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# Prevention of excessive co-rumination in adolescent girls: Theoretical mini review with a critical integrative intervention perspective

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## Abstract

Co-rumination, defined as repetitive and emotionally focused problem talk between peers, has been consistently associated with heightened risk for internalising symptoms during adolescence, particularly among girls. Despite growing evidence of its emotional and physiological costs, co-rumination remains common within close friendships, raising the question of why this interaction pattern persists. In this theoretical, integrative mini review, we described developmental, physiological, and interpersonal research to clarify mechanisms that sustain excessive co-rumination in adolescent girls. We argue that co-rumination becomes self-reinforcing through the interaction of heightened emotional distress, consciously experienced relational reassurance, and unresolved uncertainty. While early stress appraisal processes during co-rumination may operate largely outside awareness, the reassurance, validation, and relational closeness experienced during and after these interactions are accessible to awareness and shape learning and future expectations. Building on this framework, we outline the working mechanisms of the recently developed Happy Friends, Positive Minds intervention program that focus on interrupting the relief-without-resolution loop and the prevention of co-rumination and associated anxiety and depression symptoms, while preserving disclosure and relational closeness within friendships.

## Co-rumination in girls: a pressing target for prevention

For this mini review, relevant literature was identified through targeted searches of electronic databases, including PubMed, PsycINFO and Google Scholar. Keywords used included “co-rumination”, “adolescent girls”, “emotions”, “emotional regulation”, “co-regulation”, and “peer relationships”. Articles were selected based on their relevance to the topic, how recently they were published (with a focus on the last 25 years), and whether they made an empirical or theoretical contribution. The reference lists of key articles were also screened to identify additional relevant studies. While this review is not systematic, it aims to summarise current conceptual and empirical insights.

Over the past two decades, a substantial body of research has provided converging evidence for a strong association between co-rumination and internalizing symptoms and disorders during adolescence[1-6] and the transmission of internalizing symptoms observed within friendship dyads[7]. Co-rumination is an interpersonal emotion regulation strategy whereby at least two people perseverate on worries and problems in a cyclical fashion, focus exclusively on unpleasant feelings, speculate about the causes and consequences of issues, and discuss parts of problems and feelings that are not well understood, aimed at downregulating unpleasant emotions[8,9].

Girls have been found to be especially at risk. Research indicates that adolescent girls are particularly likely to disclose emotionally charged and complex interpersonal problems with their close friends relative to boys, a pattern reflected in higher levels of co-rumination among girls in both cross-sectional and longitudinal studies[8,10]. Moreover, co-rumination increases in girls during the transition from childhood to adolescence[11] and is closely intertwined with experiencing interpersonal closeness, emotional intimacy, relief, and validation, which function both as a predictor and an outcome of co-rumination during adolescence[6,11,12]. These reciprocal associations help explain why co-rumination most often occurs within high-quality, emotionally close girls' dyadic friendships[8,11]. Importantly, patterns of co-rumination are likely shaped by broader social and cultural contexts[13]. Factors such as cultural background, socioeconomic status and sexual orientation may influence the norms surrounding emotional expression, expectations of friendship and seeking help[14]. This might affect both the way co-rumination manifests and the perceived benefits of it.

Notably, however, current research suggests that for girls, the positive relationship provisions associated with co-rumination outweigh negative problem perceptions, at least in the short term[12,13]. Given co-rumination's link to internalizing problems[1-6], gaining insight into why adolescent girls are more sensitive to the positive emotional aspects of co-rumination within friendships than to its negative consequences is essential for prevention efforts. The first goal of the present mini review is to reinterpret foundational work on co-rumination through a neuroscientific lens. Expanding on biopsychosocial model of challenge and threat[5], we will discuss the underlying mechanisms that may account for these apparent relational benefits of co-rumination for girls, with particular attention to validation, reassurance and relief mechanisms that may shape learning and contribute to the persistence of co-rumination. The second goal is to describe how we translated these mechanisms into prevention principles of the Happy Friends, Positive Minds intervention program for excessively co-ruminating adolescent girls' friendship dyads[15], highlighting how intervention efforts should interrupt the relief-without-resolution loop and the prevention of co-rumination and associated anxiety and depression symptoms without undermining closeness or disclosure within adolescent girls' interactions.

