

STRESS RESPONSE TO PEER CONFLICT: EXAMINING MECHANISMS OF
EMOTION REGULATION AND SOCIAL BUFFERING

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Stress Response to Peer Conflict: Examining Mechanisms of Emotion Regulation and
Social Buffering

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ABSTRACT

STRESS RESPONSE TO PEER CONFLICT: EXAMINING MECHANISMS OF EMOTION REGULATION AND SOCIAL BUFFERING

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Previous research addressing social networks and interactions has had a large focus on positive interactions, while fewer studies have examined the harmful impacts of negative social interactions on psychological well-being. This thesis examines the role of peer conflict networks, social support, and rumination/co-rumination as predictors of cortisol levels and perceived stress response in a collegiate marching band context. The sample consisted of member of a collegiate marching band (n = 193; 52% female; mean age = 19.4 years). The role of rumination and co-rumination were explored as possible mediators connecting peer conflict to stress, with social support and friendship networks acting as potential moderators of these associations. Results revealed rumination, but not co-rumination, as a significant mechanism linking peer conflict to perceived stress levels. Additionally, the moderated mediation model revealed a moderation effect of friendship network density on the mediational effect of rumination on the association between conflict network size and perceived stress levels. The findings suggest that rumination and friendship network density are playing a role in worsening the association between

peer conflict and perceived stress. The present study advances research by jointly evaluating the role of emotion regulation and social buffering in explaining and qualifying the associations between conflict network size and perceived and physiological measures of stress.

CHAPTER ONE

When addressing research on social interactions and networks, substantial attention has been paid to high-quality friendships and positive social interactions (Bukowski, Hoza, & Boivin, 1993; Youniss & Haynie, 1992). In contrast, fewer studies have explored the harmful effects of negative social interactions on stress and psychological well-being. The adverse effects of social negativity, such as increased hormonal and physical stress response, can impact psychological and physical health in a more potent way that may negate the benefits of social interactions (Rook, 1984). Due to this effect, it is important to understand the mechanisms that could exacerbate or improve the stress response. Previous research has revealed several important mechanisms that could amplify or dampen the adverse effects of stress response to peer conflict (Laursen, Hartup, & Koplas, 1996). These include emotion regulation strategies, such as rumination and co-rumination, which could increase stress response (Brosschot, Gerin, & Thayer, 2006; Rose, 2012) and the protective or buffering effects of social support (Hostinar & Gunnar, 2013). These two moderation and mediation pathways will be jointly examined using a model of moderated mediation. Given the gap in the extant research on the effects of peer conflict on stress responses, the present study aims to examine associations between conflict and stress responses (physiological and perceived). The second goal is to explore the role of individual emotion regulation strategies (ruminations and co-

rumination) and social support as moderators of the impact of social conflict on stress response.

Young Adulthood

The proposed research study is examined during young adulthood and specifically in a sample of college students. Young adulthood is a unique developmental period marked with multiple life transitions, such as moving away from home, attending college, and starting a career. Relationships with friends and family members are going through substantial changes, which provides a unique time period of measurement for conflict and social network analysis (Wang, Davis, Wootton, Mottershaw, & Haworth, 2017). Moving away from home and the control of caregivers allows for greater autonomy and sense of identity for young adults.

This time period can be particularly interesting to examine in the context of peer interactions and social networks. These individuals are gaining their independence and are more likely to form close friendships as sources of identity development, encouragement, and social support (Wang et al., 2017). College students in particular provide a complex network as they are gaining new friendships while attempting to maintain old ones. Adjustment issues are more likely to arise, while network dynamics and sources of support will continue to shift and the emphasis shift's away from an individual's place in their peer group (Buhrmester, 1990). College students have their feet in both the outside adult communities as well as their own peer networks within an academic setting and the crossing of these communities can provide frequent interactions and increased incidences of conflicts, especially with those in close friendships (Wang et

al., 2017). The developmental period of young adulthood can provide a unique perspective towards the beneficial and maladaptive impacts of social interactions and for measuring the complexities of peer networks.

Peer Conflict

Humans experience many complex social relationships that have the potential to develop some type of conflict. It is important to understand the impact of conflict and the role it plays on social well-being. Conflicts are inherent part of peer relationships and social organizations (Birditt, Antonucci, & Tighe, 2012). Often disagreement and conflict are experienced within a friendship or positive peer group. Prior research, especially focusing on positive friendships, has often ignored how complex social networks may include both positive and negative types of relationships. When assessing the complexities of social relationships in a network, it is imperative to provide a comprehensive account of both positive and negative features of all relationships. Friendships can potentially provide an important buffer for social negativity (Lepore, Allen, & Evans, 1993). Friendship and social support may seem like they contain only positive features, but they can take a turn when negative interactions or conflicts arise. When examining all of these variables it is important to understand how they interplay with one another and the complexity of those interactions.

Peer conflict is a normal everyday life experience that can occur at any time. It is capable of occurring between close relationships or even between strangers (Laursen, Hartup, & Koplas, 1996). Conflict can be used in a more beneficial way as a means for social problem-solving and learning how to resolve disputes but can become problematic

when the conflict results in psychological distress to one or both of the individuals involved. Conflict interactions within peer friendships can be very different than conflict interactions between family members (Laursen, 1995). This is because with peers there is more of a risk of the friendship becoming weakened or even ending due to the conflict. This risk of friendship termination can increase the negative feelings and stress response after a conflict has occurred. However, resolution of a conflict between peers can result in a higher quality friendship. These potential risks and considerations are what make conflict with peers so important and unique from conflict within other social relationships (Laursen et al., 1996).

Whereas social conflict can be operationalized and studied in multiple ways, including duration, size, density, and centrality, the present study focuses on the number of outgoing conflict nominations. The aim is to quantify the presence of a conflict relationship more broadly. This allows for the best measurement to be conflict network size. During young adulthood, individuals can come into contact with peers who they have conflict with (Wang et al., 2017). This is especially true for young adults attending a university with social organizations and clubs, such as marching band. From an organizational standpoint, a marching band may contain a group of individuals that are placed in a high stress environment where they are sectioned off based on instrument. As a consequence, individuals may be forced to interact who may not interact otherwise. Conflict may arise as a result. It is important to understand how many of these conflicts an individual is experiencing in order to examine the impacts on that individual as well as an organization. Consequently, it is not necessary to determine whether that conflict is

reciprocated or not, it is only important that the single individual perceived that a conflict took place.

Stress Response to Peer Conflict

Stress is the body's way of responding to a challenging or threatening environment that it is not able to cope with or adapt to (Gunnar & Quevedo, 2006). There are multiple systems that are involved in stress response, including neuroendocrine response of the hypothalamic-pituitary-adrenal (HPA) axis leading to the release of the stress hormone, cortisol. Cortisol is a hormone in the body that is released during times of stress. Cortisol is an important hormone for times of immediate action and recovery in response to a stressor. When that recovery is not achieved, excess cortisol will begin to build up in the body and cause negative consequences to both mental and physical health (Gunnar et al., 2006). For the present study, cortisol will be used as a global measure of stress in the body and not as a reaction to a particular stressful or negative event.

In order to study the impacts of cortisol after the presence of a stressor, it is important to first understand how it is released in the body. Cortisol is a hormone secreted from the adrenal cortex (Gunnar et al., 2006). During times of danger or stress, the hypothalamus sends out a signal to the pituitary gland. The pituitary gland then sends out its own signal which initiates the release of cortisol from the adrenal cortex. This pathway of signals from the hypothalamus to pituitary gland to adrenal cortex is referred to as the HPA axis. Once released, cortisol has a variety of metabolic effects, including the release of glucose that generates the energy to adapt to a prolonged stressor (Gunnar et al., 2006).

Emotions and stress share a close relationship. Stress is a physical response associated with a negative emotional reaction to a stressful environmental event (Du, Huang, An, Xu, 2018). Due to its close tie with emotion, negative emotions arise during times of increased stress such as anger, frustration, and anxiety, especially when the stressors are uncontrollable, on-going and are concerned with social evaluation and threats to social status (Dickerson & Kemeny, 2008; Denson, Spanovic, & Miller, 2009). This is why stress is so often affiliated with social interactions. For the majority of people, social interactions are experienced on a daily basis. There are many proven beneficial results to these social interactions, such as psychological well-being and life longevity (Yang, Boen, Gerken, Li, Schorpp, & Harris, 2016). However, the benefits of interacting socially are not always upheld when those interactions evoke strong negative emotions or threaten one's social status. Conflicts arise when two or more individuals disagree or are at odds with each other. Conflicts are often associated with serious arguments or times of increased aggression, but this is not always the case. Conflicts themselves may be much subtler and usually do not result in actual physical violence (Page-Gould & Akinola, 2015). Conflict is experienced frequently in people's lives and may occur between friends, family, acquaintances, and strangers.

The stress response induced by a conflict or social negativity is a response that develops from a young age (Hardy & Smith, 1988). The experience of conflict as a potent stressor is seen early in emotional development and continues throughout adulthood (Marshall, van Dulmen, & Stigall, 2017). Our exposure to interactions that are high in either negativity and positivity can influence later development and reactions to conflict.

