“Let’s Go Over It Again”: Examining the Intra- and Interpersonal Processes that Perpetuate Co-Rumination in Close Relationships

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This dissertation titled

"Let's Go Over It Again": Examining the Intra- and Interpersonal Processes that Perpetuate Co-Rumination in Close Relationships

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Abstract

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"Let's Go Over It Again": Examining the Intra- and Interpersonal Processes that Perpetuate Co-Rumination in Close Relationships

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Co-rumination is an interpersonal emotion regulation strategy conceptualized as a fusion of self-disclosure and rumination and is characterized by extensive, cyclical conversations with close others regarding the causes and consequences of problems and their associated negative emotions. Theory posits that the interpersonal benefits of co-rumination such as emotional closeness and intimacy serve to reinforce the behavior, outweighing the resulting negative intrapersonal impacts on mental health. Despite the popularity of this trade off hypothesis, no study to date has directly tested interpersonal benefits as perpetuating factors of co-rumination. The present study aims to integrate the self-disclosure, emotion regulation, and close relationship literatures to assess the interplay of co-rumination and responsiveness in determining downstream co-rumination and the role of partner perceptions in how these processes unfold. Accomplishing these aims will facilitate our understanding of the intra- and interpersonal processes that occur during co-rumination. To do this, I utilized a self-disclosure paradigm wherein one individual (the discloser) disclosed and discussed their most stressful, ongoing problem with a close friend (the responder). Results revealed that co-rumination is accurately perceived by partners, but perceptions are also subject to projection biases. Additionally, co-rumination is a reciprocal process that occurs within dyads and elicits responsive behavior from responders. Although greater perceived partner responsiveness did not

significantly predict downstream co-rumination within the conversation as predicted, co-rumination was perceived as responsive by disclosers, highlighting the interplay between these processes during co-rumination. Overall, findings enhance our understanding of how co-rumination unfolds within conversations between close friends. Theoretical and clinical implications of these findings are discussed.

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Introduction

When individuals are upset about a problem, they commonly turn to friends, romantic partners, or family to help regulate their emotions (Campos et al., 2011; Zaki & Williams, 2013). Although emotion regulation can be an intrapersonal process, it commonly occurs in an interpersonal context through the interplay of both intra- and interpersonal processes (Campos et al., 2011; Zaki & Williams, 2013). Co-rumination is an interpersonal emotion regulation strategy wherein individuals (the *disclosers*) disclose a personal problem to a close other (the *responder*) and then ruminate on it with them. These conversations are characterized by extensive, cyclical discussions regarding the causes and consequences of personal problems and their associated negative emotions. Co-rumination has been identified as a maladaptive emotion regulation strategy, as it is associated with negative intrapersonal outcomes such as greater stressed and upset feelings (Tudder et al., in press), greater exhaustion and burnout (Boren, 2013, 2014), and the onset and exacerbation of depression and anxiety (Rose et al., 2017; Spendelow et al., 2017; Stone et al., 2011). Co-rumination has also been implicated as a mechanism of contagion of depression and anxiety within adolescent dyads, particularly in friendships perceived to be closer and of higher quality (Schwartz-Mette & Rose, 2012; Schwartz-Mette & Smith, 2018).

Yet despite these negative intrapersonal outcomes, individuals still co-ruminate. Researchers hypothesize that interpersonal benefits stemming from self-disclosure processes reinforce and perpetuate the cycle of co-rumination (Rose, 2021; Rose et al., 2007). However, empirical evidence supporting this claim is still limited. The proposed study will be the first systematic investigation of the cyclical nature of co-rumination and

the intra- and interpersonal processes that perpetuate it. More specifically, this study will examine how partner perceptions of co-rumination following problem disclosure and intimacy processes within the relationship influence downstream co-rumination.

Co-Rumination is Socially Rewarding

Co-rumination has been conceptualized as a socially rewarding manifestation of rumination (Aldrich et al., 2019; Stone et al., 2011). Conversations with greater (vs. lesser) co-rumination are perceived as more meaningful and satisfying (Obraztsova, 2015) and adolescents who engage in greater co-rumination perceive themselves to be more socially competent (Hankin et al., 2018). Additionally, co-rumination is associated with more positive perceptions of the relationship. Friends who engage in greater co-rumination tend to report greater friendship quality and feelings of closeness with their friend both concurrently (Rose, 2002; Rose et al., 2014; Smith & Rose, 2011) and prospectively four to six months later (Felton et al., 2019; Rose et al., 2007). Finally, cross-sectionally adolescents who engage in greater co-rumination with their peers, specifically greater speculation and depth of discussion of personal problems, report greater communication within their peer relationships, and greater frequency of co-rumination in these relationships is associated with greater trust (Dam et al., 2014).

Researchers posit that socially rewarding characteristics of co-rumination that facilitate relationship intimacy such as validation and social support reinforce the process (Rose et al., 2007, 2014; Stone & Gibb, 2015). Two pieces of evidence are commonly cited in support of this notion. First, in an observational study of problem talk between same-sex friends, Rose, Schwartz-Mette, Glick, Smith, & Luebbe (2014) found that greater co-rumination was associated with more supportive and engaging responses from

friends and that supportive responses were immediately followed by further problem discussion in >75% of cases. Second, longitudinal studies demonstrate a bidirectional relationship between co-rumination and friendship quality, with greater co-rumination predicting higher friendship quality and higher quality friendships predicting greater co-rumination downstream (Felton et al., 2019; Rose et al., 2007). Although these findings provide preliminary evidence that co-rumination is a cyclical, reinforcing process, no study to date has directly, empirically tested relationship intimacy processes as perpetuating factors of co-rumination.

A Dyadic Approach to Co-Rumination

At its core, co-rumination is a dyadic emotion regulation strategy, meaning that both individuals in the relationship have agency and goals in the conversation that can influence emotional trajectories and coping for both people (Campos et al., 2011; English & Eldesouky, 2020; Zaki & Williams, 2013). Approaching co-rumination as a phenomenon that occurs within a dynamic, social context is crucial to understanding how both intra- and interpersonal processes unfold to perpetuate co-rumination. Take, for example, a college student who is unhappy in their romantic relationship because they feel neglected by their partner. They conceptualize a successful relationship as one where both people prioritize spending time with each other over other obligations, but their relationship falls short of that standard due to their partner's busy schedule. As a result, they feel angry and resentful toward their partner. Preliminary research suggests that individuals co-ruminate about stressors to assuage negative affect through improving their understanding of the causes and consequences of the event while fostering intimacy with their co-ruminating partner (Dam et al., 2014). In this example, the individual might

attempt to downregulate their anger and resentment directed at their partner by disclosing and extensively processing their feelings with their roommate to serve the overarching goals of avoiding conflict in their romantic relationship and bonding with their roommate. However, the roommate, as their co-rumination partner, may have their own goals that shape how the conversation unfolds. For example, the roommate might perceive and feed into the anger to serve the higher goals of supporting their friend and helping end a relationship that they view as unhealthy. Thus, a cyclical process forms wherein both individuals in the dyad play important roles in the regulatory process. Perceptions of the stressor, the discussion of stressful situation, and the relationship and negotiation of higher order goals such as fostering and maintaining intimacy guide regulatory attempts by both individuals that influence emotional experiences.

Self-Disclosure Processes in Relationships

The socially rewarding outcomes of co-rumination are hypothesized to stem from the self-disclosure processes that occur during discussions of personal problems and associated negative emotions (Rose, 2002), and thus the self-disclosure literature may provide a theoretical foundation to better understand the processes that occur in co-rumination. Self-disclosure is an important facet of close relationships and is crucial for building intimacy within such relationships (Greene et al., 2006). Cross-sectionally, self-disclosure within friendships is associated with greater emotional closeness and respect (Bauminger et al., 2008). In particular, emotional disclosures that are inherent to co-rumination (as opposed to factual or descriptive disclosures) contribute the most to intimacy (Laurenceau et al., 1998; Reis & Shaver, 1988). Disclosures of emotions are thought to reflect core aspects of the self and provide partners with opportunities to

validate those core features and provide support (Collins & Miller, 1994; Laurenceau et al., 1998; Reis & Shaver, 1988). In support of this idea, a meta-analysis reveals that individuals who disclose deeper (vs. more superficial) information about themselves tend to be viewed more positively by partners (Collins & Miller, 1994). Not only do intimate disclosures result in being viewed more positively, but individuals are more likely to disclose to those they favor and view partners more favorably as a result of disclosing to them (Collins & Miller, 1994). Consequently, over time, self-disclosure processes are both cyclical and reinforcing.

Several studies have demonstrated the reciprocity of self-disclosure within dyads (Collins & Miller, 1994; Miller & Kenny, 1986; Sprecher & Hendrick, 2004), which may be one of the mechanisms through which the cycle of co-rumination is reinforced. In a study on self- and partner-reported disclosure, L. C. Miller and Kenny (1986) used a social relations analysis within a social network to examine reciprocity, perceived reciprocity, and accuracy of self-disclosure. Results of dyad-level analyses indicated both reciprocity and perceived reciprocity of self-disclosure. In other words, partners of individuals who reported engaging in greater self-disclosure also tended to report greater self-disclosure (reciprocity) and individuals who reported greater self-disclosure also reported greater *partner* self-disclosure (perceived reciprocity), meaning that not only do individuals engage in reciprocal self-disclosure, but their partners are able to detect and report that reciprocity. Further, individuals were generally accurate in their reports of self-disclosure (i.e., a significant correlation between and partner-reported and perceived partner disclosure). The fact that these relationships were strongest and most consistently observed at the dyad (vs. individual) level highlights how reciprocal self-disclosure

processes are largely reflective of dynamic, relationship-level influences, rather than individual tendencies regarding self-disclosure.

Response-Dependent Disclosure Processes

Although self-disclosure is a key component in the development of intimacy within relationships, disclosure on its own is not sufficient to produce positive outcomes for the relationship (Manne et al., 2004). Self-disclosure is a response-dependent process, meaning that partner responses following disclosure determine downstream outcomes of the interaction (Reis & Shaver, 1988; Zaki & Williams, 2013). Zaki and Williams (2013) theorize that response-dependent processes, in this case in the context of problem disclosure, are thought to facilitate regulation through two primary mechanisms. First, partner responses that are supportive serve as "safety signals", either prompting the individual to reappraise the stressor as less threatening or increasing perceived support through shared resources with a close other. Second, partner responses can serve to create social bonds over time to build a support network. Although the extent to which co-rumination is a response-dependent process is still unknown, researchers hypothesize that individuals engage in co-rumination in part to better understand their problems (Dam et al., 2014) and continue to do so because of the resulting intimacy co-rumination fosters (Rose et al., 2007). These regulation goals align with the mechanisms of response-dependent processes through reducing uncertainty and bolstering the social network.

