2002). Thus, co-rumination was developed to intersect the literatures on increased peer salience in adolescence and the increase in internalizing disorders, particularly depression. Co-rumination was found to have a significant correlation with internalizing

symptoms, a collapsed index of depression and anxiety, as well as friendship quality in children between third and ninth grade (Rose, 2002). In other words, girls and boys who reported strong friendship quality with a best friend also reported higher internalizing distress if these friendships contained high frequencies of specific depressive-focused conversations. Girls reported higher frequencies of co-rumination than did boys, which was also correlated with higher internalizing distress. Rose concluded that results showed a possible bridge between the positive effects of friendships and a “cost” of that friendship, being that certain interactions may contribute to increased internalizing distress, particularly for girls (Rose, 2002).

Since the original conceptualization of co-rumination by Rose (2002), a growing number of studies have replicated results in adolescents (Rose et al., 2007; Smith & Rose, 2011) as well as in college students, given the continued importance of peers during this developmental phase of emerging adulthood (Dishion & Tipsord, 2011). For example, a study conducted to examine daily co-rumination found that women reported higher levels of daily co-rumination than men (White & Shih, 2012). This study also found co-rumination to predict future depressed mood, independent of the level of stress. Similarly, Calmes and Roberts (2008) also found that co-rumination was associated with depression, and was significantly higher in female undergraduates than males. Another study examined co-rumination and alcohol consumption, finding that female college students who co-ruminated at higher levels tended to have higher levels of alcohol consumption (Ciesla, Dickson, Anderson, & Neal, 2011). Among males, the relationship between co-rumination and alcohol consumption was not significant.

It has also been suggested that the results of co-rumination may not be immediate (Hankin, Stone, & Wright, 2010). These researchers discovered that while co-rumination is positively correlated to anhedonic depression, it was not concurrently correlated with general

depressive symptoms; rather, co-rumination was related to future increases in general depressive symptoms at two future time points, about two and five months later. This study also noted that co-rumination was related to anxious arousal and general internalizing symptoms. The findings support the notion that co-rumination accumulates in a cascade that leads to future increase of internalizing symptomology, and depression. However, since co-rumination also predicted increases in close friendships, thus creating more experiences of co-rumination, it was inferred to have a cyclical, accumulating effect for general depressive symptoms across time.

The findings that co-rumination is also associated with anxiety symptoms has been noted in several studies. Supporting these associations is the finding of Sarason's experiment (1975), in which participants were assigned anxiety-provoking tasks in the laboratory, which led to increased ruminative thought and subsequent increased anxiety, suggesting a link between ruminative cognitive processes and anxiety. In a similar fashion, Harrington and Blankenship (2002) illustrated a strong correlation between rumination and subsequent scores on anxiety scales, demonstrating overlap between rumination and anxiety symptoms. These associations between rumination and anxiety are similar to those found between co-rumination and anxiety. As noted, Rose (2002) found a significant correlation between co-rumination and a composite score of both depression and anxiety. Also, individuals with social anxiety were found to report higher levels of co-rumination than normative populations (Jose, Wilkins, & Spindel, 2012). This study highlights the relationship between depressive-like interchanges between friends and anxiety processes. What has not been examined is whether there are interaction patterns that reflect the cognitive component of anxiety (e.g., worry), which may have a differential impact on anxiety, and to a lesser extent, depression. Therefore, an investigation designed specifically to assess the effects of worrisome peer interactions may further elucidate potential "costs" of

friendships that increase the risk for depression and anxiety during adolescence, as well as an increased risk for females, who may participate more frequently in these types of dyadic interchanges.

Although there is overlap between worry and rumination, and both are correlated with anxiety and depression, there also exist distinctions between the two phenomena. (Hong, 2007). Worry is more strongly associated with anxiety and anxiety disorders, whereas rumination is more strongly associated with depression and depressive disorders. The interpersonal extension of rumination, co-rumination, has an emerging literature that supports this interchange as analogous to the cognitive process of rumination. Co-rumination correlates in an expected fashion with depression, anxiety, and internalizing symptoms. What has only recently begun to be explored is whether there is an analogous interpersonal interchange mirroring the cognitive process of worry, with overlapping features with co-rumination, yet distinct components unique to anxiety. This specifically worrisome dyadic interchange, called co-worry, intersects the research on interpersonal relationships and co-rumination, creating a perspective distinctly for anxiety. In similar fashion to co-rumination, co-worry is a conversation style between friends in which worries are continually discussed. These conversations are classified by difficulty stopping discussing the worry, threat interpretation of the worry, likelihood of future negative events, and low perceived efficacy of coping skills, reflecting the cognitive processes of worry and rumination (Herzig-Anderson, Dombrowski, & Treadwell, 2011, Calmes & Roberts, 2007). Initial development of a self-report measure of co-worry has supported internal consistency, factor structure, as well as unique factor structure from co-rumination (Herzig-Anderson et al., 2012).