Children may not be able to express psychological stress as well as adults, but they still experience a similar physiological response. When six-year-olds experienced social conflict and disruptions in their family dynamics, they experienced functional somatic symptoms, such as stomach aches and migraines (Marshall et al., 2017). These symptoms can have lasting impacts on the children's development, health, and immunity, as well as impacting their ability to regulate their emotions and recover from stress as they progress into adulthood (Marshall et al., 2017).

The relationship between social conflict and stress response is not only seen in just humans. Research has found that non-human primates experience an increase in behaviors associated with anxiety after a conflict or altercation (Aureli, 1997). This behavioral stress response persists until the animal has a reconciliation with the source of conflict. Even in animals, the ability to cope with and move on from stress is beneficial to their mental health and their physical well-being (Aureli, 1997).

Physiological and Self-Reported Measures of Stress

It is important to understand the relationship between social conflict and increased stress response due to the harmful effects of stress on the mind and body, but it is also important to understand how this relationship can be influenced by other factors such as individual differences in coping mechanisms and positive high-quality friendships. To examine a comprehensive examination of all the mechanisms that may impact that relationship, multiple methods may be employed to operationalize and measure the stress response.

Cortisol can provide a suitable way to measure the global stress response to these incidences as it can measure a response within the body that may not be reflected with typical self-report questionnaires by themselves (Taylor, 2012). This is especially true for stress that occurs in a naturalistic setting outside of the laboratory. Cortisol can provide insight into the global amount of emotional stressors and conflict that occur in daily life without having to worry about the accuracy of participant reporting. Cortisol and the HPA axis are particularly sensitive to social stressors like conflict. This is important for conflict research as it allows for measurements to be taken away from when the actual conflict took place and can be collected before, during, and after the stressful event (Dickerson & Kemeny, 2004).

For the present study, cortisol is used as a global measure of stress from the presence of conflict and not in reaction to a specific negative event. The same is true for perceived stress by employing a global measure of perceived stress. A global measure allows for the measure of stress in an individual's life more broadly and not necessarily tied to a specific event. By using a global measure, we will be able to examine stress more generally as related to conflict network size and social stressors. Obtaining global measurements of cortisol and self-reported questionnaires of stress are important methods when examining the effects of social conflict. Minor conflicts are experienced quite often and will not always leave a lasting impression. By measuring that response through both global hormonal biomarkers and self-reported measurement of perceived stress, there is an increased likelihood of disentangling a relationship between a perceived psychological stress response to a minor conflict and a more major conflict that can have an impact both

biologically and psychologically. Feeling hurt by others in close relationships is more likely to result in a lasting response than by an unfamiliar stranger (Miller & Roloff, 2014), which is why it is important to understand this distinction and how it may have a greater influence on the stress response.

The Role of Emotion Regulation

All humans experience some form of stress, which can impact the way they function and behave on a daily basis. However, that response to stress is not universal across all humans. In particular, differences in emotion regulation strategies can change the nature of the individual stress response (Naragon-Gainey, McMahon, & Chacko, 2017). Even though stress is a common experience, not everyone is able to cope or recover from stress in the same way and the ability to regulate emotion provides an explanation for these differences. Emotion regulation is a way of coping and managing both positive and negative emotions, such as stress, to maintain emotional balance within the body (Naragon-Gainey et al., 2017). The regulation can either be an automatic response or a purposeful strategy. Each individual has various levels of ability when it comes to stress management and the implementation of coping strategies. Gaining insight into these differences is essential for understanding the development of social functioning and stress management throughout the lifetime. There are multiple strategies that can be employed in order to regulate emotion (Naragon-Gainey et al., 2017). These strategies have the potential to be beneficial or detrimental depending on the situation. A disadvantageous strategy may result in emotional dysfunction and negative consequences for mental well-being (Naragon-Gainey et al., 2017). Inability to downregulate negative

emotions experienced during a stressful event may amplify and prolong such negative emotions and have adverse effects on mental health (Du, Huang, An, & Xu, 2018).

There are many different types of emotion regulation strategies employed to deal with conflict and stressful situations (Naragon-Gainey et al., 2017). Two important strategies are rumination and co-rumination, which have the adverse effect of potentially increasing and prolonging the initial stress response to peer conflict (Du et al., 2018). In the present study, the mediating role of rumination and co-rumination will be examined. Due to the adverse consequences, it is imperative to examine the role of rumination and co-rumination within the complex relationship of peer conflict and stress response.

Rumination

When dealing with stress in the context of social affiliation and conflict, a major strategy employed is rumination. Rumination is the over-engagement in negative thinking about negative events and interactions that have been experienced, which can continue long after that event has taken place (Brosschot, Gerin, & Thayer, 2006). The employment of rumination can exacerbate stress by prolonging the negative effects and emotional response associated with that particular event. For example, ruminating about a conflict that took place a few days ago may increase stress and negative emotions well past the time the event transpired. When negative emotions such as stress are prolonged and not given the chance for recovery, adverse health effects could arise as a result (Brosschot et al., 2006).

To achieve a more thorough understanding of the mechanisms underlying the adverse effects of rumination, García, Duque, & Cova (2017) decided to break

rumination down into four subgroups: brooding, reflection, intrusive, and deliberate rumination. By breaking rumination down into more specific terms, the authors were attempting to explore exactly how rumination was associated with the occurrence of posttraumatic stress after a highly stressful event. They found that brooding and intensive rumination had a positive relationship with the symptoms of posttraumatic stress. The results provide a more comprehensive understanding of the mechanisms employed during rumination. Negative emotions were extended through the experience of intrusive thoughts about the negative event and excess brooding over the hurtful emotions. The consequences were a prolonged stress response that is not given the proper time and space to recover.

Despite the evidence of the adverse effects of peer conflict on stress (e.g., Du et al., 2018; Hardy et al., 1988), experiencing a conflict does not always result in rumination or a robust stress response. Miller and Roloff (2014) explored the idea that conflict response is more closely associated to individual perceptions of distress. They found that individuals who took conflict personally were more likely to engage in rumination and experienced a prolonged stress response up to a year after the event took place. This demonstrates the notion that hurt feelings during a conflict are more about subjective perceptions and not just about the presence of a conflict. This is especially important if assessing the presence of rumination in a laboratory setting where the negative emotions associated with a stressor may not be as robust as it is during a naturalistic setting.

Rumination is primarily examined as a mechanism for increasing and prolonging stress after a negative or traumatic event has occurred. A mediation model has been used

to explain how rumination can play a role as a mechanism through which the harmful effects of stress are translated into poor health outcomes. To explore this relationship, Du, Huang, An, & Xu (2018) measured the impacts of rumination on stress that occurred naturally across different time points of daily life, instead of only one major stressful event. What they found was that individuals who reported higher levels of daily stress were more likely to engage in rumination than those who reported less stress. These individuals then experienced an increase in negative emotions and outcomes after engaging in rumination. Understanding the mechanisms surrounding rumination and its adverse health consequences are essential to gain knowledge of all the adverse health outcomes associated with high levels of prolonged stress.

Co-Rumination

Co-rumination is another strategy that is often employed for coping with stressful situations and is related to rumination. Co-rumination usually occurs between friends and is a mutual encouragement between two people of excessive disclosure of problems and dwelling on negative feelings (Rose, 2002). This coping mechanism is very similar to rumination, except it involves the sharing of negative emotions with another person (Rose, 2002). Co-rumination could be employed as a way to analyze the social situation to better understand it, or it could just be a way to gain sympathy and encouragement from another individual. Co-rumination will also be examined as a mediator for the relationship between conflict and stress.

Co-rumination is a complex social phenomenon because it contributes to both positive and negative features within friendship. Typically, friendships are important

sources of social support, and co-rumination can reverse the benefits associated with supportive features of a friendship. The problem with co-rumination is that it is often used as a way of feeling camaraderie with another individual and can be used as a mechanism for friendship development (Rose, Carlson, & Waller, 2012). Research has shown that individuals who participate in co-rumination report higher levels of friendship quality than those who do not. Despite of this, co-rumination still led to increased levels of stress, anxiety, and depression (Rose et al., 2012). The increase in quality then encourages further co-rumination in the future, which only leads to more adverse side-effects. It is important to recognize the relationship between friendship quality and co-rumination in order to understand why it is used.

In the same way, co-rumination has been found to increase the release of cortisol for those who report high levels of friendship quality (Byrd-Craven, Granger, & Auer, 2010). Co-rumination engagement has been shown to increase perceived friendship quality, which as a consequence increases how often co-rumination will be implemented. However, with this increase in engagement, there is a prolonging of the internalizing symptoms and negative emotions associated with the original conflict. The lingering internalizing symptoms increase the body's stress response by continually signaling for the HPA axis to release cortisol (Byrd-Craven et al., 2010).

Co-rumination can be seen as having a profound influence on the development of emotional difficulties and stress management. To further examine the emotional difficulties associated with co-rumination, Dirghangi, Kahn, Laursen, Brendgen, Vitaro, Dionne, and Boivin (2015) tested the impact of co-rumination on depression and anxiety

in monozygotic twin pairs. By using the twin pairs as genetic comparisons, they were able to piece apart the role that environment plays on the engagement of emotion regulation strategies. They found that higher engagement with co-rumination was positively correlated with higher levels of perceived anxiety and stress. In spite of this they did not find a link between co-rumination and increased depression.