Again relying on the theoretical foundation of the self-disclosure literature, the intimacy process model (Reis et al., 2004; Reis & Shaver, 1988) emphasizes the response-dependent nature of self-disclosure and outlines how partner responses following disclosures play a key role in building intimacy in close relationships.

Specifically, this theory posits that responsiveness, or the extent to which partners convey understanding, validating, and caring is a crucial component of emotional intimacy in relationships, particularly when expressed in response to disclosures of personal information or negative emotions (Reis & Shaver, 1988; Rusbult et al., 2001). In the context of self-disclosure, when individuals reveal sensitive information to their partner, they are risking rejection. When partners convey understanding, validating, and caring in response to that vulnerability, disclosers will feel safe and will be more likely to disclose again in the future and view the relationship more positively (Greene et al., 2006; Laurenceau et al., 1998). In addition, partners of individuals who disclose tend to view disclosure and emotional expression positively (Laurenceau et al., 1998) and, in turn, to engage in reciprocal self-disclosure (Greene et al., 2006). Finally, self-disclosure may be a means by which individuals seek validation from others, particularly from close others whose perceptions are valued (Collins & Miller, 1994). Thus, responsiveness creates an ongoing, reciprocal, pro-relationship cycle that fosters greater intimacy and relationship commitment over time (Rusbult et al., 2001, 2006).

Responsiveness and Co-Rumination

Although there is strong empirical evidence demonstrating the vital role of responsiveness following self-disclosure in promoting intimacy, these processes have largely been neglected in relation to co-rumination. Only two studies to date have directly examined responsiveness in the context of co-rumination. First, in a study of experimentally-manipulated co-rumination between close friends, when prompted co-ruminate (vs. discuss the problem naturally) responders tended to perceive their partner as more responsive (Tudder et al., n.d.). Second, in a study where interaction partners

were prompted to be responsive (vs. not) during a problem-focused discussion, greater observed co-rumination was associated with increases in friendship satisfaction for those who were prompted to be responsive (Afifi et al., 2013).

Additional studies provide further, indirect evidence for the link between co-rumination and responsiveness. For example, co-rumination is associated with greater perspective-taking and empathy (Pratscher et al., 2018). Additionally, co-rumination is associated with excessive reassurance seeking (Hankin et al., 2018; Obraztsova, 2015; Smith-Schrandt, 2013), thus the extensive, negatively valenced discussions of disclosed information may be a means of eliciting responsive behavior from partners. Though these findings suggest that responsiveness may be important in the context of co-rumination, it is still unclear to what extent responsiveness facilitates the development of a pro-relationship cycle as a result of co-rumination, as it is still unclear how much partner responses and intimacy processes promote future co-rumination.

Partner Perceptions of Behavior – Tracking Accuracy and Bias

Interpersonal emotion regulation strategies such as co-rumination are dyadic phenomena that are constructed within a relationship through patterns of behavior established within that specific relationship (Dirghangi et al., 2015; Zaki & Williams, 2013) in combination with the intrapersonal processes that influence perceptions of the partner and the relationship. Thus, to assess the intra- and interpersonal processes during co-rumination that determine downstream coping behavior, the current research distinguishes between two distinct, but interrelated, components of dyadic interactions: actual behavior of an individual (e.g., co-rumination, responsive behavior) and partner perceptions of that behavior. Given the interpersonal nature of co-rumination and the

vital role perceptions play in interpersonal emotion regulation, understanding the extent to which individuals can accurately track their partner's co-rumination is crucial.

To do so, I will draw on the emotion and emotion regulation literature to first understand how perceptual processes relate to emotion regulation broadly. Research indicates that perceptions of partners' emotional experiences and coping strategies are used to guide behavioral responses such as support provision and other extrinsic emotion regulation strategies like problem-solving (Nozaki & Mikolajczak, 2020). Broadly, within close relationships, individuals are generally accurate in judgments of their partner across domains, including personality expression, positive interactions, and memories (Fletcher & Kerr, 2010). In other words, judgments are correlated with a chosen standard such as partner reports. For example, as an individual's reports of negative emotions fluctuate from day to day, partner reports correspondingly track those changes over time (Clark et al., 2017; Overall et al., 2019). Despite displaying overall tracking accuracy in judgments, individuals are also subject to biases that result in over- or underestimating a judgment relative to the chosen standard (Fletcher & Kerr, 2010). In relation to detection of emotions within close relationships, individuals are accurate in tracking the negative emotions of their partner and emotional expression by the partner further enhances tracking accuracy (Overall et al., 2019). Though, individuals with partners who engage in higher (vs. lower) expression of negative emotions also tend to overestimate the intensity of those emotions.

Within the domain of interpersonal emotion regulation specifically, relatively little research has been done to assess the extent to which individuals can recognize partners' use of specific emotion regulation strategies. However, we know from research

on emotion suppression that while individuals are somewhat accurate in tracking partners' suppression, they also tend to overestimate how much they are suppressing their emotions due to projecting their own emotion suppression onto their partner (Peters & Overall, 2020). Projection is one source of bias that relies on perceived similarity with a partner to inform judgments (i.e., "I'm suppressing my negative emotions in this interaction, so my partner must be as well.") (Morry et al., 2011).

Though the proposed study is the first to examine partner perceptions of co-rumination, given that co-rumination inherently involves self-disclosure, expression, and extensive discussion of negative emotions associated with personal problems (Rose, 2002), partners should be able to detect and track partners' co-rumination within conversations, however these perceptions may be subject to biases. Research indicates that greater information exchanged during problem discussion is associated with greater perceived similarity (Ranney & Troop-Gordon, 2015), meaning that perceptions of co-rumination during extensive problem discussion may be influenced by projection biases. Supporting this claim, research on perceived reciprocity of self-disclosure indicates that, while self-disclosure is correctly perceived as a reciprocal process within close relationships and individuals are accurate in detecting partners' self-disclosure, estimates tended to be downwardly biased (Sprecher & Hendrick, 2004). Thus, individuals may be accurate in reporting their own co-rumination but less accurate in detecting the co-rumination of their partner, meaning that perceptions of co-rumination may be similarly informed by the individual's own co-rumination. Detection of co-rumination, particularly disclosure and discussion of negative emotions, may be particularly important in facilitating downstream co-rumination, as failure to detect negative emotions in others

impairs responsiveness behavior that would reinforce disclosure processes (Overall et al., 2019).

It is also worth noting that, being biased in itself is not inherently good or bad, but instead depends on the behavior being perceived. For example, biases based on perceived similarity can be used as a heuristic to improve tracking accuracy of judgments in relationships, assuming that dyad members are in fact similar to one another. Imagine a scenario in which both dyad members engage in co-rumination during an interaction, but partner co-rumination is difficult to detect and thus tends to be underestimated. Projection biases that assume similarity between dyad members would prompt individuals to allow their own co-rumination to inform their judgments and correct for the inability to detect their partner's actual co-rumination. However, this correction would only occur in instances where dyad members engage in similar amounts of co-rumination. Even in instances where biases do not facilitate accuracy, biased judgments may still benefit the relationship. For example, partners who tend to overestimate their partner's negative emotions may provide more support or reassurance for their partner during times of stress or behave more responsively following disclosures of negative emotions.

Perceptions of Partner Responsiveness

In addition to perceptions of co-rumination, perceptions of partner responsiveness may also play an important role in determining relationship outcomes and downstream coping behavior for both individuals in the relationship. In the context of a problem discussion where individuals are motivated to provide support to their partner, individuals may elicit responsive behavior from partners through disclosure of negative thoughts and emotions. However, while partners may attempt to behave responsively, that does not

ensure that their behavior will be perceived as such. While perceptions of responsiveness are associated with responsive behavior enacted by the partner (as rated by an outside observer), such associations are generally modest and vary across relationship contexts (Maisel et al., 2008). Perceptions of partner responsiveness are subject to biases such as projection (Lemay & Clark, 2008) and are influenced by person- and relationship-level factors such as self-esteem and satisfaction in the relationship, respectively (Maisel et al., 2008). Importantly, research indicates that perceptions of partner responsiveness moderate the relationship between responsive behavior (e.g., support provision) and outcomes for the individual and the relationship (Maisel & Gable, 2009; Selcuk & Ong, 2013).

Perceptions of partner responsiveness are integral to intimacy processes, particularly following self-disclosure (Reis & Shaver, 1988) and are associated with greater relationship satisfaction (Candel & Turliuc, 2021), intimacy (Manne et al., 2004), support provision (Lemay & Clark, 2008), and investment in the relationship (Murray et al., 2006). In relation to emotion regulation, perceived partner responsiveness serves to attenuate stress, particularly during times of uncertainty (Dooley et al., 2018; Soares et al., 2021). For example, individuals who perceive their partner to be more (vs. less) responsive tend to report more positive affect, more effective coping, and better sleep quality during a period of stressful anticipation (Dooley et al., 2018). Perceived partner responsiveness has been shown to facilitate self-disclosure processes (Laurenceau et al., 1998) and emotional expression (Ruan et al., 2020), both of which are integral to co-rumination. Thus, perceived partner responsiveness may be a mechanism through which co-rumination is perpetuated within dyads.

While perceptions of responsiveness are partially informed by responsive behavior of the partner, these perceptions are also influenced by biases such as projection. This means that perceptions of partner responsiveness may be based on the extent to which the individual perceives themselves to be responsive to their partner. In fact, projection of responsiveness is a primary mechanism through which assessments of relationship satisfaction are made (Canevello & Crocker, 2010; Lemay et al., 2007) and contributes to other indicators of personal well-being such as affect, coping, and self-efficacy (Lemay & Neal, 2014). Therefore, in instances where an individual is disclosing negative thoughts and emotions related to a personal problem to their partner, the individual may base their assessments of their partner's responsiveness on their own responsive behavior.

What Drives Co-Rumination?