When examining the co-rumination literature, and the initial findings on co-worry, it is important to assess what methods have previously been employed in understanding these new constructs. The literature on co-rumination has been reliant on self-report measures, without any documentation of dyadic interchanges (Calmes & Roberts, 2008; Ciesla et al., 2011; Rose, 2002; Rose et al., 2007; Smith & Rose, 2011). While the information gathered from this research offers insight into individuals' perceptions of co-rumination and internalizing distress, it does not allow for objective assessment. Likewise, the newly created construct of co-worry has been evaluated as a self-report instrument, and was found to have a distinct factor structure from co-rumination, supporting its divergent validity (Herzig et al., 2012). However, the extent to which friends worry together was not observed, and hence has not been manipulated or observed independent of self-report. As well, the direction of the relationship between co-worry and anxiety or internalizing distress has not been determined.

The study of the cognitive variables of rumination and worry have employed methods to examine the extent to which these cognitive constructs could be induced in a laboratory setting, and to examine subsequent changes in anxious or depressive symptoms. For instance, Lyubomirsky and Nolen Hoeksema (1995) induced rumination in a laboratory setting and documented subsequent increases in depressive symptoms. Likewise, Borkovec and colleagues (1983) induced worry cognitions in a lab setting and noted associated increases in worry and anxiety following induction. A similar methodology could be employed to induce co-worry in a lab setting and document its impact on anxiety and affect. Providing such information would add to the emerging study of co-worry with an objective measurement of co-worry, as well as examine the direction of influence. The goal of this study was to address shortcomings in the

literature by examining the induction of co-worry between friends and examine its potential impact on subsequent anxiety specifically, and negative mood state generally.

This study expects to find results consistent with previous literature on co-rumination and co-worry. The first hypothesis is that co-worry will occur more often in female dyads than in male dyads, as Rose (2002) found in her co-rumination study. The higher levels of intimacy and disclosure in female relationships are expected to facilitate increased co-worry. Similarly, self-reported co-worry is anticipated to be associated with the quality of the friendship. The second hypothesis is that co-worry will be associated with anxiety, given the specific focus of this construct, as compared to depression.

The third hypothesis is that the levels of anxiety will increase at a higher rate in the group of participants engaged in worrisome conversation than in the group of participants engaged in neutral conversation. The same prediction is also made about negative and positive affect, since worry has previously been shown to be associated with both anxious and depressive symptoms (Hong, 2007).

## **Method**

### **Participants**

The participants in this study consisted of University of Connecticut students enrolled in Psychology 1100 and 1103, and an accompanying friend from the university. Sixty dyads were enrolled in the study, which resulted in a total of 120 students, with 18 males and 102 females. For those reporting ethnicity, 74% were European American, 3% were African American, 18% were Asian American, and 5% were Latino/a. The average age was self-reported to be 19.13 ( $SD = 1.7$ ). Before beginning the experiment, participants were consented and given ample opportunity to ask questions to decide whether or not they wanted to participate. Participants

were told the goal of the experiment was to study how discussions with a friend impacted individual worry and levels of anxiety. Following completion of study procedures, two dyads were removed from data analysis. One dyad was removed because they brought an opposite-sex best friend, which was not the focus of the study. The second dyad was removed because one person had previously participated in the experiment. This resulted in a total of 116 participants.

### **Measures**

Participant anxiety and mood was measured using the Depression Anxiety Stress Scales (DASS-21). The full version of the DASS is a 42-item instrument assessing current ("over the past week") symptoms of anxiety, depression, and stress, as well as overall distress. The three scales consist of 14 items each scored on a 4-point Likert scale (0 = *did not apply to me at all* to 3 = *applied to me very much or most of the time*). The DASS-21 consists of three 7-item self-report subscales taken from the full version of the DASS. Reliability was determined to be satisfactory for the total score (Cronbach's alpha = 0.88) and the three subscales (Anxiety = 0.90; Depression = 0.82; Stress = 0.93). It was also demonstrated that the DASS-21 discriminates between patients with depression and anxiety disorders, and between a clinical and normative population.

State anxiety was measured with the State-Trait Anxiety Inventory – State (STAI – S), a 20-item measure in which subjects rate statements about their current anxiety on a 4-point Likert scale ranging from 1 (*not at all*) to 4 (*very much so*) with higher scores indicated greater state anxiety (Spielberger, Gorsuch, Luschene, Vagg, & Jacobs, 1983). This measure of anxiety symptoms demonstrates adequate reliability and validity.