Additionally, co-rumination takes place between two individuals who are discussing a negative, stressful event. However, this does not mean that the person who actually experienced the event is the only one who feels the adverse emotional effects. It is often the case that the friend hearing about the distressing event will also experience an increased stress response (Smith & Rose, 2011). It may then be possible to assess co-rumination as a potential stressor without the presence of direct conflict. It could be that constantly analyzing negative events taking place in a friend's life is the event that increases stress and prolongs feelings of negative emotion. This is especially the case if for an individual who has experienced stress due to direct conflict and the other co-ruminator's stress is just exacerbating those feelings to prolong them further. If an individual is already stressed about a conflict, then ruminating with a friend may increase stress regardless of whether or not the co-rumination was focused on their own or their friend's stressful experience.

Social Buffering

Another potential influence that may change the nature of a response to stress is the presence of social support. The amount of change is dependent upon the quality of the supportive relationship and its availability. Thus, high quality, supportive relationships

may serve as a social buffer and decrease the stress response. Friendships are consistent sources of support and companionship throughout all stages of human development (Hostinar & Gunnar, 2013). When negative life events occur, these friends are sought out for empathy and encouragement. The same is true when experiencing conflict and social stress. These supportive friendships can serve as a buffer for the impacts of stress response and aid in recovery post-stressor. Social support is the experience or perception that an individual is cared for, respected, and included in a network of another likeminded individual (Wills, 1991). Social support is most often found between close friends and family members, but it is possible to be found with acquaintances and strangers (Wills, 1991). When dealing with times of stress Taylor (2006), developed the term “tend-and-befriend” as an explanation away from the typical fight or flight response. The argument is that modern humans seek out support from those in their close social networks as a mechanism of coping with a stress response. They use their close social networks as a supportive buffer to diminish the reaction elicited from the social negativity (Taylor, 2006). In the present study, social support will be examined as a moderator for the pathway between conflict network size and stress.

The importance of high-quality friendships is especially seen during late adolescence. As children develop, they begin to form closer, longer-lasting relationships with their peers (Wang, Davis, Wootton, Mottershaw, & Haworth, 2017). They also begin to form new relationships as they mature and gain independence away from their parents and family. Friendships during this period of development are especially important for social support. The most frequent interactions during late adolescence and young adulthood is

with peers (Larson, 2001). During this stage, peers come to play a greater role of confidants than parents because they are better able to relate and sympathize with social difficulties. Parents and family are large sources of support beginning at a young age, however, there is evidence towards the importance of social support and friendship found within peer networks (Schwartz, Dodge, Pettit, Bates, & The Conduct Problems Prevention Research Group, 2000), which intensifies starting at adolescence (Hostinar et al., 2015). Research has shown that when children who experienced peer victimization and reported to have lower levels of support at home showed increased social stress. However, when they developed multiple positive peer friendships, the negative effects were diminished. Taken together, positive friendships with peers can serve as an important buffer across multiple domains of social well-being from childhood through adolescence (Schwartz et al., 2000).

Social support provided through friendship is not only beneficial for psychological wellbeing, but also for physical health (Schwarzer & Leppin, 1989). A large body of evidence suggests that people who have access to psychological support from friends and family in demanding situations appear to be in better health compared with those without significant support (Schwarzer et al., 1989). For example, assessments within hospitals and nursing homes have found evidence of the beneficial impacts of social support on the immune system and endocrine systems during times of illness and traumatic events (Schwarzer et al., 1989). The literature also shows that individuals who report high levels of perceived support through friendships live longer and healthier lives than those who

live in constant social isolation and do not have anyone to turn to in stressful situations (Birmingham, Uchino, Smith, Light, & Sanbonmatsu, 2009).

The other benefits of social support obtained from friends is that it can act as a buffer against prolonged physiological stress response. As a reaction to social conflict and especially those interactions that are unpredictable and threatening to one's social status (Dickerson et al., 2008; Denson et al., 2009), the body releases a stress hormone, cortisol. Social buffering effects of friendship would, theoretically, be expected to reduce physiological stress responses. To test the impacts of supportive friendship on dampening the activation of the HPA axis, Eisenberger, Taylor, Gable, Hilmert, and Lieberman (2007) assessed participants during a fMRI task that involved stressful scenarios of social rejection. They had the participants report their perceived levels of social support from friendships in their normal everyday lives. Eisenberger and colleagues found that those who reported high levels of outside social support showed diminished cortisol in the presence of a social stressor than those who reported low support. Importantly, they found that the friend who provided the support did not need to be present while the stressor was occurring or even immediately after. The perception that a strong supportive friendship was available was sufficient to lower the stress response on a physiological as well as neurological level.

Birmingham, Uchino, Smith, Light, and Sanbonmatsu (2009) studied the impacts of positivity and negativity during moments of support on perceived stress and cardiovascular response. The participants were instructed to perform a stressful task, while the researchers offered words of support that either carried positive or negative

connotations. The results demonstrated that, when the provided support higher in positivity, it resulted in lowered cardiovascular response than when the support was high in negativity. The results shed more light onto the complexity of social support and its role as a stress buffer and how the perceptions of the individual matter more than just the presence of overall support.

Similar to the experimental manipulation by Birmingham and colleagues, there are situations where the supportive friend can be found in the same time and space as a stressful event. Situations may even occur where the person present is not even a supportive friend, but actually a complete stranger. The mere presence of an individual acting in a supporting role can act as a buffer to diminish the negative impacts of stress (Lepore, Allen, & Evans, 1993). On the level of a hormonal response, having the presence of support from a stranger can lower cortisol levels. Still, there is disagreement within the literature over whether or not a stranger can produce enough support as the presence of a friend in order to produce a significant stress reduction (Kirschbaum, Klauer, Filipp, & Hellhammer, 1995; Lepore, Allen, & Evans, 1993).

Friendship has also been found as buffer for stress during conflict with these self-reported measures of perceived stress. For example, Major, Zubek, Cooper, Cozzarelli, & Richards (1997) examined the impacts of social support when participants experienced a major stressful event. The event involved the decision to have an abortion or not, which was deemed a highly social stressor as support is often sought through friendships and romantic partners. The results demonstrated that high conflict and low support during this stressful situation resulted in increased psychological stress than those who experienced

higher support. Importantly, those who experienced conflict and low support had more difficulty in adjustment after the event. These findings underscore that social support can act as an essential buffer when the event takes place, however it is also an important aide in the recovery in order to avoid prolonged stress.

Most of the literature is focused on the presence and perceptions of supportive friendships in a person's life. This is a justified central focus for the research on friendship buffering. To further the understanding of the social buffering effect, researchers have sought to determine whether that support is actually enacted after the stressful event has occurred. Friendship quality can be an important factor related to this distinction. Birditt, Antonucci, and Tighe (2012) wanted to examine how actually providing social support relates to stress appraisal and friendship quality. They found that within low quality friendships, social support was enacted only for highly stressful events and not events that were deemed low in stress. In contrast, high friendship quality was associated with high social support regardless of the level of stress appraisal. It is important to consider how the quality and not just the presence of a friendship plays into the buffering of social stress. Taken together, the large body of research focusing on the role of social support has documented that its multiple dimensions are important to consider when investigating social buffering (e.g., Thoits). Following these recommendations, the present study focuses on objective and subjective aspects of social support – number of friends and perceived social support levels.

In the present study, social support will be assessed using friendship network density. Density is computed by dividing the number of existing friendship ties among

one's friends by the possible number of ties. Thus, this measure describes the degree of interconnectedness among one's friends. Friendship network density provides a measure of cohesion among friendship networks and has been found to better buffer the effects of outside influences and provide a measure of social support (Walker, Wasserman, & Welman, 1993).

Social Buffering as a Disrupter of Ruminative Mechanisms

The mediational impacts of rumination/co-rumination on the relationship between conflict and stress have been previously examined (Du et al, 2018; Rose et al., 2007). However, the addition of social buffering on this mediational relationship has not been explored in the literature. It has been recognized that rumination and co-rumination can work to exacerbate the relationship between conflict and stress. Potentially, adding measures of social support as buffers toward decreasing stress could disrupt this relationship. The present study examines the moderating impact of social support on the mediational relationship between conflict, rumination, and stress. Previous research has found that individuals who engage in rumination may not employ it as a coping mechanism for all stressors (Miller & Roloff, 2014). A possible explanation for the lack of employment could be due to the moderating role of social support. It could be the case that the social buffering was not examined as a possible reason for the differing prolonged engagements with rumination.