## Mechanisms intensifying excessive co-rumination in adolescent girls' friendships: Developmental and interpersonal context

Although the intra- and interpersonal trade-offs of co-rumination in adolescent girls are well documented, the specific neuroscientific mechanisms that drive and sustain problem talk remain largely unexplored, limiting our understanding of how such patterns contribute heightened vulnerability to emotional dysregulation and internalizing symptoms and disorders. The mechanisms underlying the socioemotional trade-offs of co-rumination for girls are best understood from a combined developmental and neuroscientific perspective, because dyadic regulation of unpleasant affect is intrinsically embedded in sweeping, interconnected shifts in brain, body, emotion, cognition, self-perception and interpersonal experiences during adolescence[15-17]. Adolescence is a unique developmental period characterized by shifts in emotional intensity and reactivity and peer influence, primarily close friends, on downregulation of unpleasant emotions[9,16-18]. Especially adolescent girls rely heavily on conversations with close friends to understand and downregulate emotions, relief stress and to make them feel better[3,19,20].

## Early stress appraisal during co-rumination

Recent research proposes that co-rumination can be conceptualized within the biopsychosocial model of challenge and threat[21]. This model provides a theoretical framework for assessing stress appraisal processes during peak physiological reactivity during a co-ruminative conversation[5]. Within this framework, an adaptive "challenge" state emerges when adolescents perceive their coping resources, such as their skills, knowledge, and prior positive experiences in dealing with a problem or worry, as sufficient to meet its demands. In the context of co-rumination, this may allow girls to engage in emotionally intense interactions without becoming overwhelmed, as they feel equipped to navigate and manage the content of the conversation. Conversely, a maladaptive "threat" state arises when the perceived demands of a problem exceed available resources, triggering feelings of uncertainty, insecurity, or risk, states that are often the central focus of co-ruminative interactions. Challenge and threat exist along a continuum of stress responses, with adolescents' ongoing appraisals dynamically guiding their movement toward one state or the other. This perspective highlights how co-ruminative interactions can simultaneously provide opportunities for emotional processing and relational bonding while also posing the risk of sustained physiological and emotional stress when adolescents feel under-resourced, that is, when their perceived capacity to manage the demands of the interaction falls short[21].

The very few studies examining physiological responses during co-rumination[5,21] provide preliminary evidence of a broad multi-system threat response. These include reduced parasympathetic activity (indexed by respiratory sinus arrhythmia, RSA), elevated stress hormone output (salivary cortisol), and heightened sympathetic arousal (salivary alpha-amylase). Together, these indicators suggest that co-rumination engages the body's threat systems rather than resolving them. Crucially, Tudder et al.[5] found

that for female disclosers, perceived demands already outweighed coping resources at the very onset of the conversation, before it had meaningfully progressed. This early, automatic activation operates below the threshold of conscious awareness and underpins the dissociation we describe in the following section.

## Physiological costs, conscious benefits, and the persistence of co-rumination

The findings about physiological indicators of threat are important for two reasons. First, they capture the initial phase of the biopsychosocial model of challenge and threat. Research on problem perceptions directly following co-ruminative conversations indicates that despite positive relationship provisions, adolescents perceive the problem to be more important, more upsetting, and harder to feel better about[12]. Notably, neither the physiological stress responses during co-rumination nor the negative problem perceptions that followed were found to reduce adolescents' positive outcome expectations regarding co-rumination[12]. Importantly, supportive responses to unpleasant affect in the absence of solution-focused content have been associated with greater emotion dysregulation[3,12].

We propose that co-rumination persists despite these negative appraisals in part because early physiological reactivity reflects automatic processes that operate largely outside conscious awareness. Because these physiological stress responses may diminish positive appraisals of coping capacity without girls registering them as a reason to disengage, a dissociation emerges between physiological stress and girls consciously held beliefs about the benefits of co-rumination. This dissociation matters because interoceptive awareness, the capacity to detect and interpret signals from within the body, plays a central role in enabling early emotion regulation. Research indicates that greater awareness of interoceptive signals facilitates emotion regulation by supporting the detection of early bodily reactions at the onset of emotionally challenging situations, allowing for appraisal and strategic response before a full stress response unfolds[22].

From a predictive processing perspective, the brain constructs emotional experience on the basis of its internal model, continuously generating predictions and updating that model when conscious experience produces a mismatch, or prediction error[23]. We propose that when threat-related physiological signals during co-rumination remain below the threshold of conscious awareness, no such mismatch is registered. Instead, the consciously experienced relational relief may confirm the brain's prediction that co-rumination is regulating and safe, reinforcing rather than correcting the internal model and thereby sustaining the loop.