The Co-Worry Scale (CWS) is a 12-item scale measuring the interpersonal aspects of worrying with a friend (Herzig-Anderson et al., 2012). This self-report scale assesses

interpersonal interactions with a same-gender best friend. Items reflect discussion focused on a) difficulty stopping a conversation about worries; b) threat interpretations; c) likelihood of negative events; and d) low perceived efficacy of coping skills. Each item is rated from “*not at all true*” to “*really true*” on a Likert scale ranging from 1-5. A high internal consistency of .90 was evidenced for the CWS, and initial support for construct validity in that it significantly correlated with worry and anxiety. As well, a single underlying factor structure was noted for the scale, and when examined with co-rumination items, a two-factor structure supported the difference between co-rumination and co-worry.

Worry was assessed with the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990). This instrument is a 16-item survey measuring excessive and uncontrollable worry. The internal consistency of the PSWQ was high ( $\alpha = .93$ ) as was test-retest reliability ( $\alpha = .92$ ; Meyer et al., 1990) in community samples and in college students. The scale evidenced high construct validity in differentiating adults diagnosed with general anxiety from those with other psychological disorders. Factor analysis indicated that the PSWQ measures a unitary construct, and evidenced convergent and divergent validity with measures of anxiety, depression and emotional control in college students (Brown, Antony, & Barlow, 1992; Meyer et al., 1990).

The Co-Rumination Questionnaire-Short Form (CRQ; Calmes & Roberts, 2008; Rose, 2002) assessed co-rumination in a 16-item survey designed to measure the frequency with which participants engage in repeated conversations focusing on negative, depressive mood state or lack of motivation to change. Items are rated on a 5-point Likert scale (1 = *not at all true* and 5 = *really true*). In a college student population, internal consistency was .89, and the scale

correlated in predicted directions with depression and to a lesser extent, anxiety (Calmes & Roberts, 2008).

Negative affect was assessed with the Positive and Negative Affect Scale (PANAS; Watson & Clark, 1988), a brief scale measuring two primary dimensions of mood – positive and negative affect. Two 10-item scales measure the extent that the respondent experienced a negative or positive mood item on a 5-point Likert scale ranging from “*very slightly to not at all*” to “*extremely*”. The scale evidenced strong internal consistency, with high test-retest reliability and convergent and discriminant validity. The scale is sensitive to fluctuations in mood.

Finally, the Quality of Relationships Inventory-Short Form (QRI; Calmes & Roberts, 2008; Pierce, Sarason & Sarason, 1991), a 6-item measure designed to assess the perceived support, importance, and ambivalence of relationships, was used to evaluate the relationship between the individuals of each dyad. This measure demonstrated adequate reliability and validity in a college student population, and demonstrated good concurrent validity (Calmes & Roberts, 2008).

Dyadic interchanges during a conversation task were recorded and subsequently scored for total co-worry using observational coding. Three researchers independently scored the videos based on an explicit and detailed coding scheme, with two researchers coding all 60 videos and the primary researcher coding 32 evenly distributed videos. This coding scheme was designed to discern how much co-worry took place in each dyadic interchange. Co-worry was subdivided into four categories to operationalize the term to facilitate reliable scoring. These categories were: repetitive nature of conversation, threat interpretation, perceived likelihood of future negative events, and low perceived efficacy of coping skills. The four categories were looked at in conjunction with one another to determine a score of the total level of co-worry present in

each video. Coders, blind to the hypotheses of the study, rated items on a 7-point Likert scale ranging from “*not at all*” to “*90-100% of the time*” Reliability was monitored throughout the coding, resulting in 100% of all tapes coded for reliability. The average inter-rater reliability across all tapes was calculated to be 80.26%.

### **Procedure**

Participants came into the laboratory one dyad at a time and, after signing in, were given consent forms outlining what would be required of them during the study, their compensation for participation, and their rights as human subjects. After any questions were answered about the procedures, participants signed their consent and were given a pen and the first set of surveys to be completed, which included the PANAS, STAI – S, CRQ, CWS, QRI, PSWQ, DASS-21, and a sheet containing instructions to generate a list of either worrisome or neutral discussion topics. Upon completion, the surveys were taken from the participants, leaving them only with their self-generated list of discussion points. Participants were randomly assigned to one of two conversation conditions: worry (n = 64) or neutral (n = 56). The instruction sheet for conversation items reflected the assigned condition. Participants in the worry condition listed three topics about which they worried with their friend and participants in the neutral condition generated three neutral topics of conversation, such as the weather or campus events.

The researcher next delivered the following instructions to the dyad for participation in the recorded discussion: “For this task you are going to have a discussion with each other for 8 minutes. You will use the list of topics you created just a minute ago as a reference sheet in case you can’t think of anything to discuss. I will step out into the hallway and begin the clock. Once the 8 minutes are up I will come back into the room and stop the camera. Please keep going until I come back.” Following these instructions, participants were given the opportunity to ask any

questions before the conversation task began. The researcher then started the camera and exited the room for eight minutes before returning to the room. Participants were then asked to fill out the STAI – S and PANAS a second time. Upon completion, participants were given gift cards as compensation for their participation. The participant that signed up through the Psychology Participant Pool was given experimental credit and a \$5 gift card to the UConn Coop, and the friend they brought was given a \$10 gift card to the Coop. Participants were thanked for their participation and led out of the room.