In particular, co-rumination has been linked to increase in feelings of intimacy within friendships and relationships (Rose et al., 2012). Those who engage in co-rumination may be experiencing increases in friendship quality and support which could

then influence how stressful that particular co-rumination experience is. A potential explanation could be that the role of social support within these friendships are buffering the impacts on stress and will disrupt the mediational relationship. On the other hand, co-rumination has been found to increase the release of cortisol for those who report high levels of friendship quality (Byrd-Craven et al., 2010). Co-rumination engagement has been shown to increase perceived friendship quality, which as a consequence increases how often co-rumination will be employed as a strategy. This cycle could show social support as a mechanism that further exacerbates the mediational relationship. The present study will examine the moderated mediation impacts of rumination, co-rumination, and social support to explore how social buffering can interact with and potentially disrupt the mediational relationship between conflict, rumination/co-rumination, and stress.

CHAPTER TWO

To address limitations of the prior research that has predominantly focused on the effects of positive types of network, the present study examines the role of peer conflict as a predictor of stress responses in a sample of young adults. Previous research has revealed several important mechanisms that could amplify or dampen the adverse effects of stress response to peer conflict (Laursen et al., 1996). These include emotion regulation strategies, such as rumination and co-rumination, which could increase stress response (Brosschot et al., 2006; Rose et al., 2012) and the protective or buffering effects of social support (Hostinar & Gunnar, 2013). Thus, the present study examines the role of rumination and co-rumination as potential mediators for the relationship between peer conflict and stress. Second, to examine the role of social support as a potential moderator for for the relationship between peer conflict and stress. Third, to examine the role of social support as a potential moderator for the mediational relationship between peer conflict, rumination/co-rumination and stress. These goals are pursued using a sample of young adults, a developmental period when successful navigation of interpersonal relationships and social conflict is critical for psychological adaptation, health and wellbeing (Laursen & Collins, 1994).

The present study uses three models of mediation, moderation, and moderated mediation. The mediational impacts of rumination on stress (Du, Huang, An, & Xu,

2018; Brosschot et al., 2006), as well as the role of moderating role of social support (Hostinar & Gunnar, 2013), have been examined previously in the literature. However, the combined moderated mediation model used to examine the role of social support and friendship density as moderators of the mediated path between conflict network size, rumination/co-rumination, and social support, has not been explored in the literature. This potential moderated-mediation pathway was chosen due to the support surrounding the separate mediation and moderation pathways. The present study examines the hypothesis that these pathways will work together to create the moderated-mediation model.

Methods

Participants

Participants consist of undergraduate students from Arizona State University (Tempe, AZ), who participated in marching band. Consent was obtained for 220 students (72% of the active marching band members), and 205 (68% of the active marching band members) completed network assessments across two waves. 177 students participated in the study at wave 1 and 175 at wave 2. Participants were 48% male and 52% female. The mean age of participants was 19.43 years ($SD = 1.51$, range: 18-30 years). Ethnic/racial composition of participants was 5.3% African American, 5.3% Asian-American, 62.1% European-American, 20.9% Hispanic/Latino, and 3.4% Native American. Participants had completed 1-14 semesters of college ($M = 4.45$, $SD = 2.52$) and had completed one to six seasons of marching band at the college level ($M = 2.17$, $SD = 1.21$). The study procedures were approved by the university's institutional review board.

Procedure

In the middle of September and at end of November, all participants received an email with a unique username and password and were asked to complete a 30-minute online survey focusing on demographic characteristics, music-related motivations, personality, perceived stress and coping strategies. The choice of assessment timeframe intended to capture the initial configuration of social relationships, which formed over the first 6 weeks of the season; then again, two months later at the end of band season (also coinciding with the end of academic semester) to capture continuity and change in social ties. At both time-points, students completed the online survey during one-week prior to a band practice session when the in-person data collection took place. During the in-person session, held between 3:30 and 6:30 pm (i.e., immediately before and after the band rehearsal), participants were asked to complete social network measures and a short questionnaire on health and medication use. Two waves of data were collected, however for present study only data from wave 1 will be used for the analysis.

Stress Response

To measure the stress biomarker cortisol, participants provided two saliva samples, one before and one after rehearsal, at both Time 1 and Time 2 of the in-person sessions. Saliva samples were collected via passive drool into 2 mL cryogenic vials and were immediately placed on ice and transferred to the laboratory where they were stored frozen at 80°C until assay. An average level of cortisol was obtained by averaging across the two collection time points.

Perceived stress was measured using the 10-item Perceived Stress Scale, which measures stress during the last month. The alpha reliability estimate for this scale was 0.87.

Rumination/Co-Rumination

Rumination was measured as a subscale of the *Cognitive Emotion Regulation Questionnaire* (36 items). The rumination subscale consists of four items that measure the degree to which individuals focus on the feelings and thoughts associated with a negative event (e.g., “I often think about how I feel about what I have experienced” and “I dwell upon the feelings the situation has evoked in me”). Items are rated (1 = “almost never” to 5 = “almost always”) so that larger scores represent greater use of rumination. The alpha reliability estimate for this scale was 0.76.

Co-rumination was measured using *Co-rumination with a friend* (9 items) taken from Haggard, Robert, & Rose, 2011, where the 9 items with the highest factor loading from each content area of the original 27 items were kept based on the factor analysis conducted by Rose (2002).

Conflict and Friendship Networks

The presence of conflict and friendship networks was assessed using peer nominations during both time points. Participants responded to the following questions: “Please list the codes of the band-mates that are your closest friends with whom you spend a lot of time doing different activities and whom you can count on when you need help,” and “Please list the codes of the band-mates with whom you had experienced interpersonal conflict, tension, or with whom you just did not get along.” Participants

were able to nominate an unlimited number of individuals with whom they were friends or had conflict.

Conflict network size was used in the present study as the number of outgoing nominations of peer conflict as the independent variable.

Friendship network density was used in the present study. Density of friendship network was computed by dividing the number of existing friendship ties among one's friends by the possible number of ties. Thus, this measure describes the degree of interconnectedness among one's friends, such a relational structure is most conducive to social support provision (Walker et al., 1993). Friendship density was examined as a moderator in the model.

Social Support

Social support was assessed by taking a composite of the following items from UCLA Loneliness scale (Russell, 1996): item-3, item-12, item-19, item-20. This includes items such as, "There is no one I can turn to" and "There are people I can talk to." The alpha reliability estimate for this scale was 0.773. Social support was examined as a moderator in the model.

Data Analysis

A cross sectional design only using wave 1 of the data will be used to measure the proposed hypotheses. There are three sets of hypotheses that are examined in the present study. The first set of hypotheses is that rumination and co-rumination will act as mediators for the relationship between peer conflict network size and global stress (i.e., average cortisol and perceived stress). However, due to this being a cross-sectional study, methodological mediation cannot be tested, which requires longitudinal data in which a

predictor, mediator, and outcome appear in a temporal sequence. However, statistical mediation was examined with these analyses to examine the associations in question. In order for this mediation effect to be examined, mediational analysis in SPSS PROCESS macro (Model 3; Hayes, 2013) was performed. This estimation procedure involves simultaneous estimation of three regression paths and computation of bias-corrected bootstrapped standard errors. The first regression path will examine the relationship between the conflict network size independent variable and the stress dependent variables. If there is no a direct association found between the independent and dependent variables, indirect effects would still be examined because they still remain plausible even in absence of a significant direct effect. The second regression path examined the conflict network size independent variable as a predictor of the mediator (rumination/co-rumination). The third path had the conflict network size independent variable and the mediator predicting the dependent stress response variables. These mediational models (i.e., four in total) are separately estimated for both the hormonal and perceived measures of stress and for both rumination and co-rumination.

The second set of hypotheses examined will focus on examining whether social support and friendship network density will act as moderators for the relationship between conflict network size and stress (hormonal and perceived). In order to test to see whether social support moderates the mediated relationship between conflict network size and global stress, conditional process modeling will be used to test for moderation using the PROCESS macro in SPSS v. 24 (i.e., Model 1; Hayes, 2013).

The third is to examine the role of social support and friendship density as moderators of the indirect path between conflict network size, rumination/co rumination, and global stress. To further explore the potential moderated mediation, conditional process modeling will be used to test for moderated mediation as outlined by Hayes (2013) using the PROCESS macro in SPSS v. 24. Specifically, it was tested whether social support moderates the relationships among conflict network size, rumination, and stress response. The first models explored the moderator at both combined paths of the indirect path (i.e., Model 58; Hayes, 2013). The next models explored moderation at the first stage (figure 3; Model 7; Hayes, 2013) and second stage (figure 4; i.e., Model 14; Hayes, 2013) of the indirect path (i.e., Models 7/14; Hayes, 2013).

CHAPTER THREE

Descriptive Statistics

The current sample consists of 187 (52% females) undergraduate marching band students. Table 1 provides the means, standard deviations, and correlations for the main variables and levels of cortisol at time 1 as well as the friendship and conflict networks.