Second, while these early stress appraisal processes operate largely outside awareness, girls' conscious relational experiences during and after the interaction appear to play a central role in maintaining the behaviour. A growing body of research shows that girls report increased feelings of reassurance, validation, and relational closeness following co-rumination, even when distress and physiological activation remain elevated[3,8,12]. These positive relational experiences are accessible to awareness and are salient to adolescents, shaping how co-ruminative interactions are evaluated and remembered. Importantly, such subjective relationship provisions have been shown to influence outcome expectations regarding future problem talk with friends[12], suggesting that girls may learn to associate co-rumination with relief and relational safety despite its emotional and physiological costs.

At the same time, these reinforcing processes probably occur within a wider socialisation context. The norms and expectations communicated by parents, peers and the media may shape beliefs about the value of emotional disclosure, intimacy and supportive friendship behaviours[24,25]. This influences how co-rumination is interpreted and enacted. For instance, social messages that prioritise emotional sharing and relational closeness may emphasise the perceived advantages of co-rumination, and peer dynamics may further normalise and reinforce these interaction patterns[26].

From the girls' perspective, the reassurance and validation experienced during co-rumination may shift the subjective meaning of the interaction, creating a temporary sense of relief or clarity, even though the underlying problem or worry remains unresolved. This pattern is likely to be amplified within highly intense friendships, where emotional closeness and mutual attunement increase both the regulatory benefits and the risks of repeated co-rumination[26], though the mechanisms through which friendship intensity moderates these effects warrant further investigation. Together, these findings suggest that consciously experienced relational outcomes play a key role in reinforcing continued co-rumination within close friendship dyads.

## The relief-without-resolution loop: integrating available evidence

While early stress appraisal processes may operate outside awareness in young girls, the self-reinforcing nature of co-rumination appears to arise from the interaction between heightened emotional distress, consciously experienced relational reassurance and validation, and the persistence of unresolved uncertainty about problems and worries during and after interactions, resulting in more negative problem perceptions and shaping future problem talk. In this mini review, we introduce the concept of 'a relief-without-resolution loop' to summarize this self-reinforcing

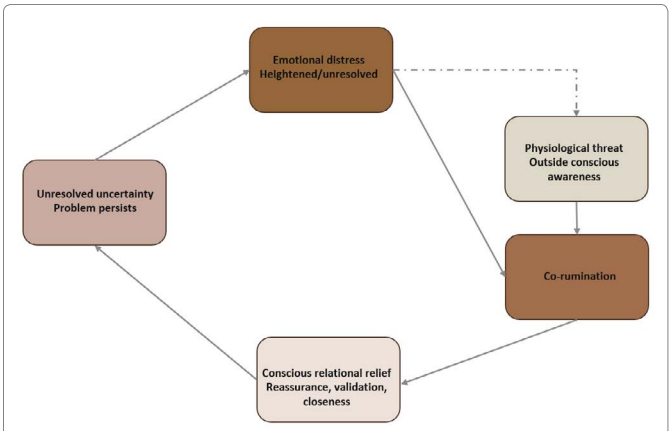


**Figure 1:** The relief-without-resolution loop: a proposed self-reinforcing cycle sustaining excessive co-rumination in adolescent girls. The dashed line represents the physiological threat response operating largely outside conscious awareness.

cycle of mechanisms sustaining excessive co-rumination in adolescent girls (Figure 1). This relief-without-resolution loop integrates the available empirical evidence[6,12,27], while recognizing that the specific role of interoceptive awareness in sustaining co-ruminative patterns in adolescent girls has not yet been directly examined, and that empirical testing of this proposed mechanism remains an important direction for future research.

In sum, the relief-without-resolution loop explains why co-ruminative conversations heighten distress and maintain the salience of the problem, while simultaneously providing reassurance, validation, and relational closeness that temporarily reduce uncertainty and emotional discomfort. Because this relief is achieved without resolving the underlying problems or worries and result in more negative problem perceptions, girls become more at risk for emotional dysregulation and the development and exacerbation of related anxiety and depressive symptoms[1,2], intrapersonal risk factors that spiral into future co-rumination in order to regain reassurance and relief[28]. Within close friendship dyads, this pattern can become mutually reinforcing, as both partners contribute to and benefit from the temporary reduction in uncertainty, thereby sustaining repeated co-rumination around the same concerns.