Taken together, extant literature paints two pictures of how co-rumination might unfold and be perpetuated within dyads, both of which may contain a kernel of truth. On the one hand, co-rumination may reflect dynamics in the relationship informed by accurate perceptions of partner behavior (e.g., co-rumination, responsiveness). An individual discloses and co-ruminates with their partner, the partner perceives that co-rumination and behaves responsively, which the discloser perceives. Both individuals are then more likely to disclose and co-ruminate in the future. On the other hand, co-rumination may reflect more intrapersonal processes. Disclosers may overestimate their partner's contribution to the co-ruminative conversation, relying on their own co-rumination to inform their judgments. They may perceive their partner as more responsive as a result of these biased judgments and then choose to co-ruminate more in

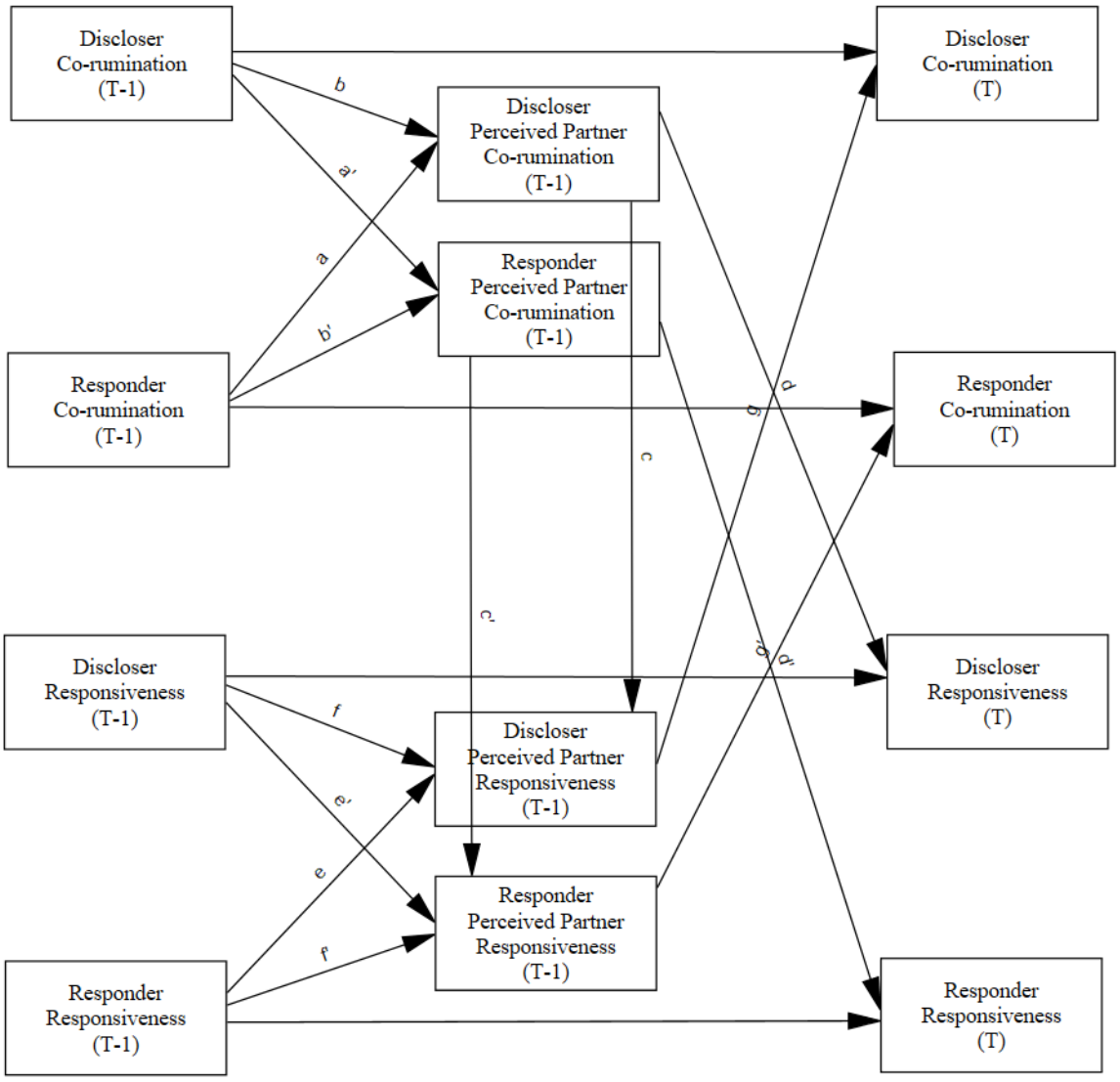
the future. Similarly, individuals (or their partners) may perceive their partner as more responsive due to projecting their own responsiveness onto their perceptions of their partner, again increasing the likelihood of future co-rumination. Although the cycle of co-rumination is likely influenced by both intra- and interpersonal processes, it is important to determine the relative importance of these processes in order to understand how co-rumination impacts social functioning.

Current Research

The theoretical model proposed by the self-disclosure and intimacy literature posits that disclosure (or co-rumination) that is met with responsiveness by a partner leads to increases in intimacy and more disclosure downstream. The conceptual model proposed by the current research (Figure 1) builds upon this framework by modeling co-rumination and responsiveness as interrelated processes that, together, determine the trajectory of co-rumination within the conversation and relationship outcomes for the dyad. In this model, perceptions of partner co-rumination and responsiveness are predicted by actor (projection) and partner (tracking accuracy) self-reported co-rumination and responsiveness at time T-1. These partner perceptions inform behavioral responses including understanding, validating, and caring (e.g., responsiveness) and co-rumination downstream for both individuals in the dyad, with perceived partner responsiveness increasing the likelihood of future co-rumination and perceived partner co-rumination eliciting responsive behavior from partners.

Figure 1

Conceptual Model



The overarching goal of the current study is to examine the intra- and interpersonal processes that occur during co-rumination and how they serve to perpetuate this cyclical form of interpersonal emotion regulation within close relationships. To accomplish this, I will test the conceptual model described previously, which can be broken down into two smaller specific aims.

The first aim is to use truth and bias modeling (West & Kenny, 2011) to assess the extent to which individuals are able to perceive the co-rumination of their partner. I hypothesize that individuals will be (**H1**) biased (overestimate) and (**H2**) accurate in perceiving partner co-rumination (path a) but also (**H3**) project their own co-rumination onto their partner (path b). In addition to testing these aims in relation to co-rumination broadly, I will also conduct analyses on each of the four dimensions of co-rumination: staying on topic, going over the problem repeatedly, speculating about causes and consequences of problems, and dwelling on negative affect. These analyses will allow conclusions to be drawn regarding what components of co-rumination can be detected by partners. Due to the importance of sex differences in outcomes of co-rumination in extant literature, I will conduct exploratory analyses to test whether tracking accuracy, bias, and projection vary based on actor or partner sex.

The second aim is to assess the interplay between co-rumination and intimacy processes and the intra- and interpersonal processes that predict downstream co-rumination. I hypothesize that (**H4**) co-rumination will be perceived as responsive, as indicated by a direct relationship between perceptions of co-rumination and perceived partner responsiveness (path c), but also that (**H5**) co-rumination will elicit responsive behavior from partners (path d). (**H6**) Responsive behavior will be accurately perceived

by partners (path e) but (**H7**) perceptions of partner responsiveness will be influenced by projection biases (path f). Finally, (**H8**) greater perceived partner responsiveness will be associated with greater downstream co-rumination (path g) within the same problem-focused conversation. I will explore whether these effects are moderated by role (discloser vs. responder). Though outcomes may vary as a function of role, extant research does not provide enough theoretical evidence to support specific hypotheses.

Method

Power Analysis

Based on the approach utilized by Peters et al. (2020) and Peters & Overall (2020), the Actor-Partner Interdependence Model power module (Ackerman et al., 2016) was used to approximate the required sample size for truth and bias models. Power analyses indicated that 85 dyads would provide adequate power (~.80) to detect small actor (projection) effects (r = .25) and small partner (tracking accuracy) effects (r = .20) at $p < .05$ where variables are moderately correlated across dyad members (r = .30). However, this analysis is only an approximation as it does not account for the repeated assessments used in truth and bias models that increase the power of statistical tests. At the time of study design and data collection, there were no established practices for conducting a priori power analyses for dyadic, repeated measures designs (Lane & Hennes, 2018). The current study used a sample of 174 participants in 87 dyads, which is comparable to other studies with analogous designs and statistical approaches (Overall et al., 2015; Peters et al., 2020; Peters & Overall, 2020).

Participants

Friendship dyads were recruited through the Ohio University's psychology research participant pool. To be eligible for participation, both participants had to be 18 – 40 years of age and consider themselves to be close or best friends. The initial sample included 178 participants in 89 dyads. Four participants in two dyads were excluded due to missing data for the review procedure. The study included two attention check items ("Select '2' for this item"), one during baseline questionnaires, and one during post-conversation questionnaires. There were no attention check items during the review

procedure, however, the experimenter was present during the duration of the review procedure to answer questions and encourage accurate responding. Participants who failed one or more attention checks ($N = 17$) were retained in the final sample, however their questionnaire data were deleted for that portion of the study. Two participants failed both attention checks and only demographic information was retained for these individuals. The final sample was comprised of 174 participants in 87 dyads. Descriptive statistics for the sample can be viewed in Table 1. Demographic information for three individuals in two dyads was missing due to time constraints for the study session.

Table 1

Demographic Information for Sample

Variable	*M*	*SD*
Age	18.68	0.96
Friendship length (months)	20.83	29.98
	N	*%*
Self-reported sex at birth		
Male	48	20.93
Female	123	77.33
Dyad sex composition		
Both female	56	69.19
Both male	24	13.37
Male and female	20	15.12
Race		
White	150	78.49
Black, African American	11	9.59
Asian	2	3.78
Mixed	6	4.36
Other	2	2.03
Hispanic origin		
No, Hispanic	164	94.77
Yes, Hispanic	7	3.49

Note. N = 174. Demographic information missing for 3 individuals in 2 dyads (1.7%).

Procedure

All study procedures were conducted after review and approval from the Ohio University Institutional Review Board. Upon arrival at the laboratory, participants were seated in a participant room and separated by a curtain. After confirming eligibility for the study and completing the informed consent process, participants completed a series of

baseline questionnaires including the problem-generation questionnaire (more detail below). All questionnaires were completed with the curtain dividing participants for privacy.

Following a warm-up conversation about mundane events in their week to acclimate participants to the procedure and intercom system, participants received instructions for a problem-focused conversation wherein one member of the dyad (the *discloser*) was randomly assigned to discuss one of the extradyadic problems they disclosed in the problem-generation questionnaire. The other member of the dyad (the *responder*) was assigned to respond to their friend. Severity items (described below) were summed for each problem and the discloser's most severe problem was assigned by the experimenter for discussion. Participants were instructed to talk about the problem as they naturally would (see Appendix A for full instructions). Experimenters gave participants cards to remind them of the instructions and the conversation topic. The problem-focused conversation was 8 minutes long and was audio and video recorded. At the end of the conversation, participants completed questionnaires regarding their own and their partner's behavior during the conversation.