Table 1 Descriptive Statistics

Variable	<i>n</i>	<i>M (Range)</i>	<i>SD</i>	1	2	3	4	5	6	7
1. Salivary cortisol avg. pre/post rehearsal (µg/dL)	178	.19	.16	—						
2. Perceived Stress Scale	187	25.01 (10-45)	7.49	.06	—					
3. Conflict network size (outdegree)	177	1.36 (0-10)	1.89	.07	.00	—				
4. Friendship network density	162	.35	.24	.10	.12	-.07	—			
5. UCLA social support	187	15.05 (7-18)	2.43	.04	-.47**	-.06	-.12	—		
6. Rumination	182	12.15 (4-20)	3.79	.13	.33**	.19*	.07	-.20**	—	
7. Co-rumination	186	2.79 (1-5)	.88	.09	-.01	.23**	.14	.10	.30**	—

***p* < .001.

Mediation Models

Rumination and co-rumination were examined as mediators in the link between conflict network size and stress (average cortisol and perceived stress). In model 4.1, (PROCESS “Model 4”) mediation was tested using the PROCESS Macro (Hayes, 2013). The first analysis included average cortisol as the dependent variable, conflict network

size as the independent variable, and rumination and co-rumination as the two potential mediators. Gender, dietary intake in last 24 hours (fresh food, caffeine, alcohol, and dairy), and hormonal contraceptive usage were entered as covariates.

Rumination as a Mediator of Conflict Network Size – Cortisol Association

In Step 1 of the mediation model, the regression of average cortisol on conflict network size, ignoring the mediator, was not significant, $b = .01$, $t(156) = .89$, $p = .37$. Although the direct path was nonsignificant, the analyses continued to determine the possibility of an indirect effect. Step 2 showed that the regression of the conflict network size on the mediator, rumination, was significant, $b = .41$, $t(156) = 2.65$, $p < .01$. Step 3 of the mediation process showed that the rumination mediator, controlling for conflict network size, was not significant, $b = .004$, $t(155) = 1.18$, $p = .24$. Step 4 of the analyses revealed that, controlling for the mediator rumination, conflict network size was not a significant predictor of average cortisol levels, $b = .004$, $t(156) = .63$, $p = .53$. The bootstrapped estimates revealed a non-significant indirect effect, 95% CI [-.0005, .0044]. Thus, rumination was not a significant mediator of the conflict network size and cortisol association.

Co-Rumination as a Mediator of Conflict Network Size – Cortisol Association

In a similar analysis, the indirect effect of co-rumination was examined using the PROCESS Macro (Hayes, 2013). In Step 1 of the mediation model, the regression of conflict network size and average cortisol, ignoring the mediator, was not significant, $b = .01$, $t(159) = .87$, $p = .39$. Step 2 showed that the regression of the conflict network size on the mediator, co-rumination, was significant, $b = .11$, $t(159) = 3.03$, $p < .01$. Step 3 of

the mediation process showed that the mediator co-rumination, controlling for conflict network size, was not significant, $b = .01$, $t(158) = .85$, $p = .39$. Step 4 of the analyses revealed that, controlling for the mediator co-rumination, conflict network size was not a significant predictor of average cortisol levels, $b = .004$, $t(159) = .65$, $p = .52$. The bootstrapped estimates revealed a non-significant indirect effect, 95% CI [-.0015, .0041]. Thus, co-rumination was not a significant mediator of the association between conflict network size and cortisol.

Rumination as a Mediator of Conflict Network Size – Perceived Stress Association

Next, rumination and co-rumination were examined as mediators in the link between conflict network size and perceived stress. In model 4.1, (PROCESS “Model 4”) mediation was tested using the PROCESS Macro (Hayes, 2013). The first analysis included perceived stress as the dependent variable, conflict network size as the independent variable, and rumination as the mediator. Gender was entered as a covariate. In Step 1 of the mediation model, the regression of conflict network size and perceived stress, ignoring the mediator, was not significant, $b = .09$, $t(165) = .31$, $p = .76$. Step 2 showed that the regression of the conflict network size on the mediator, rumination, was significant $b = .38$, $t(165) = 2.50$, $p = .01$. Step 3 of the mediation process showed that the mediator rumination, controlling for conflict network size, was a significant predictor of perceived stress, $b = .67$, $t(164) = 4.56$, $p < .001$. Step 4 of the analyses revealed that, controlling for the mediator rumination, conflict network size was not a significant predictor of perceived stress scores, $b = -.16$, $t(165) = -.55$, $p = .58$. The bootstrapped estimates revealed a significant indirect effect, 95% CI [.0473, .5139] of conflict network

size on perceived stress through rumination. This model provided a good fit to the data ($F(3, 164) = 10.62, p < .001$). An R^2 of .1627 suggests that the model explains 16.27% of variance in the outcome.

Co-rumination as a Mediator of Conflict Network Size – Perceived Stress Association

In a similar analysis, co-rumination was examined as a mediator using the PROCESS Macro (Hayes, 2013). In Step 1 of the mediation model, the regression of conflict network size and perceived stress, ignoring the mediator, was not significant, $b = -.018, t(168) = -.06, p = .95$. Step 2 showed that the regression of the conflict network size on the mediator, co-rumination, was significant, $b = .106, t(168) = 3.06, p = < .01$. Step 3 of the mediation process showed that the mediator co-rumination, controlling for conflict network size, was not significant, $b = .135, t(167) = .204, p = .84$. Step 4 of the analyses revealed that, controlling for the mediator rumination, conflict network size was not a significant predictor of perceived stress levels, $b = -.032, t(168) = -.11, p = .92$. The bootstrapped estimates revealed a non-significant mediation effect, 95% CI [- .1348, .1558]. Because zero is not in the 95% confidence interval for co-rumination, we can conclude that these indirect effects are significantly different from zero at $p < .05$, and that rumination partially mediates the relationship between conflict network size and perceived stress, whereas co-rumination does not. Thus, co-rumination was not a significant mediator of the association between conflict network size and perceived stress.

Moderation Models

To test the hypothesis of whether social support and friendship network density moderate the relationship between conflict network size and average cortisol levels, a hierarchical multiple regression analysis was conducted.

Friendship Network Density as a Moderator of Conflict Network Size – Cortisol Association

In the first step, two variables were included: conflict network size and friendship network density. These variables did not account for a significant amount of variance in average cortisol levels, $R^2 = .122$, $F(2, 159) = 1.21$, $p = .301$. To avoid potentially problematic high multicollinearity with the interaction term, the variables were centered and an interaction term between conflict network size and friendship network density was created. Next, the interaction term between conflict network size and friendship network density was added to the regression model, which did not account for a significant proportion of the variance in average cortisol levels, $\Delta R^2 = .001$, $\Delta F(1, 158) = .113$, $p = .47$, $b = -.01$, $t(149) = -.25$, $p = .79$. Thus, friendship network density was not a significant moderator of the association between conflict network size and cortisol.

Social Support as a Moderator of Conflict Network Size – Cortisol Association

To test the hypothesis of whether social support and friendship network density moderate the relationship between conflict network size and average cortisol levels, a hierarchical multiple regression analysis was conducted. In the first step, two variables were included: conflict network size and social support. These variables did not account for a significant amount of variance in average cortisol levels, $R^2 = .008$, $F(2, 169) =$

.701, $p < .49$. To avoid potentially problematic high multicollinearity with the interaction term, the variables were centered and an interaction term between conflict network size and social support was created. Next, the interaction term between conflict network size and social support was added to the regression model, which did not account for a significant proportion of the variance in average cortisol levels, $\Delta R^2 = .00$, $\Delta F(1, 168) = 9.27$, $p = .69$, $b = .0003$, $t(158) = .11$, $p = .91$. Thus, social support was not a significant moderator of the association between conflict network size and cortisol.

Friendship Network Density as a Moderator of Conflict Network Size – Perceived Stress Association

To test the hypothesis of whether social support and friendship network density moderate the relationship between conflict network size and perceived stress, a hierarchical multiple regression analysis was conducted. In the first step, two variables were included: conflict network size and friendship network density. These variables did not account for a significant amount of variance in perceived stress scores, $R^2 = .015$, $F(2, 154) = 1.198$, $p = .305$. To avoid potentially problematic high multicollinearity with the interaction term, the variables were centered and an interaction term between conflict network size and friendship network density was created. Next, the interaction term between conflict network size and friendship network density was added to the regression model, which did not account for a significant proportion of the variance in perceived stress scores, $\Delta R^2 = .00$, $\Delta F(1, 153) = .00$, $p = .49$, $b = -.85$, $t(152) = -.47$, $p = .64$. Thus, friendship network density was not a significant moderator of the association between conflict network size and perceived stress.

Social Support as a Moderator of Conflict Network Size – Perceived Stress Association

To test the hypothesis of whether social support and friendship network density moderate the relationship between conflict network size and average cortisol levels, a hierarchical multiple regression analysis was conducted. In the first step, two variables were included: conflict network size and social support. These variables accounted for a significant amount of variance in perceived stress scores, $R^2 = .217$, $F(2, 169) = 23.36$, $p < .001$. To avoid potentially problematic high multicollinearity with the interaction term, the variables were centered and an interaction term between conflict network size and social support was created. Next, the interaction term between conflict network size and social support was added to the regression model, which did not account for a significant proportion of the variance in perceived stress scores, $\Delta R^2 = .218$, $\Delta F(1, 168) = .321$, $p < .001$, $b = .058$, $t(167) = 2.83$, $p = .59$. Thus, social support was not a significant moderator of the association between conflict network size and perceived stress.