Several limitations and alternative explanations of this framework warrant consideration. First, the relief-without-resolution loop is a theoretical integration of available evidence rather than a directly tested model, and its proposed mechanisms, particularly the role of interoceptive unawareness and prediction error absence, await empirical examination in co-ruminative contexts. Second, alternative accounts of co-rumination's persistence deserve acknowledgement. It is possible that girls who engage in excessive co-rumination have a generally reduced capacity for individual emotion regulation, making reliance on dyadic strategies more likely regardless of interoceptive awareness[3,28]. Social reinforcement from the friend, through reciprocal validation and continued engagement, may also independently sustain the pattern without requiring the predictive processing mechanism we propose[12,26]. Third, the loop as described does not account for variability in co-rumination outcomes: not all girls who co-ruminate develop internalizing symptoms, suggesting that moderating factors such as baseline emotion regulation capacity, attachment security, and friendship quality may determine when the loop becomes clinically significant[6,11,23,26]. These limitations notwithstanding, the relief-without-resolution loop offers a parsimonious account of the dissociation between physiological cost and subjective benefit that has thus far remained unexplained in the co-rumination literature and generates testable predictions about intervention targets.

## Intervention perspective: the Happy Friends, Positive Minds intervention program

To date, no prevention programs exist that specifically target co-rumination and associated internalising problems in adolescent girls. Existing approaches to related internalising difficulties in adolescence, including rumination-focused cognitive-behavioural therapy targeting maladaptive thought patterns, mindfulness-based programmes aimed at reducing emotional reactivity, and broader social skills training focused on improving peer communication, offer meaningful support but are largely individually oriented. Critically, none specifically address the dyadic, interactional processes through which co-rumination is maintained, nor do they target the interoceptive and predictive mechanisms through which physiological threat responses go unregistered, and the relief-without-resolution loop is sustained. The Happy Friends, Positive Minds program was developed to fill this gap[15,29].

The Happy Friends, Positive Minds intervention program was developed using the Intervention Mapping Approach for planning health promotion programs[30]. The program aims to prevent excessive co-rumination and associated anxiety and depression symptoms in girls from age 13 to 15 years old. Girls participate with a close or best same-sex friend, reflecting evidence that co-rumination occurs predominantly within same-sex friendship dyads during adolescence[8,11]. These dyads are eligible for inclusion when at least one of the two girls, or both girls, have a score of at least one standard deviation above the mean co-rumination screening score on the Co-rumination Questionnaire Short[3]. Rather than working with girls individually, the program operates at the level of the friendship interaction itself, the unit within which co-rumination becomes self-reinforcing. The program comprises of fourteen online training sessions of 45 minutes each, which are offered over a period of six

to nine months. The training sessions are implemented by well-trained and supervised mental health professionals who follow the Happy Friends, Positive Minds training protocol[29].

The primary working mechanisms of the Happy Friends, Positive Minds intervention program target the interoceptive and predictive mechanisms through which physiological threat responses go unregistered and relief-without-resolution loops within girls' close dyadic friendship interactions are sustained. Every training session consists of five practices and starts with inducing essential emotional safety signals interrupting threat, inadequacy and isolation priors: sensory anchoring, micro-movements, curiosity and seeking, extended exhale, and touch[31]. This practice allows the girls to land in the lesson and prepares them to work with the emotionally challenging themes that are introduced in the following practices. Emotionally challenging themes are themes that are prominent within adolescent girls' daily lives (e.g., feelings of low self-worth, procrastination, ambiguous interactions on social media, feelings of uncertainty being able to support a close friend, feelings of uncertainty about identity), triggering feelings of uncertainty, insecurity, or risk, states that are often the central focus of co-ruminative interactions within girls' close friendships. These topics are introduced through a series of psychoeducational animations and carefully selected short movies in which the girls see snapshots from the lives of their peers, experiencing emotional activation by the introduced theme. Girls are invited to practice with body awareness in response: the emphasis is on pacing and small, experiential shifts in attention, explicitly without the need to analyse or discuss what they are experiencing.