### Results

Means and standard deviations for study variables were calculated and examined for normal distribution (see Table 1). Data were within range for skewness and kurtosis. One outlier was noted for negative mood, and this dyad's data was not used in subsequent analyses. The resulting participants (114 total) consisted of 96 females and 18 males. Two of the dyads that were removed had been assigned to the neutral conversation group, and one was assigned to the worry group.

Next, the groups were compared on study variables to ensure that randomization resulted in comparable groups (see Table 2). Gender distribution across groups was analyzed using chi square. Results indicated disproportionate assignment across groups by gender,  $X^2 = 8.91, p = .004$ . The neutral group had 38 females and 14 males, while the worry group was found to have 58 females and 4 males. As there were not enough observations of each ethnic group reported by the participants to conduct a chi square, ethnicity was collapsed into European American and non-European American. A chi square analysis indicated no variations in ethnic composition across groups ( $p = .24$ ). A series of one-way ANOVAs was conducted to determine if there were any statistical differences between the pre-conversation questionnaire scores of the neutral and

worry groups. While the groups did not differ significantly on pre-conversation co-worry, co-rumination, positive mood, negative mood, state anxiety, or worry (all  $p > .05$ ), they did significantly differ for the quality of friendship,  $F(1, 112) = 9.56, p = .003$  and total distress,  $F(1, 111) = 4.22, p = .042$ . For friendship quality on the QRI, the worry condition had a higher mean of 22.74 ( $SD = 1.64$ ) than the neutral group's mean of 21.48 ( $SD = 2.67$ ). The reverse was true for total distress as reported on the DASS, with the worry condition's mean of 12.56 ( $SD = 9.35$ ) significantly lower than the neutral condition's mean of 16.80 ( $SD = 12.57$ ).

To examine the first hypothesis that co-worry would vary as a function of gender, a one-way ANOVA was conducted. Results indicated no significant differences,  $F(1, 111) = .002, p = .962$ . Males reported an average co-worry score of 25.94 ( $SD = 7.39$ ) and females an average of 25.86 ( $SD = 6.54$ ). There was also no evidence to support that co-worry was related to friendship quality, in that these variable were not significantly correlated ( $r = -.13, p > .05$ ; see Table 1).

To examine the second hypothesis, that co-worry would be associated with anxiety specifically, a Pearson correlation was conducted. The subscales of the DASS, co-worry, and co-rumination were evaluated. Results indicated that self-reported co-worry was significantly correlated with anxiety ( $r = .26, p < .01$ ), and not depression ( $p > .05$ , see Table 3). Also, co-worry was significantly associated with co-rumination ( $r = .43, p < .01$ ), indicating they share some variability.

The third hypothesis examined whether co-worry could be induced in a lab setting by a conversation task, with an impact on subjective anxiety and affect for those who co-worried. First, a one-way ANOVA showed a significant main effect for observed levels of co-worry,  $F(1, 112) = 203.76, p < .001$ . Participants in the worry condition displayed higher observed levels of

co-worry ( $M = 4.84$ ,  $SD = .70$ ) than did participants in the neutral condition ( $M = 1.54$ ,  $SD = 1.54$ ).

Next, a 2 (group) x 2 (time) repeated measures ANCOVA was conducted for each of three outcome variables, state anxiety, positive mood, and negative mood. Since the groups differed significantly for friendship quality and total distress, these two variables were entered as covariates in the analyses. Results of all three outcome variables yielded no significant main effects, but did yield significant interaction effects. Specifically, results for state anxiety revealed a significant interaction across time by group,  $F(1, 104) = 11.62$ ,  $p = .001$ . Participants in the neutral group reported a decrease in state anxiety pre-assessment ( $M = 34.45$ ;  $SD = 8.75$ ) to post-assessment ( $M = 30.71$ ,  $SD = 8.69$ ), whereas the worry group maintained their pre-conversation level of state anxiety (pre  $M = 32.79$  [ $SD = 8.20$ ] post  $M = 33.09$  [ $SD = 10.22$ ]; see Figure 1). Post-hoc t-tests indicated that groups trended towards significance at post-conversation,  $t(112) = -1.68$ ,  $p = .095$ . Similar results were noted for negative mood state, in that no main effect of condition was noted, but a significant interaction,  $F(1, 108) = 4.40$ ,  $p = .038$ , indicated a group by time difference. Specifically, the participants in the neutral group reported a decrease in negative mood state from pre-assessment ( $M = 13.33$ ;  $SD = 3.44$ ) to post-assessment ( $M = 12.00$ ,  $SD = 2.48$ ), whereas the worry group maintained their pre-conversation level of negative mood state ( $M = 13.15$ ,  $SD = 2.97$ ) to post-conversation ( $M = 13.32$ ,  $SD = 4.31$ ; see Figure 2). Post-hoc t-tests indicated that post-conversation, negative affect was significantly different between groups,  $t(111) = -2.00$ ,  $p < .05$ . Finally, results for positive mood state demonstrated a significant interaction effect,  $F(1, 108) = 4.74$ ,  $p = .032$ . Participants in the neutral group reported an average of 27.82 ( $SD = 8.41$ ) pre-conversation, and an average positive mood of 29.94 ( $SD = 9.34$ ) post-conversation, whereas the worry group reported 28.08 ( $SD = 7.73$ ) pre-conversation