Moderated Mediation Models

Friendship Network Density as a Moderator of Conflict - (Co)Rumination - Cortisol Paths of Mediation Model

Analyses were conducted to explore the extent to which social support and friendship network density moderated the mediational impact of rumination and co-rumination on stress (perceived and cortisol) through conflict network size. To test moderated mediation for model 4.1a PROCESS “Model 58” was analyzed with conflict network size entered as the independent variable and average cortisol (stress) as the

outcome variable. Gender, dietary intake in last 24 hours (fresh food, caffeine, alcohol, and dairy), and hormonal contraceptive usage were entered as covariates.

The first model assesses the moderator at the combined first stage and second stage of the indirect paths. First, rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The indirect effects at -1SD of friendship network density was not significant (95% CI[-.0065, .0048]). At the mean of friendship network density was not significant (95% CI[-.0007, .0061]). At +1SD of friendship network density was not significant (95% CI[-.0159, .0085]).

Second, co-rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The indirect effects at -1SD of friendship network density was not significant (95% CI[-.0041, .0047]). At the mean of friendship network density was not significant (95% CI[-.0015, .0042]). At +1SD of friendship network density was not significant (95% CI[-.0035, .0079]).

Social Support as a Moderator of Conflict - (Co)Rumination – Cortisol Paths of Mediation Model

This model assesses the moderator at both the combined first stage and second stage of the indirect paths. First, rumination was entered as the mediator (M) variable and social was entered as the moderator (W) variable. The indirect effects at -1SD of social support was not significant (95% CI[-.0019, .0056]). At the mean of social support was not significant (95% CI[-.0002, .0050]). At +1SD of social support was not significant (95% CI[-.0029, .0072]).

Second, co-rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The indirect effects at -1SD of social support was not significant (95% CI[-.0021, .0040]). At the mean of social support was not significant (95% CI[-.0015, .0043]). At +1SD of social support was not significant (95% CI[-.0030, .0072]).

Friendship Network Density as a Moderator of Conflict - (Co)Rumination – Perceived Stress Paths of Mediation Model

The model assesses the moderator at the combined first stage and second stage of the indirect paths. First, rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The indirect effects at -1SD of friendship network density was not significant (95% CI[-.1833, .2170]). At the mean of friendship network density was significant (95% CI[.0800, .5737]). At +1SD of friendship network density was significant (95% CI[.2484, 1.5589]). This model provided a good fit to the data ($F(5, 148) = 5.69, p = .001$). A R^2 of .1612 suggests that the model explains 16.812% of variance in the outcome of perceived stress. The determination of the stage of the significant moderation effect will be explored further in Models 7 and 14, which are presented below.

Second, co-rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The indirect effects at -1SD of friendship network density was not significant (95% CI[-.1275, .3940]). At the mean of friendship network density was not significant (95% CI[-.1036, .1923]). At +1SD of friendship network density was not significant (95% CI[-.2630, .1791]).

Social Support as a Moderator of Conflict - (Co)Rumination – Perceived Stress Paths of Mediation Model

This model assesses the moderator at both the combined first stage and second stage of the indirect paths. First, rumination was entered as the mediator (M) variable and social was entered as the moderator (W) variable. The indirect effects at -1SD of social support was not significant (95%CI[-.2974, .5070]). At the mean of social support was significant (95%CI[.0157, .4188]). At +1SD of social support was not significant (95%CI[-.0457, .5062]).

Second, co-rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The indirect effects at -1SD of social support was not significant (95%CI[-.0979, .3234]). At the mean of social support was not significant (95%CI[-.0691, .2132]). At +1SD of social support was not significant (95%CI[-.1434, .2255]).

Friendship Network Density as a Moderator of Conflict - (Co)Rumination Path of Mediation Model for Cortisol as the Outcome

Analyses were conducted to assess the extent to which social support and friendship network density moderated the mediational impact of rumination and co-rumination on stress (perceived and cortisol) through conflict network size. To test moderated mediation for model 4.1a (figure 3), PROCESS “Model 7” was analyzed with conflict network size entered as the independent variable and average cortisol (stress) as the outcome variable. Gender, dietary intake in last 24 hours (fresh food, caffeine, alcohol, and dairy), and hormonal contraceptive usage were entered as covariates.

First, rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0035, .0296]. Thus, the extent to which rumination accounted for the link between conflict network size and average cortisol was not conditional on friendship network density in the first stage of the model.

Second, co-rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0121, .0084]. Thus, the extent to which co-rumination accounted for the link between conflict network size and average cortisol was not conditional on friendship network density in the first stage of the model.

Social Support as a Moderator of Conflict - (Co)Rumination Path of Mediation Model for Cortisol as the Outcome

First, rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0086, .0166]. Thus, the extent to which rumination accounted for the link between conflict network size and average cortisol was not conditional on social support.

Second, co-rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0084, .0165]. Thus, the extent to

which co-rumination accounted for the link between conflict network size and average cortisol was not conditional on social support.

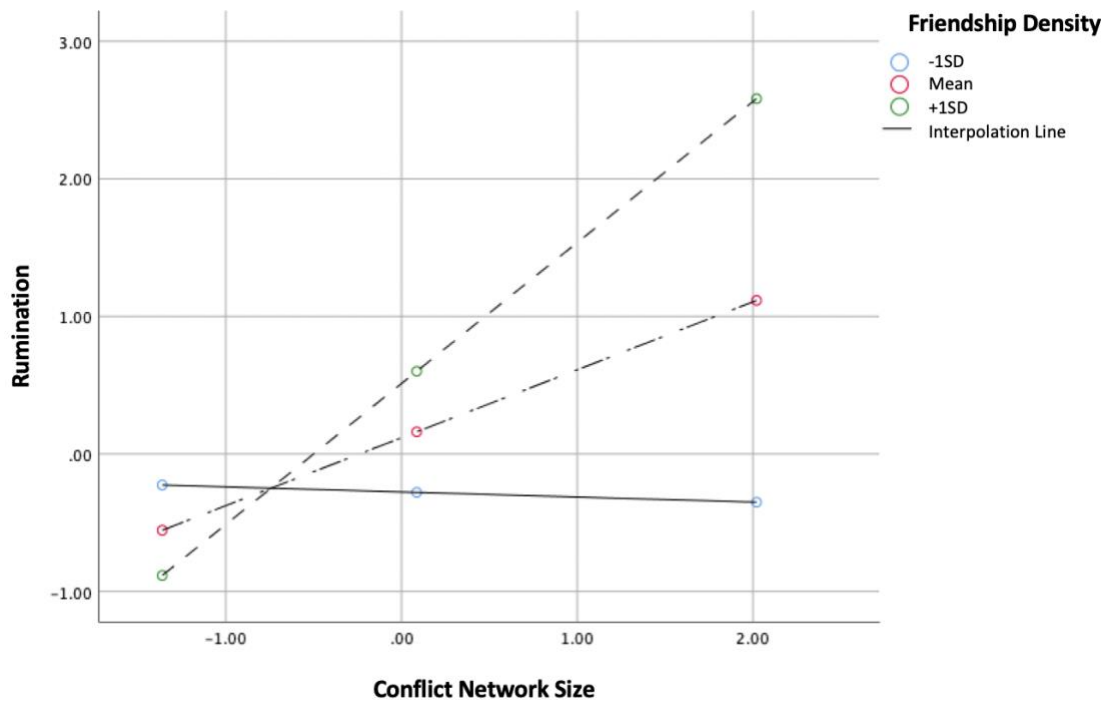
Friendship Network Density as a Moderator of Conflict- (Co)Rumination Path of Mediation Model for Perceived Stress as the Outcome

Similar analyses were conducted to test moderated mediation for model 4.1a (figure 3), PROCESS “Model 7” with conflict network size entered as the independent variable and perceived stress as the outcome variable. Gender was entered as a covariate.

First, rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The bootstrapped estimates revealed a significant moderated indirect effect, 95% CI [.3149, 2.638]. Thus, the extent to which rumination accounted for the link between conflict network size and perceived stress was conditional on friendship network density in the first stage of the model. This model provided a good fit to the data ($F(3, 150) = 7.86, p < .001$). A R^2 of .3685 suggests that the model explains 36.85% of variance in the outcome of perceived stress.

At -1SD on friendship network density, the effect was positive and not significant ($b = .037, se = .23, p = .87$). At the mean of friendship network density, the effect of conflict network size was positive and significant ($b = .494, se = .15, p = .001$). At +1SD of friendship network density, conflict network was a significant positive predictor ($b = 1.025, se = .29, p < .001$).

Table 2: Association between Rumination and Conflict Network Density for Levels of Friendship Network Density



Second, co-rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated indirect effect, 95% CI [-.5009, .3469]. Thus, the extent to which co-rumination accounted for the link between conflict network size and perceived stress was not conditional on friendship network density in the first stage of the model.

Social Support as a Moderator of Conflict - (Co)Rumination Path of Mediational Model for Perceived Stress as the Outcome

Similar analyses to test moderated mediation was conducted using PROCESS “Model 7” (figure 3) First, rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0360, .1577]. Thus, the extent to which rumination accounted for the link between conflict network size and perceived stress was not conditional on social support.