In the next phase, the girls are invited to practice with one of the thirty available guided practices[29]. These guided practices are each five to seven minutes long and are introducing the central theme, followed by different combinations of the twelve available salience signalling components to practice with: (1) sensory anchoring, (2) micro-movement, (3) curiosity and seeking, (4) rhythm and vibration, (5) extended exhale, (6) touch, (7) non-reactive attention, (8) orientation to context, (9) co-regulation, (10) warmth inward, (11) noticing change, and (12) self-affirmation[31]. In the first phase of the practice, girls are invited to being aware of the threat signals their bodies are experiencing based on previous experiences, quickly followed by working with the salience signalling components. The goal of inducing the salience signalling components is to support the girls to implement prediction errors: repeated, specific, body-felt experiences that contradicts the prior's prediction, delivered with enough precision that the nervous system cannot assign it low weight[31]. Some of the guided practices are built for individual practice, others are built for dyadic practice. The process of working with the guided meditations supports the girls in experiencing that they are able to create moments where emotional settling and a sense of closure can occur without escalating worry, reassurance seeking, or repeated revisiting of the same concern that is central to the theme they are working with.

In the inquiry phase of every practice, girls are invited to reflect on their experiences during working with the guided practice. Girls are invited to reflect on the changes they noticed in their body, followed by a short summary of the key learning points, and an invitation to think about how these practices can be implemented in their daily lives and how they can support each other in this.

This approach is consistent with research showing that adolescents' learning about social support is shaped by their subjective experiences of relief and safety rather than by problem resolution or physiological stress responses. By targeting these consciously experienced outcomes, the Happy Friends, Positive Minds intervention program can alter the reinforcement loop that sustains co-rumination, while remaining developmentally attuned to the central role of friendships in emotional regulation during adolescence.

In terms of long-term outcomes, the program aims to produce durable reductions in co-ruminative interaction patterns and associated internalising symptoms across the period of risk. By working at the level of the predictive model, supporting girls to generate repeated, body-felt experiences that contradict threat-based priors, the intervention aims to update what co-ruminative conversations teach the nervous system over time. If successful, this would be expected to manifest as reduced frequency of co-ruminative problem talk, lower levels of anxiety and depressive symptoms, and an increased capacity for dyadic emotion regulation that supports settling and closure rather than escalating reassurance-seeking[15,29]. It should be acknowledged, however, that long-term follow-up data examining the persistence of these effects beyond the intervention period are not yet available, and that the mechanisms through which the program produces change remain to be directly tested. Establishing the durability of outcomes and identifying the active ingredients of change represent important priorities for future research.

Diversity considerations may be relevant both to the mechanisms underlying co-rumination and to intervention responsiveness. Cultural and contextual variation in norms surrounding emotional disclosure, interpersonal dependency, and peer support may shape the extent to which co-rumination is socially reinforced and may thereby be associated with variation in the operation of the relief-without-resolution loop. In addition, differences in developmental context, as well as individual variation in emotion regulation capacity and interoceptive awareness,

may be associated with differences in the transition from co-rumination to internalising symptomatology. These factors may also be relevant for engagement with, and responsiveness to, intervention components targeting dyadic interaction patterns and emotional processing, suggesting the importance of further examining heterogeneity in both mechanisms and outcomes.

While the specific role of interoceptive awareness in sustaining co-rumination among adolescent girls remains unexamined, incorporating interoceptive awareness training into the Happy Friends program and evaluating its effects on co-rumination represents a promising avenue for prevention.

Taken together, the findings reviewed here, and the proposed relief-without-resolution loop carry several clinical implications. Co-rumination in adolescent girls is not simply a harmful behaviour to be discouraged; it is embedded in the same relational dynamics, validation, closeness, and mutual support, that are protective in other contexts. Interventions that address excessive co-rumination should therefore avoid undermining these relational qualities. The Happy Friends, Positive Minds program is designed with this in mind: rather than targeting disclosure or emotional intimacy directly, it aims to interrupt the physiological and predictive mechanisms that sustain the loop while preserving the friendship as a resource. For clinicians and school-based practitioners, this suggests that dyadic rather than individual formats may be more appropriate for girls presenting with co-ruminative patterns linked to internalising difficulties, and that interoceptive awareness may be a meaningful but underutilised target in prevention work with this group.

## Ethics Approval

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PV and PN had co-written the Happy Friends, Positive Minds protocol paper and they co-wrote this manuscript. PV and PN both reviewed and approved the final version of this manuscript.

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