and 27.71 ( $SD = 9.10$ ) post-conversation (see Figure 3). Post-hoc t-tests indicated that groups showed no significance difference at post-conversation,  $t(111) = 1.32, p = .189$ .

### Discussion

This study investigated the effects of co-worry in a dyadic interchange between same-gender friends. Friendship dyads were recruited to answer self-report questionnaires about state anxiety, mood, worry, co-worry, co-rumination, total distress, and friendship quality. They then engaged in a conversation task in which they were instructed to co-worry (i.e., discuss their worries) or discuss neutral topics. Upon completion of the conversation, participants filled out self-report questionnaires about state anxiety and mood a second time. Use of self-report measures about anxiety and mood both before and after the interchange allowed for insight into the effects of co-worry, as well as the success of inducing co-worry in a laboratory setting. Observational coding of the conversations noted the extent of co-worry between dyads. The goals were to determine the relationship between co-worry and internalizing distress, as well as to examine a laboratory paradigm of co-worry. This was done by inducing co-worry and examining potential directional effects of co-worry on internalizing distress.

Results revealed that co-worry was related to co-rumination, negative affect, and anxiety as expected. Co-worry was significantly related to increased co-rumination, anxiety, and stress. However, contrary to predictions, females did not co-worry at a greater frequency than did males. In addition, co-worry was not significantly associated with friendship quality. Additionally, from pre-conversation to post-conversation, those dyads in the neutral condition experienced a decrease in state anxiety and negative affect and an increase in positive affect. Dyads in the worry condition had no change in their state anxiety, negative affect or positive affect from pre- to post-conversation. Analysis of the observational coding showed that those in

the co-worry condition had higher observed levels of co-worry than those in the neutral condition. This suggests that the induction of co-worry was successful, and could account for the differences between the two conditions.

The association between co-worry and co-rumination in the present study is consistent with previous literature indicating a strong relationship between worry and rumination (Borkovec, Ray, & Stöber, 1998; Nolen-Hoeksema, 1991). The cognitive processes underlying worry and rumination are very similar, in that both focus on repetitive, negative cognitions. Likewise, co-rumination and co-worry, based on the respective cognitive constructs, also demonstrate a significant association. This is likely accounted for by the repetitive focus of conversations in each construct, as well as the focus on negative aspects of events. Each construct differs however, on the direction of the conversations' foci (i.e., past or future). Conversations that are ruminative in nature are past-oriented, whereas worrisome conversations are future-oriented. Given these different foci, it is hypothesized that each would exhibit a differential relationship with anxiety and depression, although this specific hypothesis awaits further investigation.

It was surprising that co-worry did not vary by gender as predicted. Rose (2002) noted that females co-ruminated significantly more often than boys, which is consistent with literature of internalizing disorders (Furman & Buhrmester, 1992). Perhaps differences are attributable to the small, normative nature of our sample. In a non-clinical population, differences in symptomology between the sexes may not be as noticeable. Our sample size was also small to begin with, and the percentage of males within that small sample size may have been insufficient to detect differences. Another explanation may be the voluntary nature of this study. Since each of the participants in this study were volunteers, our results are limited to answers provided by

students that would volunteer, with a friend, to do a research study. Thus, there may not be as much variability about co-worry habits amongst individuals who volunteered to worry with a friend. Alternatively, there may be unique attributes of co-worry that are experienced in a similar fashion by both males and females.

In a similar vein, co-worry was not associated with friendship quality, as is co-rumination. Rose (2002) found co-rumination and friendship quality to be associated due to the process of self-disclose that predicated the conversation and the resulting feelings of closeness. Perhaps co-worry does not require the same intimate self-disclosure as co-rumination, resulting in less necessity of a particularly close friend in order to co-worry. Additionally, most participants in the current study reported feeling satisfied with the overall quality of their friendship, and there may not have been sufficient variability on this variable in the community sample to detect any covariation with co-worry. Friendship quality in clinical anxiety populations would be needed to further examine this possibility.