Second, co-rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0173, .0283]. Thus, the extent to which co-rumination accounted for the link between conflict network size and perceived stress was not conditional on social support.

Friendship Network Density as Moderator of (Co)Rumination-Cortisol Path of Mediation Model

Similar analyses to test moderated mediation was conducted using PROCESS “Model 14” (figure 4). First, rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0338, .0013]. Thus, the extent to which rumination accounted for the link between conflict network size and average cortisol was not conditional on friendship network density in the second stage of the model.

Second, co-rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The bootstrapped estimates

revealed a non-significant moderated mediation effect, 95% CI [-.0089, .0157]. Thus, the extent to which co-rumination accounted for the link between conflict network size and average cortisol was not conditional on friendship network density in the second stage of the model.

Social Support as a Moderator of (Co)Rumination-Cortisol Path of Mediation Model

Similar analyses to test moderated mediation was conducted using PROCESS “Model 14” (figure 4) First, rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0013, .0004]. Thus, the extent to which rumination accounted for the link between conflict network size and average cortisol was not conditional on social support.

Second, co-rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0008, .0012]. Thus, the extent to which co-rumination accounted for the link between conflict network size and average cortisol was not conditional on social support.

Friendship Network Density as a Moderator of (Co)Rumination-Perceived Stress Path of Mediation Model

Similar analyses to test moderated mediation was conducted using PROCESS “Model 14” (figure 4) First, rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.2283, .1.023].

Thus, the extent to which rumination accounted for the link between conflict network size and perceived stress was not conditional on friendship network density in the second stage of the model.

Second, co-rumination was entered as the mediator (M) variable and friendship network density was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.8460, .3182]. Thus, the extent to which co-rumination accounted for the link between conflict network size and perceived stress was not conditional on friendship network density in the second stage of the model.

Social Support as a Moderator of (Co)Rumination-Perceived Stress Path of Mediation Model

Similar analyses to test moderated mediation was conducted using PROCESS “Model 14” (figure 4) First, rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0875, .0044]. Thus, the extent to which rumination accounted for the link between conflict network size and perceived stress was not conditional on social support.

Second, co-rumination was entered as the mediator (M) variable and social support was entered as the moderator (W) variable. The bootstrapped estimates revealed a non-significant moderated mediation effect, 95% CI [-.0637, .0333]. Thus, the extent to which co-rumination accounted for the link between conflict network size and perceived stress was not conditional on social support.

CHAPTER FOUR

Discussion

The current study sought to explore the way that rumination, co-rumination, friendship network density, and social support help explain the relationships between conflict network size and levels of hormonal and perceived stress. Nearly all theoretic models and prior research have identified rumination as a harmful emotion regulation strategy resulting in negative outcomes, such as increased levels of perceived and physiological stress (Brosschot et al., 2006; Rose, 2012), depressive symptoms (Rose et al., 2007), and declines in physical health (Thomsen et al., 2004). Additionally, previous literature surrounding the impacts of social relationships and support suggest a protective, or buffering, effect resulting in reduced levels of stress (Hostinar & Gunnar, 2013). The present study advances research by jointly evaluating the role of emotion regulation and social buffering in explaining and qualifying the associations between conflict network size and perceived and physical stress. Therefore, the predictions of this study were that (1) rumination and co-rumination would act as mechanisms linking peer conflict to stress; (2) social support and friendship would moderate the relationship between peer conflict and stress levels, and (3) together social support would moderate the mediated relationship between rumination/co-rumination, peer conflict, and stress. Examining

these processes is especially relevant in a sample of collegiate marching band students grouped together in an intensive, high-stress environment.

An important contribution of this study was its reliance on multisystemic measurement of stress response including a self-reported measure of perceived stress (Cohen, Kamarck, & Mermelstein, 1983), and activation of HPA axis as indexed by its end product cortisol. Cortisol can provide a suitable way to measure the global stress response to these incidences as it can measure a response within the body that may not be reflected with typical self-report questionnaires by themselves (Taylor, 2012). This is especially true for stress that occurs in a naturalistic setting outside of the laboratory. Cortisol can provide insight into the physiological response to global amount of emotional stressors and conflict that occur in daily life without having to worry about the accuracy of participant reporting. Cortisol and the HPA axis are particularly sensitive to social stressors like conflict (Dickerson & Kemeny, 2004). By measuring that response through both global hormonal biomarkers and self-reported measurement of perceived stress, there is an increased likelihood of disentangling a relationship between a perceived psychological stress response to a minor conflict and a more major conflict that can have an impact both biologically and psychologically. Feeling hurt by others in close relationships is more likely to result in a lasting response than by an unfamiliar stranger (Miller & Roloff, 2014), which is why it is important to understand this distinction and how it may have a greater influence on the stress response.

Emotion Regulation as a Mechanism Linking Peer Conflict to Stress

There are many different types of emotion regulation strategies employed to cope with negative situations and social encounters (Naragon-Gainey et al., 2017). Two strategies explored in this study were rumination and co-rumination, which have the adverse effect of potentially increasing and prolonging the initial stress response (Du et al., 2018). Rumination is the over-engagement in negative thinking about events or interactions that have been experienced, such as social conflict (Brosschot et al., 2006). Due to the link between rumination and increased stress, rumination was examined as a potential mediator explaining the association between conflict network size and stress. Even though there was no direct association between conflict network size and perceived stress, rumination was found to be an indirect mechanism linking conflict network size and perceived stress scores. This finding is consistent with Du, Huang, An, and Xu (2018) finding that rumination acts as a potential mediator that increases stress and other negative emotions.

Similarly, co-rumination is related to rumination except it involves excess disclosure of those negative events or interactions with another person (Rose, 2002). Co-rumination has not been examined as a link explaining the relationship between conflict network size and stress in the past research. This was true for both associations with perceived stress scores and levels of cortisol. The findings suggest that ruminating alone, and not co-ruminating with others, is playing a role as a possible link explaining the relationship between conflict network size and perceived stress levels. This finding does not support the previously theorized notion that co-rumination can act as a possible relation explaining increases in stress and anxiety levels (Byrd-Craven et al., 2010). The

reason for the null results with co-rumination could potentially be attributed its possible benefits on friendship quality and increased feelings of intimacy. Previous findings by Rose and colleagues (2007) demonstrated that those who indicated engagement with co-rumination also reported increased feelings of intimacy toward the friend or individual they were co-ruminating with. The feelings of intimacy associated with co-rumination could be lessening the impact of the stressor hormonally and psychologically.

In addition, there was an indirect effect of rumination for the relationship with perceived stress, but not with levels of cortisol. In fact, none of the hypothesized associations were documented for cortisol. Such conflicting results surrounding self-reported and hormonal measures of stress appear to be consistent with previous research on psychological and physiological stress (Taylor, 2012). The findings suggest that that self-report measures of perceived stress and hormonal measures of cortisol may differ in their sensitivity to past stressful events given different timescales on which they are measured (Taylor, 2012). In this case, cortisol levels were not as sensitive to previous stressors as the perceived stress scores were.

Perceived stress is a more subjective measure of psychological distress that could be more sensitive to minor stressors that are not activating the HPA axis. Additionally, the Perceived Stress Scale is a measurement that captures stress within the past 30 days, which is a potentially longer timeframe than cortisol levels. Due to this time disparity, the body may have had a physiological response closer to time of the stressful event or encounter that is not being captured at the time of measurement. The self-reported questionnaire allowed for the reporting of stress that may have occurred in the past

regardless of current salience. Furthermore, the sample consists of members of a collegiate marching band where there are frequent rehearsals and competitions. It is possible that repeated exposure to an initially stressful situation could lead to a rapid habituation effect or avoidance of that stressor. Habituation and avoidance of stressors have the potential to reduce the potential for HPA axis activation where the distress was not able to be measured hormonally through cortisol levels (Kirschbaum et al., 1995, Gerra et al., 2001). However, the stress may still be measured psychologically through a broader measure such as the Perceived Stress Scale

Further explanation for the different findings related to the hormonal and perceived measurements of stress is the growing literature demonstrating that cortisol responses to competition and conflict need to be considered in conjunction with testosterone levels. The literature suggests that in order to gain a full understanding of the measurement and impacts of cortisol and stress levels, there needs to be a dual-hormone approach where both cortisol and testosterone are measured (Terburg, Morgan, van Honk, 2009; Zilioli & Watson, 2012). The hypothalamus-pituitary gonadal (HPG) axis, which releases testosterone, and the HPA axis are both co-regulated by the other (Zilioli, Ponzi, Henry, & Maestriperi, 2015). As a result, testosterone has the ability to inhibit cortisol release, while cortisol has the ability to inhibit testosterone release. The regulatory impacts of the HPG and HPA axes demonstrate the interconnectedness of the two hormones and the potential need for integrating a dual-hormone approach in future research on conflict and stress response.