Additionally, participants completed a review procedure based on Ickes, Marangoni, and Garcia's (1997) empathic accuracy paradigm during which participants watched the audio/video recording of their conversation and rated their own and their partner's co-rumination and responsiveness every 30 seconds. A researcher remained in the room during this time to ensure participants complied with task instructions and to answer participant questions about the procedure. At the conclusion of the study, participants completed a demographic questionnaire.

Problem-Generation Questionnaire

The problem-generation questionnaire (Rose et al., 2005) prompted participants to write about two extradyadic problems that they were currently experiencing (i.e., problems not involving the person that they brought with them to the study). Participants then responded to seven items that assessed the severity of the problem on a scale from 1 (*not at all*) to 7 (*very much*). This method of generating conversation topics has been used in the co-rumination literature to generate an extradyadic problem discussion (e.g., Byrd-Craven, Granger, & Auer, 2011; Rose et al., 2014; Tudder et al., in press). The full questionnaire can be found in the Appendix A.

Measures

Co-Rumination

During the review procedure, co-rumination was assessed every 30 seconds using four items pertaining to co-ruminative behavior participants engaged in during the specified segment of the conversation (Tudder et al., in press). Participants reported the extent to which they agreed with each statement on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Items included "I kept us on topic," "I encouraged us to go over the problem multiple times in order to understand the problem better," "I encouraged us to talk about the causes and consequences of the problem," and "I encouraged us to talk about negative emotions." The same items were used to assess perceived partner co-rumination by changing the stem to "My friend" (e.g., "My friend kept us on topic"). Items were averaged to create self-reported co-rumination scores (R_{1F} = .879, R_C = .855) and perceived partner co-rumination scores (R_{1F} = .934, R_C = .883) for each dyad member for every 30 second epoch of the conversation. Reliability for these measures

were calculated based on recommendations by Cranford et al. (2006) for daily diary measures. This approach is based on generalizability theory, which partitions variance into components that assess measurement error across items, persons, and time. R_{1F} is a reliability estimate similar to an average Cronbach's alpha across epochs. R_C estimates a scale's ability to detect differences in systematic changes over time. In the current study, the measure demonstrated good internal consistency and ability to detect change over time.

Responsiveness

A single item, "I was responsive to my friend's needs," was used to assess self-reported responsiveness. An analogous item, "My friend was responsive to my needs," assessed perceived partner responsiveness. Participants rated their agreement with each statement on a scale from 1 (not at all) to 7 (very much) for every 30 second epoch of the conversation. A single item was chosen as an index of responsiveness in an effort to reduce participant fatigue during the review procedure.

Results

Aim 1

Analytic Plan for Aim 1

To assess mean-level bias, tracking accuracy, and projection of perceived partner co-rumination (Hypotheses 1 – 3), we utilized truth and bias modeling (TBM) as described by West and Kenny (2011). TBM analyses were conducted in SPSS 28 using the MIXED procedure. To account for the inherent dependency in dyadic data, models used a compound heterogeneous symmetry covariance structure, which models the dependency within distinguishable dyads (Kenny et al., 2006). Dyad members were distinguished based on role in the conversation. Intercepts and the effects of actors' and partners' self-reported co-rumination were modeled as random to permit them to vary by discloser and responder roles. According to West and Kenny (2011), the TBM model is as follows:

$$P_{ij} = b_{0j} + b_{1j}(\text{partner's self reported corumination}) + b_{2j}(\text{actor's self reported corumination}) + e_{ij}$$

In this regression equation, perceived partner co-rumination (P) at time i for members of dyad j is a function of: an intercept (b_{0j}), partner's self-reported co-rumination (b_{1j}), actor's self-reported co-rumination (b_{2j}), and an error term (e_{ij}) which reflects random error as well as unaccounted for influences on perceived partner co-rumination. In TBM, the outcome variable (P_{ij}), perceived partner co-rumination, is centered based on the partner's self-reported co-rumination, such that a predicted value of 0 would indicate perfect agreement between actor and partner assessments of the partner's co-rumination. The intercept in this model reflects mean-level bias. Positive

intercept values indicate overestimation of partner co-rumination while negative intercept values indicate underestimation. The first predictor (b_{1j}), partner's self-reported co-rumination, is grand-mean centered and represents the extent to which partner's co-rumination influences actor's perceptions. This coefficient quantifies actors' tracking accuracy of their partner's co-rumination. The second predictor (b_{2j}), actor's self-reported co-rumination, is also centered on partner's self-reported co-rumination and tests the extent to which actors project their own co-rumination onto their partner. Significant positive coefficients indicate projection.

Bias, Tracking Accuracy, and Projection of Co-Rumination

TBM analyses were conducted for co-rumination composite scores as well as for each dimension of co-rumination (i.e., staying on topic, going over the problem multiple times, speculating about causes and consequences of problems, and digging into negative emotions). Full results of these analyses can be viewed in Table 2. In line with my hypotheses, perceptions of partner co-rumination were strongly predicted by partners' self-reported co-rumination, indicating high tracking accuracy of co-rumination within the conversation (**H2**). Additionally, participants were biased in their perceptions of their partner's co-rumination. Specifically, individuals tended to overestimate their partner's co-rumination, as indicated by an intercept significantly greater than zero (**H1**). Finally, actor co-rumination strongly predicted perceived partner co-rumination such that actors who reported engaging in greater co-rumination tended to perceive their partner to be engaging in greater co-rumination as well. Thus, these results reveal projection as one source of bias influencing partner perceptions (**H3**).

Table 2

Effects of Actor and Partner Self-Reported Co-Rumination and Role on Perceived Partner Co-Rumination

	Model 1				Model 2			
	B	*SE*	*t*	*r*	*B*	*SE*	*t*	*r*
Overall co-rumination								
Intercept (bias)	0.46	0.07	**6.69*** **	0.62	0.46	0.07	**6.54*** **	0.60
Partner co-rumination (accuracy)	0.25	0.02	**12.93*** **	0.80	0.25	0.02	**12.43*** **	0.79
Actor co-rumination (projection)	0.34	0.03	**11.41*** **	0.80	0.34	0.03	**11.51*** **	0.80
Role					0.01	0.09	0.10	0.01
Role × partner co-rumination					0.01	0.02	0.43	0.05
Role × actor co-rumination					0.03	0.03	0.97	0.11
Stay on topic								
Intercept (bias)	0.45	0.07	**6.51*** **	0.60	0.46	0.07	**6.54*** **	0.60
Partner co-rumination (accuracy)	0.30	0.02	**14.46*** **	0.86	0.25	0.02	**12.43*** **	0.79
Actor co-rumination (projection)	0.31	0.03	**10.33*** **	0.76	0.34	0.03	**11.51*** **	0.80
Role					0.01	0.09	0.10	0.01
Role × partner co-rumination					0.01	0.02	0.43	0.05
Role × actor co-rumination					0.03	0.03	0.97	0.11
Go over it again								
Intercept (bias)	0.37	0.09	**4.09*** **	0.43	0.36	0.09	**3.89*** **	0.41
Partner co-rumination (accuracy)	0.16	0.02	**8.88*** **	0.75	0.16	0.02	**8.19*** **	0.72
Actor co-rumination (projection)	0.27	0.03	**10.14*** **	0.77	0.28	0.03	**10.25*** **	0.78
Role					0.01	0.12	0.11	0.01
Role × partner co-rumination					0.02	0.02	0.83	0.10
Role × actor co-rumination					0.04	0.03	1.52	0.18

	Model 1				Model 2			
	B	*SE*	*t*	*r*	*B*	*SE*	*t*	*r*
Speculate								
Intercept (bias)	0.38	0.08	**4.70*** **	0.47	0.38	0.08	**4.64*** **	0.47
Partner co-rumination (accuracy)	0.23	0.02	**10.90*** **	0.76	0.22	0.02	**10.30*** **	0.74
Actor co-rumination (projection)	0.29	0.02	**11.72*** **	0.81	0.29	0.03	**11.52*** **	0.80
Role					0.08	0.11	0.73	0.08
Role × partner co-rumination					0.00	0.02	0.18	0.02
Role × actor co-rumination					0.03	0.03	1.28	0.15
Dig into negative emotions								
Intercept (bias)	0.55	0.09	**5.97*** **	0.57	0.54	0.09	**5.85*** **	0.56
Partner co-rumination (accuracy)	0.19	0.02	**9.25*** **	0.73	0.18	0.02	**8.86*** **	0.71
Actor co-rumination (projection)	0.29	0.03	**9.33*** **	0.75	0.29	0.03	**9.40*** **	0.74
Role					0.12	0.11	1.12	0.13
Role × partner co-rumination					0.01	0.02	0.38	0.05
Role × actor co-rumination					0.03	0.03	0.92	0.11

Note. *p < .05. **p < .01. ***p < .001. Role was contrast coded -1 = responder, 1 = discloser.

To test role in the conversation as a predictor of bias, tracking accuracy, and projection, role was contrast coded (1 discloser, -1 responder) and added to the model as a fixed effect and crossed with partner's self-reported co-rumination and actor's self-reported co-rumination to create two interaction terms. There were no significant effects of role across all models (see Table 2), indicating that bias, tracking accuracy, and projection did not depend on the individual's role in the conversation (i.e., discloser vs. responder).

To test actor and partner sex as a predictor of bias, tracking accuracy, and projection, contrast coded actor and partner sex variables (-1 male, 1 female) were added to the model as fixed effects and crossed with partner's self-reported co-rumination and actor's self-reported co-rumination. As these were exploratory analyses and there were no significant effects of actor or partner sex, full results can be viewed in Table B1 of Appendix B.

Aim 2

Analytic Plan for Aim 2

To assess the interplay between perceptions of partner co-rumination and perceived partner responsiveness and the extent to which perceived partner responsiveness predicts downstream co-rumination, path analysis of actor-partner interdependence mediation models with dyads distinguished by role were conducted in Mplus (v8.8). In these models, discloser and responder self-reported co-rumination and responsiveness predicted perceived partner co-rumination and responsiveness at time T-1, which then predicted downstream self-reported co-rumination and responsiveness at time T. In addition, a path was added for disclosers and responders predicting perceived partner responsiveness at time T-1 from perceived partner co-rumination at time T-1 to test the hypothesis that co-rumination is perceived as responsive (path c). Unstandardized path estimates were derived using robust

maximum likelihood estimation procedures on the variance-covariance matrices. The full statistical models can be viewed in Figures B1 – B3 of Appendix B, however, simplified statistical models presenting paths of interest can be viewed in the main manuscript (Figures 2 – 4). In these figures, non-primed paths (e.g., path a) predict disclosers' criterion variables and primed paths (e.g., path a') predict responders' criterion variables.