Given the specific nature of the co-worry construct, it was expected that co-worry would be associated with anxiety, as this study demonstrated. The cognitive factors underlying anxiety, such as repetitive worry and availability heuristics, show the circularity of anxious symptoms (Butler & Mathews, 1983). While worry keeps the circularity internal, co-worry externalizes the process, but doesn't fundamentally change it. Thus, our results follow the previous research trends that co-worry would be associated with anxiety.

The evidence supporting the third hypothesis is also not exactly what was anticipated. The hypothesis predicted that the worry group would have higher scores of state anxiety and negative affect post-conversation, but it was expected that this would be due to an increase in the self-reported levels in this condition. However, results revealed that the worry group's scores

were higher because the neutral group experienced a decrease in their state anxiety and negative affect, and an increase in positive affect, post-conversation. Such a finding suggests that talking to a friend under non-worrisome conditions is a positive influence on internalizing symptoms. Previous literature has shown intimate friendships can have a positive effect on adjustment (Rose et al., 2007). It's possible that the act of having a non-affect laden conversation calmed down dyads in the neutral condition from whatever potential anxiety may have arisen due to being videotaped. Conversely, dyads in the worry condition were not given any opportunity to relax, potentially explaining why their self-reported anxiety and mood did not change.

Hankin, Stone, and Wright's 2010 finding that co-rumination does not immediately lead to general depressive symptoms may also help explain why co-worry did not lead to increases of anxiety and negative affect in the worry condition. The researchers discovered that an accumulation of this interactional style was necessary to see general depressive symptoms. It is possible that the case is similar for co-worry and anxious/depressive symptoms. Perhaps a continued engagement in this interchange would increase general anxiety symptoms. Inducing an isolated instance of co-worry in the laboratory may not have been enough to show the predicted effects.

These results are important because they contribute to the base knowledge currently being accumulated on the phenomenon of co-worry. Previous research was strictly correlational in nature, whereas this study began to tease apart the directionality of the relationship between co-worry and anxious symptoms. In this study co-worry was induced in a laboratory setting and the co-worry group did not increase in their subjective comfort during the dyadic interaction with a friend, as compared to the neutral conversation group.

Gathering a substantial body of knowledge about co-worry also allows for further development of the connections between interpersonal relationships and anxiety. Previous research has already shown interpersonal relationships focusing on depressive conversations to be associated with emotional adjustment (Rose et al., 2007), but investigations into co-worry elucidate impacts on cognition and future internalizing symptoms. This study's results suggest that interpersonal factors may also be an important risk factor for the development of anxiety. A deeper understanding of how communication between friends can affect those with vulnerabilities for internalizing disorders could help in the prevention and treatment of the disorders. This would lead to a greater understanding of the interplay between interpersonal factors and cognitive variables in the etiology of clinical anxiety.

There were several limitations in the study to note. Frequency calculations showed that the neutral condition had a disproportionate number of males compared to the worry condition. It was assumed that randomization of participants would lead to an even distribution of males and females across the groups, but the low overall male turnout affected our stratification negatively. Because this study required participants to bring a close same-gender friend, males, who spend less time in dyads than females, may have been less attracted to the study as a research opportunity. Future studies following a similar methodology would do well to pay closer attention to male enrollment to ensure better representation across groups.

Another limitation of this study was that it was dependent on undergraduate volunteers to bring a friend to the session. On a campus where there are a plethora of research opportunities, not everyone is inclined towards a study requiring them to find and bring another person for participation. This could have resulted in a certain profile of student undertaking this experiment, leading to biased results. It might be that potential participants with a good friend were more

likely to volunteer for the study, and hence persons with very high friendship quality may have been overrepresented. Likewise, the buffering effects of a high quality friendship may have diminished the extent to which the co-worry induction could increase negative mood. The overall high quality of the friendships represented in the sample may have contributed to the maintenance of mood state and anxiety from pre-conversation to post-conversation, rather than the conversation leading to increased anxiety as predicted.

While our results concluded that changes in state anxiety and affect levels were due to co-worry, future studies could benefit from coding co-rumination as well as co-worry. Dyads were given clear instructions to discuss their worries, but since worry and rumination involve such similar processes, participants may have drifted towards co-rumination at some points in their conversation. Coding for co-rumination would allow researchers to determine more conclusively that any changes are due to co-worry alone, separating out any co-rumination.

Overall, this study examined the effects of inducing co-worry in friendship dyads in a laboratory setting. Most notably, findings demonstrate that co-worry can be successfully induced in a laboratory, and that inducing co-worry has significant effects on subsequent anxiety and affect. This study lays some of the groundwork for future research to investigate co-worry and its specific relationship to internalizing disorders.