Social Buffering in Peer Conflict Effects on Stress

Contrary to our hypotheses, both social support and friendship network density did not act as a buffer against levels of stress. These findings were consistent for both measures of stress, perceived stress and cortisol levels. The results do not replicate Schwartz and colleagues' (2000) findings that peer friendships can act as a source of social support that serves as a buffer against stress and negative emotions. Furthermore, the present results are contrary to findings by Eisenberger and colleagues (2007) who reported that levels of high-quality friendships and social support showed diminished cortisol in the presence of a social stressor. It could also be the case that high quality, supportive friendships are not present at wave 1 during the marching band rehearsals and not able to properly diminish the negative impacts of conflict on stress. As this sample is taken from a collegiate marching band, there is the possibility that the supportive friendships formed within that structure are not of a high enough quality to greatly impact stress. However, future research may need to consider the source and quality of social support received from within and outside of the immediate context of a social organization.

Previous studies have found a link between friendship quality and social buffering against stressors (Birditt et al., 2012). Low-quality friendships have been found to only buffer against highly stressful events and encounters, which could be the case in this particular sample. Due to the more global measures of stress used in this study, we do not know details about the quality of friendships and only focus on being embedded in supportive friendship network structures or global assessment of social relationships. The

current study only examined the role of friendship and social support more generally and did not find a buffering effect.

Friendship Network Density as an Amplifier of Ruminative Mechanisms Linking Peer Conflict to Stress

The final prediction was that social support would moderate the indirect effect of rumination on conflict network size and levels of stress. The findings revealed that the extent to which rumination accounted for the link between conflict network size and perceived stress was conditional on levels of social support, which was operationalized as a global assessment of social support by the individual and friendship network density. Friendship network density was chosen because this metric describes being embedded in a highly interconnected network, a type of structure that is theorized to provide higher levels of social support (Walker et al., 2013). However, contrary to the expectations, the graph of moderated mediation (Table 2) revealed that friendship network density was not serving as a buffer but was actually increasing engagement with rumination. Specifically, individuals with higher and average levels of friendship network density saw an increased positive association between conflict network size and rumination underscoring that the structure of positive social ties may amplify the effects of negative social ties on rumination and perceived stress.

Results revealed that friendship network density did not serve the role of a social buffer, but in fact served to amplify the ruminative mechanisms linking peer conflict to stress. This was found to be true for the first stage of the model (Model 7) linking conflict network size and rumination, but not the second model (Model 14) between rumination

and perceived stress levels. The results found significant mean and +1SD slopes, which means that for those with higher and average levels of friendship network density, there was evidence of strengthening of ruminative mechanisms. This is an important novel finding and contribution of this study. Contrary to previous findings in the literature (Schwartz et al., 2000), it appears that higher and average friendship network density is playing a role in altering perceived stress when present before rumination. This indicates that the structure of positive relationships and associations are potentially strengthening the effects of negative social associations on rumination and perceived stress. So, having an average or higher density friendship network may be resulting in more instances of social conflict, which is then resulting in increased employment of rumination as an emotion regulation strategy. This contradicts literature by providing friendship density as a possible explanation as to what mechanisms are impacting the mediational role of rumination on perceived stress.

Despite the one significant model, the other models exploring co-rumination, social support, and cortisol did not show significant results. It is possible that social support and density of friendship networks do not consist of high-quality friendships that could potentially lessen the harmful impacts of rumination or co-rumination on cortisol and perceived stress. It seems to be that more density in friendship networks are resulting in increased instances of social conflict, which is amplifying engagement with rumination and, as a result, perceived stress response.

Limitations and Future Directions

This study has some limitations that should be addressed in future research. First, the generalizability should be approached in a cautious manner because this is a sample of collegiate marching band students from one university. Second, this was a cross-sectional study, therefore, limiting our ability to provide a test of a methodological mediation, which requires longitudinal data and temporary ordered predictor, mediator, and outcome. Nonetheless, the indirect effects shown in the statistical mediation highlighted the need for future longitudinal research in order to determine the methodological mediation effects of rumination on peer conflict and stress. Additionally, this study has examined the role of rumination/co-rumination as one set of potential mediators for the association between conflict and stress, however, this could be a complicated relationship with other emotion regulation strategies potentially playing a role. For example, multiple research studies have found associations between employment of self-blame, blaming others, and catastrophizing with increased depression, anxiety, and stress (Garnefski et al., 2001; Martin & Dahlen, 2005). Future research should examine these other facets of emotion regulation which could be interconnected with rumination and co-rumination.

Similarly, future research should examine the role of friendship quality when looking at social support as potential buffers of stress. Impacts of the quality of friendships was not included in the current study but have been demonstrated to play a potential role in the effectiveness of social support (Birditt et al., 2012).

Finally, the current study only examined cortisol as a single hormone. Future research should examine the dual-hormone connection between cortisol and testosterone.

As demonstrated by previous research, the co-regulatory impacts of testosterone on cortisol could play a role in cortisol release during times of stress (Terburg et al., 2009; Zilioli et al., 2015). This dual-hormone theory should be examined in further research seeking to gain an understanding of the role of cortisol as a part of responding to social conflict.

Conclusion

In conclusion, the goal of the current study was to explore the relationship between conflict and stress with the mediating and moderating roles of rumination/co-rumination, friendship network density, and social support. Rumination was found to be significant mediator explaining the link between conflict network size and perceived stress. Also, a significant moderated indirect effect revealed that the extent to which rumination accounted for the link between conflict network size and perceived stress was conditional on friendship network density. This was true for the first stage model where friendship network density is strengthening employment of ruminative mechanisms of emotion regulation. The results provide further insight into friendship density as it applies to mechanisms of rumination. In past literature, social support has been shown as a buffer protecting against stress, however the present findings reveal how the strengthening of ruminative mechanisms by friendship density results in increased stress. The findings provide further insight into the associations of friendship density and rumination on the relationship between peer conflict networks and levels of stress.

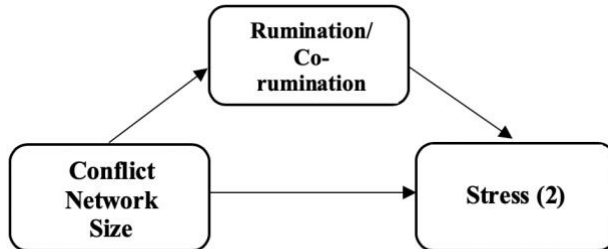
APPENDIX

To further explore the relationship between conflict network size and stress, I will use conditional process modeling as outlined by Hayes (2013) using the PROCESS macro in SPSS v. 24.

The first set of hypotheses is that rumination and co-rumination will act as mediators for the relationship between peer conflict and stress response (i.e., cortisol and perceived stress).

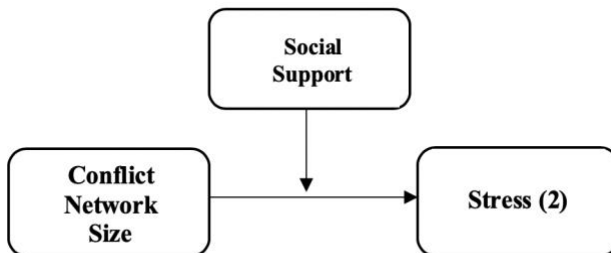
- a. In order for this mediation effect to be examined, mediational analysis in SPSS PROCESS macro (Hayes, 2013) will be performed. This estimation procedure involves simultaneous estimation of three regression paths and computation of bias-corrected bootstrapped standard errors.
- b. These mediational models (i.e., four in total) will be separately estimated for both the hormonal and perceived measures of stress and for both rumination and co-rumination.

Figure 1: Mediation



2. The second set of hypotheses examined will focus on examining whether social support and friendship network density will act as moderators for the relationship between conflict network size and stress response (hormonal and perceived).

Figure 2: Moderation



3. The third is to examine the role of social support and friendship density as moderators of the mediated path between conflict network size, rumination/co-rumination, and social support.

Figure 3: Moderated mediation Model 7 in PROCESS.

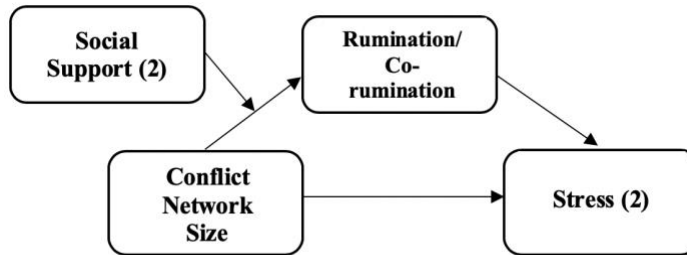
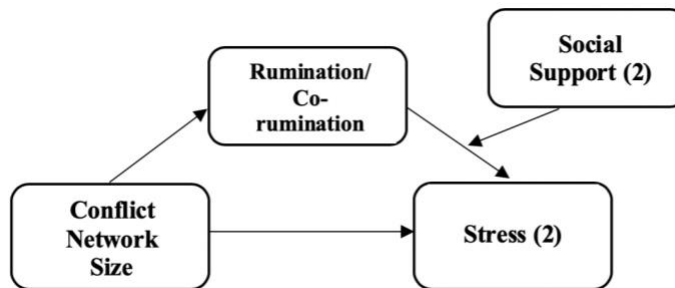


Figure 4: Moderated mediation Model 14 in PROCESS



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BIOGRAPHY

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