Due to an insufficient number of dyads, I was not able to test the required number of parameters in the full model predicting downstream co-rumination and responsiveness for disclosers and responders simultaneously. Consequently, I adopted an approach used by Murray et al. (2000) wherein I first tested a cross-sectional model with self-reported co-rumination and responsiveness predicting perceived partner co-rumination and responsiveness for disclosers and responders at time T-1. Non-significant covariances were dropped from the model to address convergence issues. To maximize parsimony and reduce the number of parameters to be estimated in the model, corresponding paths were sequentially constrained to equality across disclosers and responders. These tests have the added benefit of testing whether effects were moderated by role. Robust chi-square difference tests (Satorra & Bentler, 2001) were used to compare model fit between constrained and unconstrained models with significant reductions in chi-square indicating moderation by role. Paths were tested sequentially, starting with the paths with estimates most similar across roles. Constraints that did not result in significant decreases in model fit were retained in the cross-sectional model and added to downstream models predicting co-rumination and responsiveness for disclosers and responders at time T. Thus, I will present results from three separate models—a cross-sectional model and downstream co-rumination and responsiveness models. See Tables B2 and B3 in Appendix B for descriptive statistics

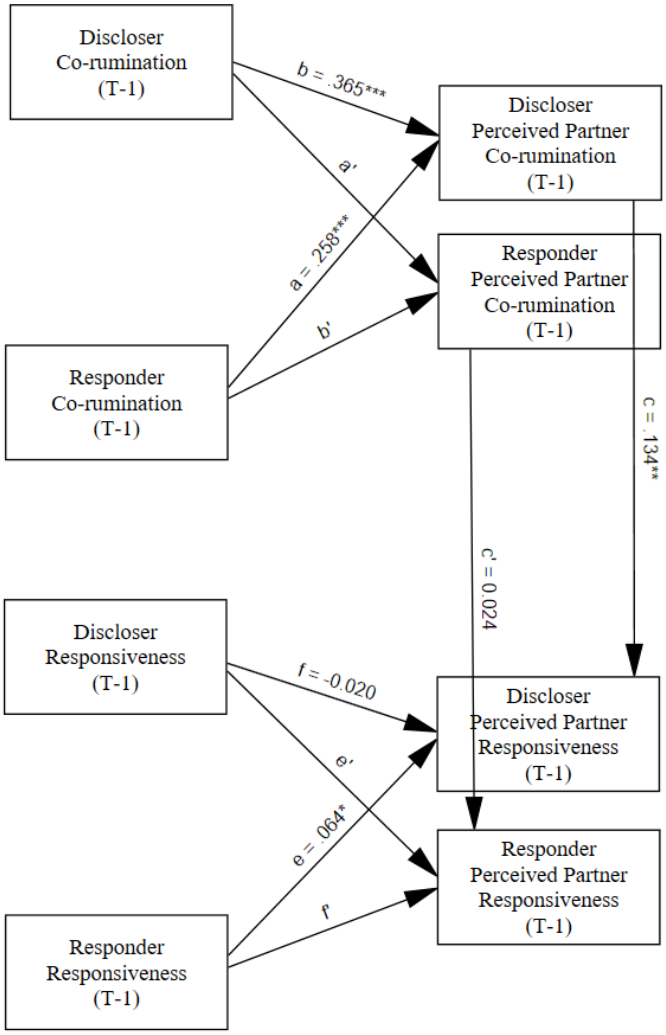
and mean-level correlations between variables of interest at time T-1, respectively.

Cross-Sectional Model

The cross-sectional model with unstandardized path estimates can be viewed in Figure 2. The model was a good fit to the data (comparative fit index [CFI] = .998, root-mean-square error of approximation [RMSEA] = .015, $\chi^2(6, N = 87) = 7.687$, $p = .262$). Supporting results from TBM analyses of Aim 1, path estimates from the cross-sectional model indicate that individuals accurately perceived their partner's co-rumination (**H2**: paths a and a') and projected their own co-rumination onto their partner (**H3**: paths b and b'). Similarly, individuals accurately perceived their partner's responsiveness (**H6**: paths e and e'), however they did not project their responsiveness onto their partner as I had predicted (**H7**: paths f and f'). None of these effects were moderated by role. Note that mean-level bias (**H1**) cannot be assessed using these path models, as variables were uncentered and interpretations of the intercepts were changed due to the presence of multiple predictors in the model.

Figure 2

Cross-Sectional Model with Unstandardized Path Estimates



Note. *p < .05. **p < .01. ***p < .001. For simplicity, estimates for paths constrained to equality are presented only for non-primed paths.

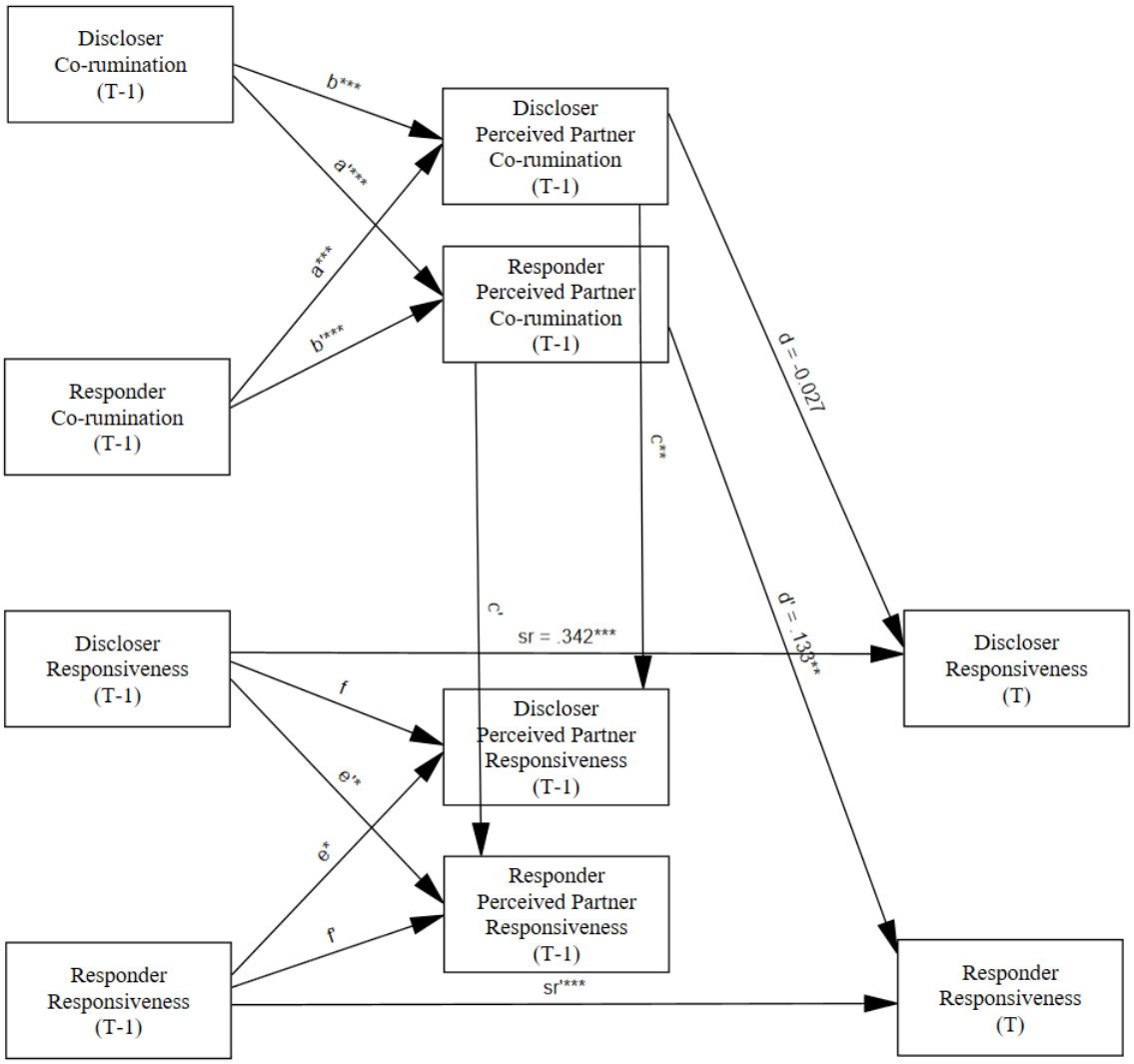
Additionally, a significant c path (**H4**) indicated that for disclosers greater perceived partner co-rumination predicted greater perceived partner responsiveness. This supports the idea that disclosers view partners participating in their co-rumination as being responsive to their needs. This effect was not significant for responders (path c').

Downstream Responsiveness Model

The downstream responsiveness model with unstandardized path estimates can be viewed in Figure 3. The model was a good fit to the data (CFI = .970, RMSEA = .030, $\chi^2(48, N = 87) = 108.937$, $p < .001$). Supporting my hypothesis (**H5**) that co-rumination would elicit responsive behavior from partners, responders that perceived their partner to engage in greater co-rumination at time T-1 reported behaving more responsively toward their partner at time T (path d'). However, this effect was not significant for disclosers (path d).

Figure 3

Downstream Responsiveness Model with Unstandardized Path Estimates



Note. *p < .05. **p < .01. ***p < .001. For simplicity, estimates for paths tested in the cross-sectional model are omitted and estimates for paths constrained to equality are presented only for non-primed paths.