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Table 1. Means (Standard Deviations) and Correlations of Dependent Variables

Measure	CWS	CRQ	PANAS – Pos	PANAS – Neg	QRI	STAI-S	DASS	PSWQ
<b>CWS</b>		.425**	.041	.192*	-.134	.188	.218*	.122
<b>CRQ</b>			.211*	.123	.044	.008	.268**	.116
<b>PANAS – Pos</b>				.001	.046	-.394**	-.020	-.200*
<b>PANAS – Neg</b>					-.142	.615**	.340**	.092
<b>QRI</b>						-.181	-.107	-.075
<b>STAI-S</b>							.294**	.254**
<b>DASS</b>								.357**
<b>PSWQ</b>								
<b>M (SD)</b>	25.9 (6.6)	70.8 (18.5)	28.0 (7.9)	13.2 (3.2)	22.2 (2.2)	33.6 (8.4)	14.5 (11.1)	51.3 (14.7)

Notes: \*\*  $p < .01$ , \*  $p < .05$

Table 2. Means and Standard Deviations of Study Variables Across Condition

	<b>Worry Group</b>	<b>Neutral Group</b>
<b>CWS</b>	25.94 (7.09)	25.80 (6.13)
<b>CRQ</b>	70.20 (18.22)	71.46 (19.06)
<b>PANAS Positive</b>	28.08 (7.73)	27.82 (8.25)
<b>PANAS Negative</b>	13.15 (2.97)	13.33 (3.50)
<b>STAI</b>	32.79 (8.20)	34.54 (8.69)
<b>QRI</b>	22.74 (1.64)	21.48 (2.67)
<b>DASS</b>	12.56 (9.35)	16.80 (12.57)
<b>PSWQ</b>	51.58 (14.23)	51.04 (15.35)
<b>Observed Co-Worry</b>	4.84 (1.54)	1.54 (.70)

Table 3. Correlation Among Co-worry, Co-rumination, Anxiety and Depression

<b>Measure</b>	<b>CWS</b>	<b>CRQ</b>	<b>DASS – Stress</b>	<b>DASS – Depression</b>	<b>DASS – Anxiety</b>
<b>CWS</b>		.425**	.158	.158	.263**
<b>CRQ</b>			.190	.252**	.285**
<b>DASS – Stress</b>				.690**	.662**
<b>DASS – Depression</b>					.595**
<b>DASS – Anxiety</b>					