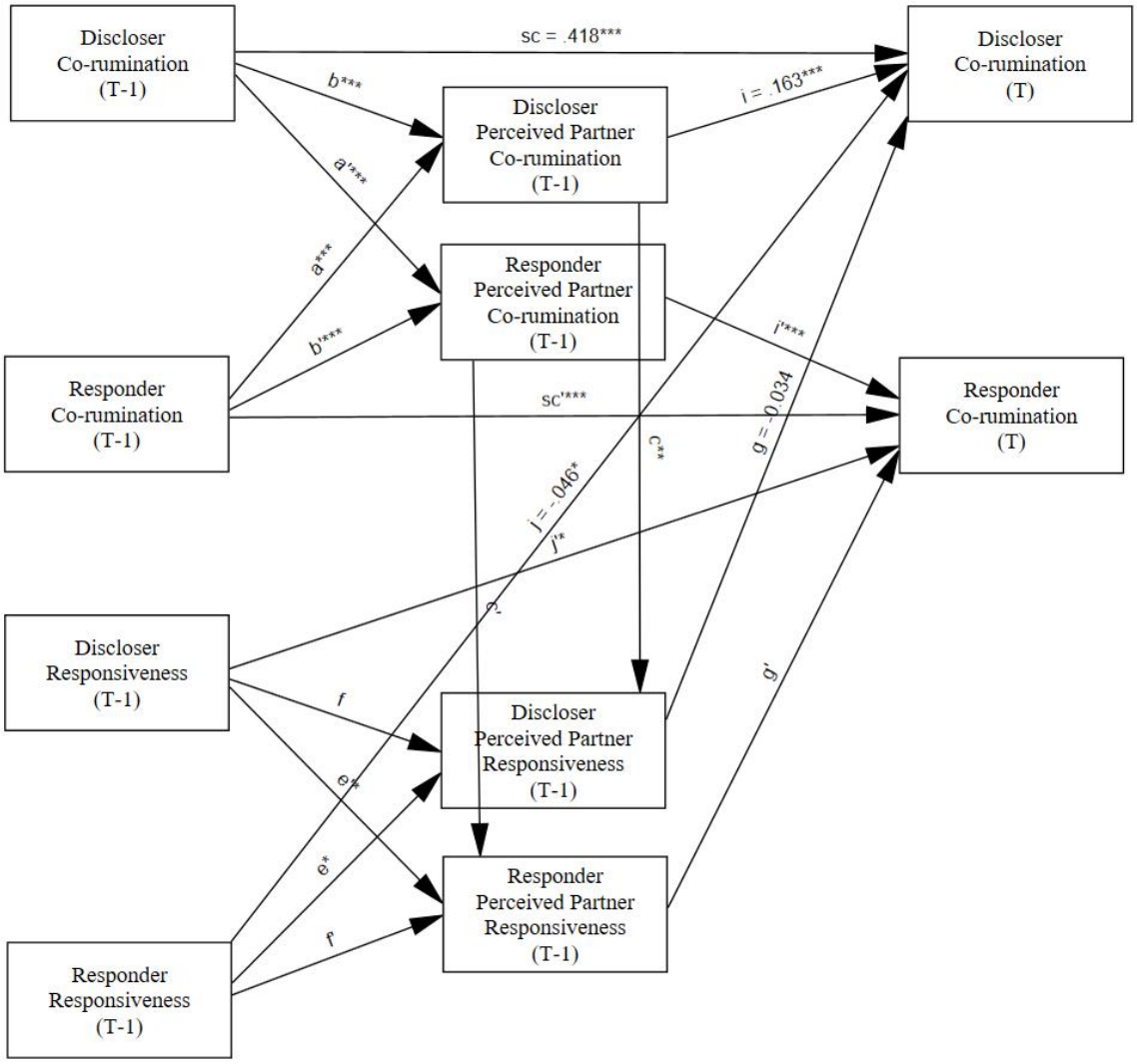
Downstream Co-Rumination Model

The downstream co-rumination model with unstandardized path estimates can be viewed in Figure 4. The model was a good fit to the data (CFI = .994, RMSEA = .015, $\chi^2(42, N = 87) = 55.494$, $p = .079$). Contrary to my hypothesis (**H8**), greater perceived partner

responsiveness at time T-1 was not associated with greater self-reported co-rumination at time T for either disclosers or responders (paths g and g').

Figure 4

Downstream Co-Rumination Model with Unstandardized Path Estimates



Note. *p < .05. **p < .01. ***p < .001. For simplicity, estimates for paths tested in the cross-sectional model are omitted and estimates for paths constrained to equality are presented only for non-primed paths.

Additional Results

Although not hypothesized explicitly, additional results emerged that are worthy of discussion and are supported by extant literature. There was a reciprocity effect such that disclosers and responders who perceived their partners to engage in greater co-rumination at time T-1 tended to report engaging in greater co-rumination themselves at time T (path i and i'). In other words, perceptions of partner co-rumination that are both accurate and biased play a key role in facilitating co-rumination downstream. Additionally, an unexpected effect was observed that does not align with extant work; although greater perceived partner responsiveness did not predict greater co-rumination downstream as predicted, there were significant *negative* associations between self-reported responsiveness and downstream co-rumination such that greater discloser and responder self-reported responsiveness at time T-1 predicted *less* co-rumination at time T for both dyad members. See the discussion section for further elaboration on these findings.

Discussion

The aim of the present study was to examine the intra- and interpersonal processes that perpetuate co-rumination within close friend dyads. Specifically, I used a dyadic, repeated measures approach to assess outcomes for both members of the dyad within a single problem-focused conversation. I assessed the extent to which individuals can perceive the co-rumination of their partner and the role perceived partner co-rumination and responsiveness play in determining downstream co-rumination. Below I describe how the results advance our theoretical understanding of how co-rumination unfolds within dyads.

Reciprocity of Co-Rumination

Supporting my hypotheses (**H1-H3**), results indicated that while individuals are generally accurate in tracking the changes in their partner's co-rumination, they also base their judgments, in part, on the extent to which they are co-ruminating themselves, highlighting the intrapersonal (projection) and interpersonal (tracking accuracy) processes at play. Importantly, individuals tend to overestimate the extent to which their partner is co-ruminating with them. These results align with extant work demonstrating that within close relationships, judgments tend to be both biased and accurate (Fletcher & Kerr, 2010; Overall et al., 2019). This overestimation of co-rumination may be problematic because when individuals perceived their partner to be engaging in greater co-rumination, they engaged in greater co-rumination themselves later in the conversation (i.e., a reciprocity effect). Thus, overestimation of the extent to which partners are co-ruminating may be a means by which the cycle of co-rumination develops within the dyad, furthering the ruminative processes that are thought to induce and exacerbate depression and anxiety (Rose, 2002; Stone & Gibb, 2015).

Notably, this is the first study to demonstrate reciprocity of co-rumination within dyads. As co-rumination has been hypothesized as a mechanism by which depression and anxiety are transmitted across individuals in close relationships, reciprocity of co-rumination may have important clinical implications. However, these results are temporally limited in that reciprocity was only tested for the subsequent 30-second segment of the conversation, meaning that future work should examine whether reciprocity is also evident across conversations to show how co-rumination unfolds over time and throughout relationships. Moreover, the nature of reciprocity is still unclear. In this study, participants were assigned to roles with one person assigned to disclose their most stressful, ongoing problem and the other assigned to respond. Responders were not precluded from engaging in reciprocal problem disclosure as it related to the discloser's initial problem disclosure. Research on self-disclosure in relationships indicates that disclosure by one individual may be perceived as "permission" to disclose similar information by the other person (Greene et al., 2006). Thus, while our results demonstrate reciprocity of co-rumination, we cannot know whether this reciprocity involved continued discussion of the assigned problem or discussion of a problem disclosed by the other dyad member.

This ambiguity reflects corresponding ambiguity in the co-rumination literature more broadly, which fails to meaningfully distinguish co-rumination from related constructs such as verbal rumination and dyadic coping that vary based on the type of problem discussed (e.g., extradyadic problem vs. shared problem), who is disclosing a problem (i.e., one or both dyad member), and whether one or both dyad members are actively participating in the conversation. For example, a study with a similar problem discussion paradigm by Rose et al., (2014) indicated that supportive friend responses to problem discussion are commonly

followed by further problem discussion, however this work did not conclude whether the downstream problem discussion pertained to the original problem or if the partner disclosed a problem of their own to discuss. Recent work has begun to address this theoretical gap by specifically conceptualizing co-rumination as a pattern of problem-talk that involves discussion of either extradyadic or shared problems but occurs in a context where both members are actively participating in the conversation (DiGiovanni et al., 2021). This more recent conceptualization distinguishes co-rumination from verbal rumination, which occurs when one person discloses and excessively discusses a problem with a close other who does not reciprocate (Afifi et al., 2013). However, this theoretical work is still new to the field and researchers should work to clarify the conceptual definition of co-rumination to further our understanding of the context in which co-rumination occurs. These theoretical distinctions emphasize the importance of examining co-rumination in a dyadic context, as partner responses and contributions to the discussion play a key role in determining how problem conversations unfold and the outcomes experienced by both dyad members.

Responsiveness as a Perpetuating Factor of Co-Rumination

In addition to demonstrating reciprocity of co-rumination, the present work established associations between co-rumination and responsiveness, which may help researchers understand the interpersonal benefits of co-rumination demonstrated in extant literature (Felton et al., 2019; Rose, 2002; Smith & Rose, 2011). Supporting my hypothesis (**H4**), results indicated disclosers perceived their partner (i.e., responders) to be more responsive to their needs when they also perceived their partner to be co-ruminating with them. Additionally, when responders perceived their partner to be engaging in greater co-rumination, they tended to behave more responsively later in the conversation, demonstrating

that co-rumination elicits responsive behavior from partners (**H5**).

Tests of tracking accuracy (**H6**) and projection (**H7**) of responsiveness revealed that participants were accurate in tracking their partners' responsive behavior (supporting **H6**) and were not projecting their own responsiveness onto their partner (contrary to **H7**). These effects diverge from previous work that provides strong evidence that individuals' perceptions of their partner's responsiveness are influenced by the extent to which they are being responsive themselves (Lemay et al., 2007; Lemay & Clark, 2008). These discrepant findings may be due to having self-reported co-rumination and perceived partner co-rumination as additional predictors of perceived partner responsiveness in the model or it may be the case that a single problem-focused conversation where co-rumination could occur is not a context in which individuals tend to project their responsiveness.

Contrary to expectations (**H8**), greater perceived partner responsiveness did not significantly predict greater downstream co-rumination. Interestingly, greater self-reported responsiveness for disclosers and responders predicted significantly *less* co-rumination downstream for both dyad members. One explanation of this effect could be that the effect of perceived partner responsiveness matters more *across* conversations than *within* conversations. Research indicates that co-rumination is associated with excessive reassurance seeking and a desire to downregulate negative emotions (Dam et al., 2014; Hankin et al., 2018; Obraztsova, 2015; Smith-Schrandt, 2013). As co-rumination was perceived as responsive by disclosers and elicited responsive behavior from responders within a single conversation, it may be that disclosers received the reassurance they were seeking within the conversation, reducing the need to continue co-ruminating in the moment but increasing the likelihood of co-ruminating in future conversations to receive reassurance or support. Thus,

co-rumination may be a means of support seeking for problem disclosers that provides responders with an opportunity to behave responsively. Future work should examine support and reassurance seeking and other self-soothing attempts as motivating factors for co-rumination to help better contextualize these effects.

Strengths, Limitations, and Caveats

Overall, the current investigation integrates theory across the close relationships and self-disclosure literatures and applies methodology that is novel to the area to advance understanding of co-rumination. I used a modified version of the empathic accuracy paradigm to assess both self-reported and perceived partner co-rumination and responsiveness every 30 seconds of a problem-focused conversation for both members of a close friendship dyad. The theoretical advancement provided by the current study may serve as a foundation for future work examining how co-rumination benefits relationships at the expense of mental well-being.

Despite the strengths of this work, there are limitations that qualify the conclusions that can be drawn from these results. First, although assigning roles in the conversation allowed me to meaningfully distinguish between problem disclosers and responders, confining participants to roles may have come at the cost of ecological validity. Though yet to be supported empirically, it seems that individuals likely take on the role of both discloser and responder within a conversation, particularly when the problem, or a similar problem, is shared between dyad members. The current study limited conversation topics to extradyadic problems, meaning that even though reciprocity of co-rumination was still observed, the nature of that reciprocity may have been changed by the task instructions and the type of problem assigned as the conversation topic. Overall, there is a lack of existing research on

the frequency and impact of co-ruminating about different types of problems. One study found that co-rumination was more strongly associated with depressive symptoms when the problem being discussed was controllable or interpersonal in nature (Nicolai et al., 2013), but no studies to date have examined how outcomes of co-rumination vary as a function of the type of problem being discussed.

Second, although the sample size was sufficient to test my primary hypotheses and detect small-to-medium effect sizes, given the complexity of the statistical models and number of parameters estimated, there were not enough dyads in the current study to test other moderating variables such as other emotion regulation strategies used during the conversation (e.g., problem solving, reappraisal) or individual differences. These moderators may have influenced trajectories of co-rumination and responsiveness across the conversation. Along these lines, this study used a primarily white, undergraduate sample and no studies to date have assessed differences in co-rumination across races or other demographic groups. Thus, the results of the current study may not generalize across groups and it is still unclear from this work, and in the literature more broadly, who is most affected by co-rumination. There has been considerable debate in the field regarding sex differences in outcomes of co-rumination (Calmes & Roberts, 2008; Spendelow et al., 2017). Recent work posits that the relationship between co-rumination and negative outcomes is the same for males and females, however greater frequency of co-rumination by females relative to males may account for higher rates of negative outcomes (Spendelow et al., 2017). Additionally, there is substantial heterogeneity in the effects of co-rumination such that while some individuals experience the often-discussed pattern of intrapersonal costs and

interpersonal benefits of co-rumination, some experience greater costs than benefits or vice versa (DiGiovanni et al., 2021).

Third, this study used repeated measurements across 30-second epochs of a single conversation. The decision to use 30-second epochs was based on previous working using the empathic accuracy paradigm to assess bias and tracking accuracy of perceptions of emotion and emotion regulation within a conversation between dyad members (e.g., Overall et al., 2019; Peters & Overall, 2020), but it may be the case that the results of this study do not replicate when relationships are examined on a longer timescale. Future work should continue to examine the factors that perpetuate co-rumination over time and across conversations.

Conclusion

In current study, I integrated the self-disclosure, emotion regulation, and close relationship literatures to assess how the cycle of co-rumination is perpetuated within close friend dyads. I modeled co-rumination, responsiveness, and partner perceptions of these behaviors as interrelated processes that, together, predict downstream co-rumination during a single, problem-focused conversation. Results indicated that perceptions of partner co-rumination, that are both accurate and subject to projection biases, play an important role in determining downstream co-rumination for both dyad members and perceptions of partner responsiveness for individuals disclosing a stressful problem to their friend. These findings highlight the intra- and interpersonal processes that occur during co-rumination and further our theoretical understanding of how co-rumination unfolds within conversations.

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Appendix A: Supplemental Methods

Conversation Instructions

*"At this time, you will engage in a conversation where you *point to discloser* will be disclosing a personal problem about _____. Throughout the conversation, please discuss this problem in a way that feels natural to you and how you would normally discuss these types of issues with each other. You can refer to these cards if you need a reminder of the instructions. I will tell you when to start and stop talking over the intercom. Please wait to begin your conversation until I tell you to start over the intercom. Do you have any questions about the procedure or topic?"*

Problem Generation Questionnaire

*Name and describe two problems that you are having (**not involving the person you brought with you today**) and answer the questions that follow about each problem.*

Problem #1:_____

Describe:_____
_____
_____
_____
_____
_____

Please answer the following questions with regard to problem #1 you described.

Circle ONE number to indicate your response.

	Not at all ▼						*Very Much* ▼
How upsetting is this problem?	1	2	3	4	5	6	7
How important is this problem?	1	2	3	4	5	6	7
How hard would it be to solve this problem?	1	2	3	4	5	6	7
How hard would it be to feel better about this problem?	1	2	3	4	5	6	7
How much do you want to feel better about this problem?	1	2	3	4	5	6	7
How much do you want this problem not to bother you?	1	2	3	4	5	6	7
How much do you want to not be upset about this problem?	1	2	3	4	5	6	7

[repeat for problem #2]

Appendix B: Supplemental Results

Table B1

Effects of Actor and Partner Self-Reported Co-Rumination on Perceived Partner Co-Rumination Moderated by Actor and Partner Sex

	Model 1 (Actor Sex)				Model 2 (Partner Sex)			
	B	*SE*	*t*	*r*	*B*	*SE*	*t*	*r*
Overall co-rumination								
Intercept (bias)	0.46	0.08	**5.65*****	0.53	0.47	0.08	**5.71*****	0.54
Partner co-rumination (accuracy)	0.27	0.02	**11.43*****	0.74	0.25	0.02	**10.69*****	0.72
Actor co-rumination (projection)	0.34	0.03	**9.76*****	0.72	0.35	0.03	**10.26*****	0.74
Sex	0.02	0.08	0.25	0.03	-0.01	0.08	-0.11	0.01
Sex × partner co-rumination	-0.03	0.02	-1.14	0.10	0.00	0.02	0.07	0.01
Sex × actor co-rumination	0.00	0.03	0.01	0.00	-0.03	0.03	-0.76	0.07
Stay on topic								
Intercept (bias)	0.44	0.08	**5.52*****	0.52	0.46	0.08	**5.77*****	0.54
Partner co-rumination (accuracy)	0.30	0.02	**12.18*****	0.81	0.29	0.02	**11.78*****	0.80
Actor co-rumination (projection)	0.31	0.03	**9.11*****	0.70	0.32	0.03	**9.31*****	0.71
Sex	0.04	0.08	0.55	0.05	-0.03	0.08	-0.39	0.04
Sex × partner co-rumination	0.01	0.02	0.37	0.04	0.03	0.02	1.32	0.13
Sex × actor co-rumination	-0.01	0.03	-0.16	0.01	-0.02	0.03	-0.72	0.06
Go over it again								
Intercept (bias)	0.38	0.11	**3.60*****	0.37	0.42	0.11	**3.90*****	0.40
Partner co-rumination (accuracy)	0.17	0.02	**7.56*****	0.69	0.16	0.02	**7.08*****	0.67
Actor co-rumination (projection)	0.28	0.03	**8.93*****	0.71	0.28	0.03	**8.89*****	0.71
Sex	-0.02	0.11	-0.19	0.02	-0.10	0.11	-0.96	0.10
Sex × partner co-rumination	-0.01	0.02	-0.34	0.04	0.01	0.02	0.44	0.06
Sex × actor co-rumination	-0.02	0.03	-0.76	0.08	-0.02	0.03	-0.49	0.05

	Model 1 (Actor Sex)				Model 2 (Partner Sex)			
	B	*SE*	*t*	*r*	*B*	*SE*	*t*	*r*
Speculate								
Intercept (bias)	0.38	0.10	**4.01*** **	0.41	0.38	0.10	**3.97*** **	0.41
Partner co-rumination (accuracy)	0.22	0.02	**9.31*** **	0.70	0.22	0.02	**9.17*** **	0.69
Actor co-rumination (projection)	0.29	0.03	**10.13*** **	0.75	0.30	0.03	**10.66*** **	0.77
Sex	0.02	0.10	0.17	0.02	0.01	0.10	0.06	0.01
Sex × partner co-rumination	0.01	0.02	0.47	0.04	0.01	0.02	0.46	0.04
Sex × actor co-rumination	0.00	0.03	-0.02	0.00	-0.02	0.03	-0.66	0.07
Dig into negative emotions								
Intercept (bias)	0.60	0.11	**5.57*** **	0.52	0.61	0.11	**5.63*** **	0.52
Partner co-rumination (accuracy)	0.20	0.02	**8.60*** **	0.67	0.18	0.02	**7.64*** **	0.63
Actor co-rumination (projection)	0.29	0.04	**8.04*** **	0.66	0.28	0.04	**7.93*** **	0.66
Sex	-0.06	0.11	-0.58	0.06	-0.09	0.11	-0.80	0.08
Sex × partner co-rumination	-0.03	0.02	-1.44	0.15	0.01	0.02	0.23	0.02
Sex × actor co-rumination	-0.01	0.04	-0.31	0.03	0.01	0.03	0.17	0.02

Note. *p < .05. **p < .01. ***p < .001. Sex was contrast coded -1 = male, 1 = female.