Notes: \*\*  $p < .01$

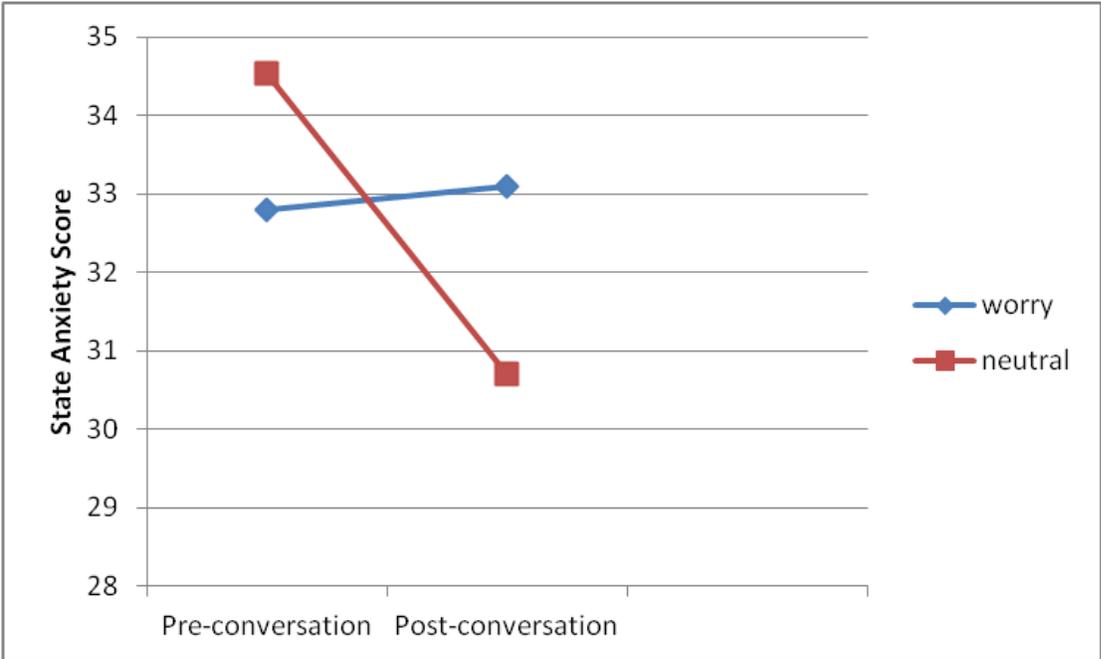


Figure 1. State Anxiety by Condition During the Conversation Task

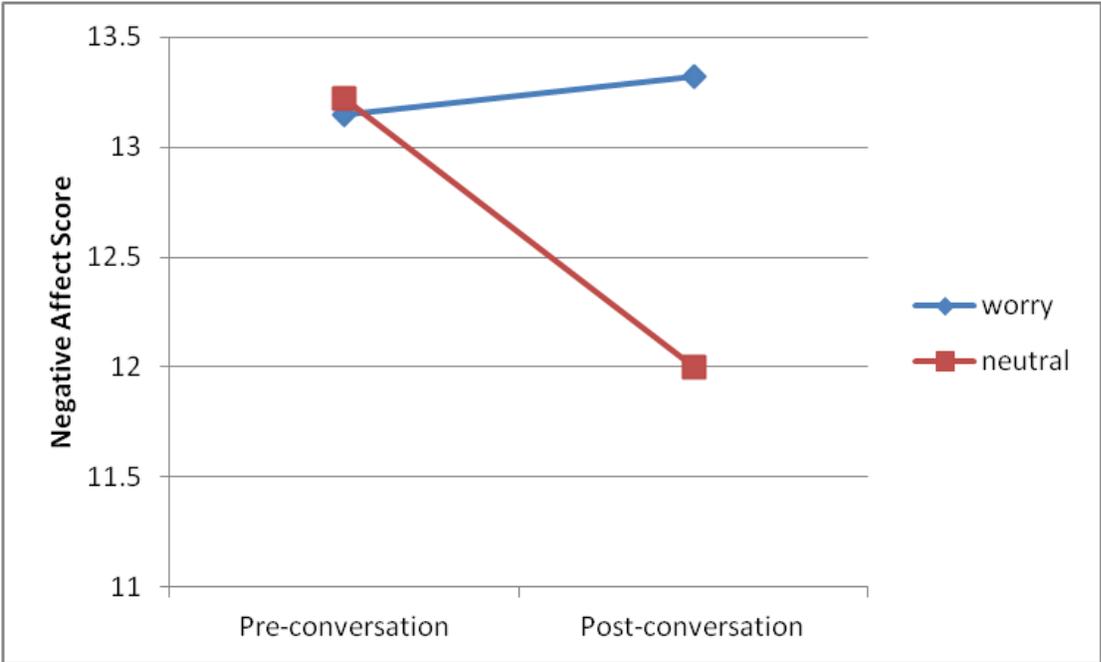


Figure 2. Negative Affect by Condition During the Conversation Task

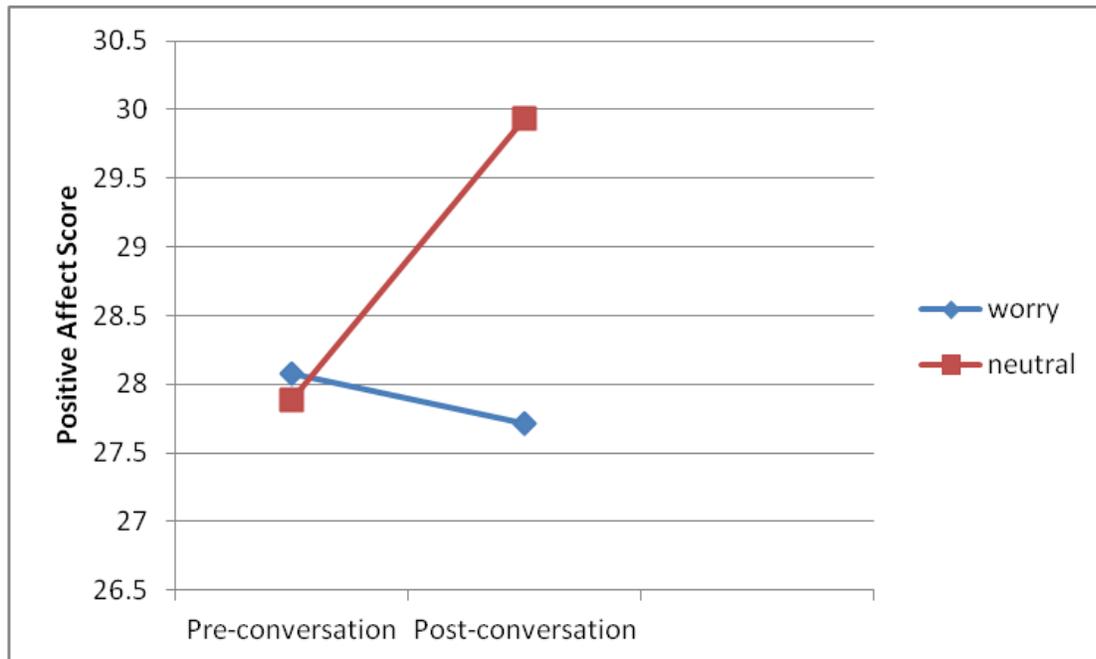


Figure 3. Positive Affect by Condition During the Conversation Task