Figure B1

Full Statistical Model – Cross Sectional Model

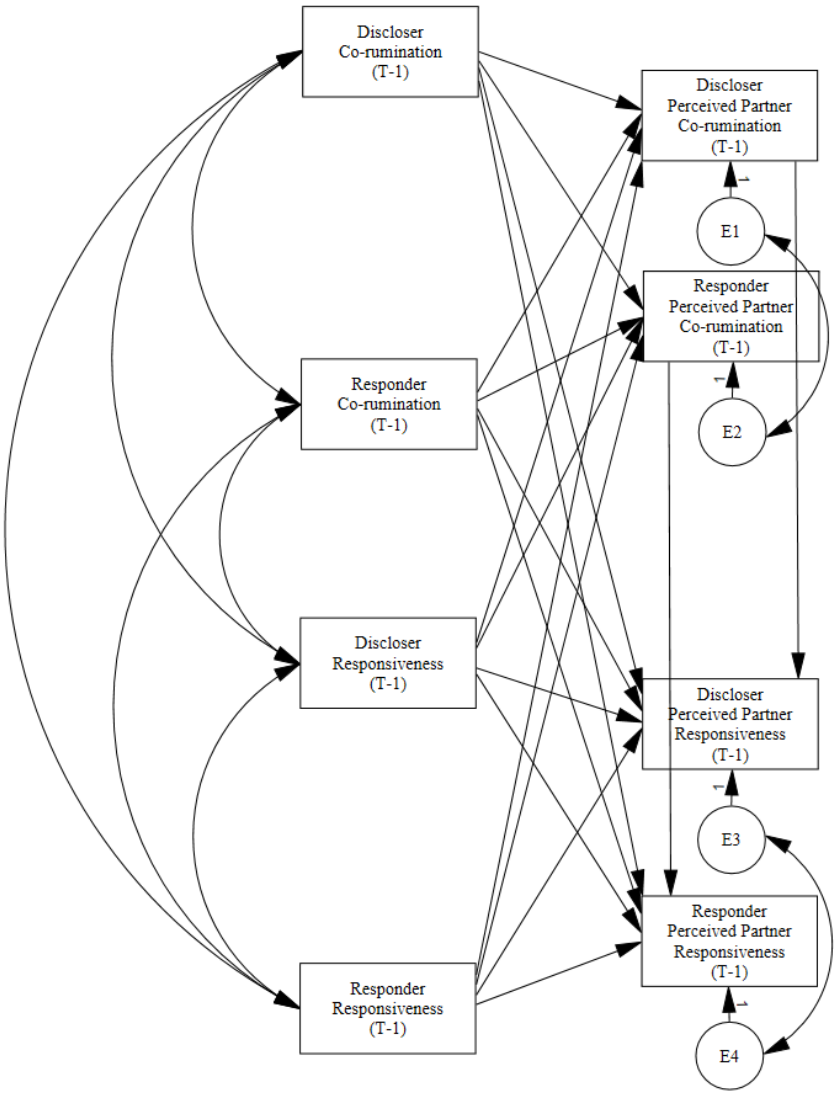

Figure B2

Full Statistical Model – Downstream Responsiveness Model

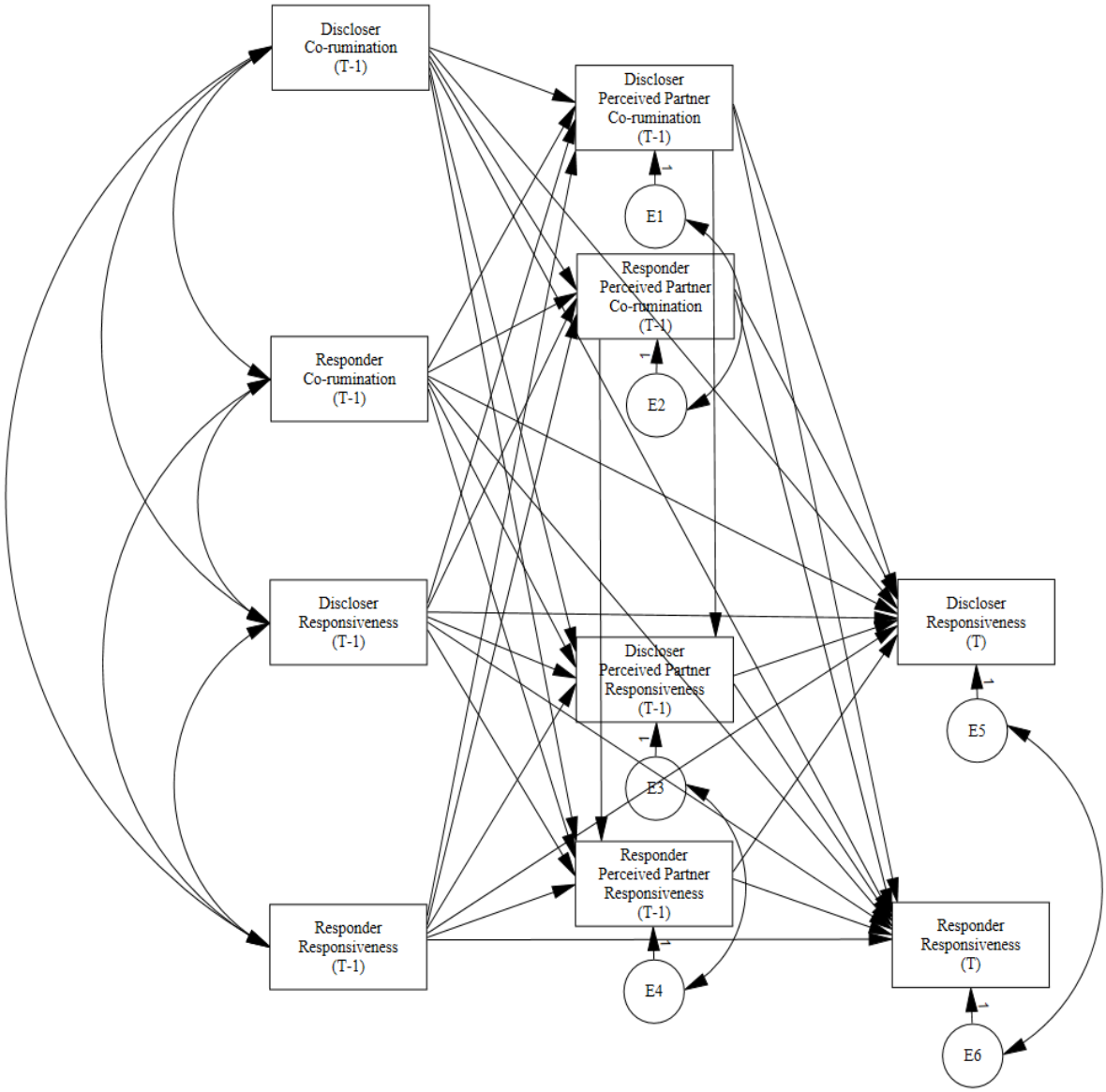

Figure B3

Full Statistical Model – Downstream Co-Rumination Model

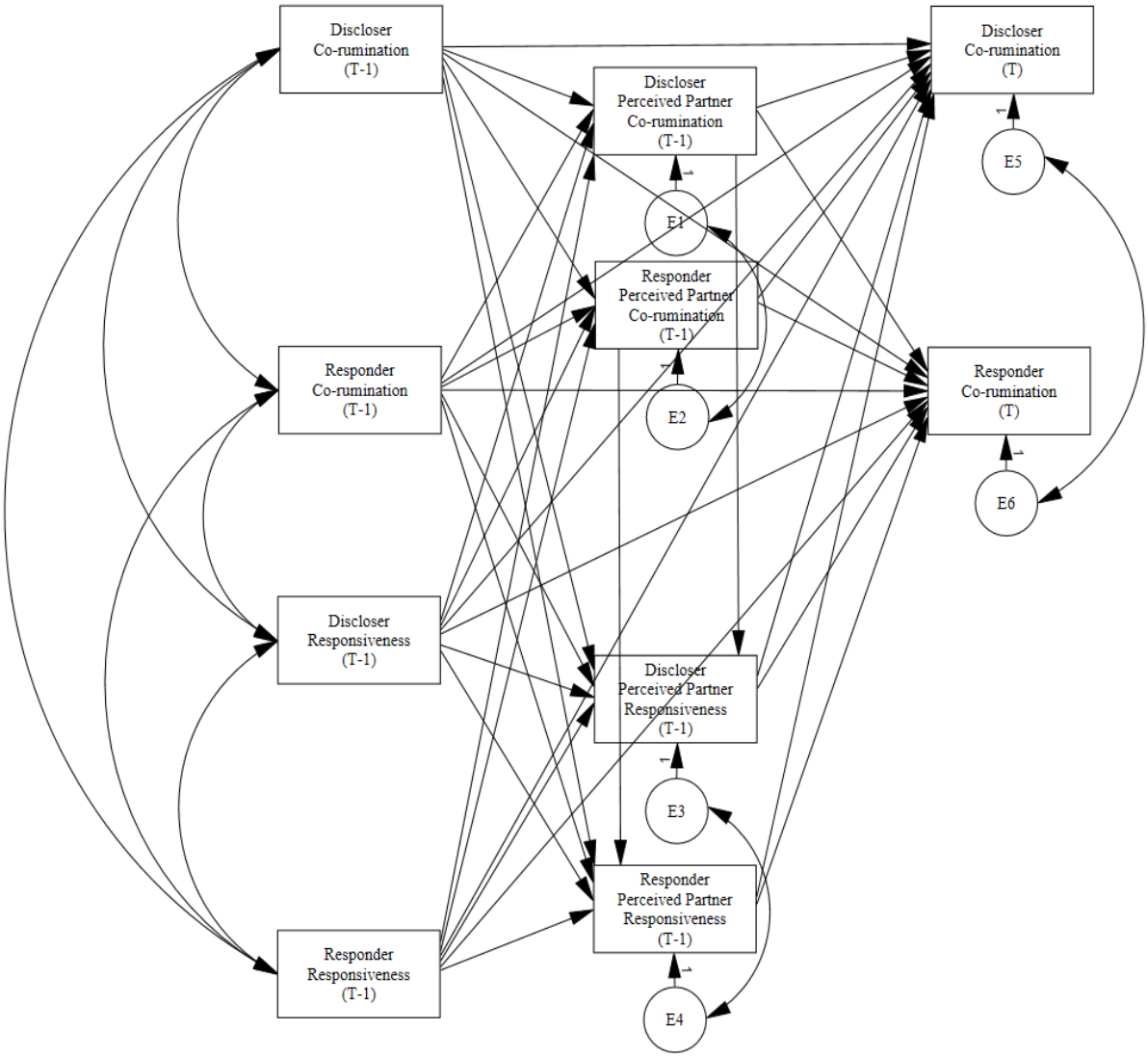

Table B2

Descriptive Statistics for Variables of Interest at Time T-1.

Variable	*M*	*SD*
Discloser self-reported co-rumination	3.93	1.15
Discloser self-reported responsiveness	4.59	1.55
Discloser perceived partner co-rumination	4.34	1.33
Discloser perceived partner responsiveness	5.44	1.53
Responder self-reported co-rumination	3.86	1.20
Responder self-reported responsiveness	5.22	1.50
Responder perceived partner co-rumination	4.28	1.36
Responder perceived partner responsiveness	4.88	1.65

Note. $N_{\text{disclosers}} = 87$. $N_{\text{responders}} = 85$.

Table B3

Pearson Correlations between Mean Self-Reported and Perceived Partner Co-Rumination and Responsiveness for Disclosers and Responders at Time T-1.

		1.	2.	3.	4.	5.	6.	7.	8.
1.	Discloser self-reported co-rumination	--							
2.	Discloser self-reported responsiveness	**0.475*** **	--						
3.	Discloser perceived partner co-rumination	**0.832*** **	**0.374*** **	--					
4.	Discloser perceived partner responsiveness	**0.444*** **	**0.515*** **	**0.492*** **	--				
5.	Responder self-reported co-rumination	**0.396*** **	0.063	**0.433*** **	**0.251***	--			
6.	Responder self-reported responsiveness	0.185	0.009	**0.321****	**0.261***	**0.494*** **	--		
7.	Responder perceived partner co-rumination	**0.304****	0.023	**0.241***	**0.220***	**0.741*** **	**0.361*** **	--	
8.	Responder perceived partner responsiveness	0.174	0.175	**0.269***	**0.220***	**0.384*** **	**0.664*** **	**0.331****	--

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

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