

THE RELATIONSHIP BETWEEN CORTISOL AND SOCIAL STRESS  
IN LATE ADOLESCENT GIRLS' FRIENDSHIPS

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The undersigned, appointed by the Dean of the Graduate School, have examined the dissertation entitled

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IN LATE ADOLESCENT GIRLS' FRIENDSHIPS

Presented by Jennifer Byrd-Craven

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## ABSTRACT

The potential mechanisms linking early experience and temperament to coping with common peer dynamics and the stress hormone cortisol were explored for young women in two studies. Girls and women typically use friendships, specifically dyadic self-disclosure, as one means to cope with social stressors. As with any coping mechanism, self disclosure can have a range of effectiveness, with extremes resulting in maladaptive coping and increased, rather than decreased stress responses. Interactions at the extreme end of dyadic self-disclosure are characterized by the construct co-rumination, which refers to repeatedly discussing and rehashing problems, speculating about the causes and consequences of the problems, focusing on negative affect, and mutual encouragement of problem discussion (Rose, 2002). In study 1, two hundred six college women completed a series of questionnaires on their friendship, temperament, and relationship with their father. In study 2, a sub-sample was randomly assigned to tasks that involve discussing a problem with their friend (problem-talk group) or performing a non-social task (control group). Study 1 results confirmed that temperament traits such as high sociability, negative affect, and attention to affective changes increase the likelihood of adopting a co-ruminative social style within friendships, but the relation with father variables was weak. Study 2 results indicated dyads whose conversations were characterized by co-rumination, particularly dwelling on negative affect, had higher cortisol levels after their conversations compared with dyads lower on these constructs and dyads in the control group. These results suggest some aspects of temperament may place some girls at risk for excess co-rumination and engagement in this level of co-rumination can lead to a short-term spike in cortisol levels. Finally, the majority of the

content of these conversations revolved around developmentally contingent issues such as male choice and same-sex friendships.

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## CHAPTER 1: INTRODUCTION

As a social species with an exceptionally long developmental period, it is not surprising that many of the neural and behavioral systems involved with complex social interactions undergo significant modification and elaboration over the course of development. One such system is the hypothalamic-pituitary-adrenal (HPA) axis, whose end product is the neurohormone, cortisol. Early in development, the social context is defined by parents and other kin. Parent-child conflict and evaluation of parental responsiveness or investment during this time influence responsiveness of the HPA system and may have long-term effects on how the system responds to later social conflict (Boyce & Ellis, 2005; Ellis et al, 2006; Flinn, 2006; Heuther, 1998; Liu, Diorio, Tannenbaum et al, 1997; Meaney, 2001).

Theoretically, the HPA system has evolved such that it is typically modified to respond to variation in specific evolutionarily expectant contexts, particularly in social contexts (Dickerson & Kimeny, 2004). Later in development, non-kin (e.g., friendships) serve as significant sources of social support and a potential context for further modification of the HPA axis. However, in comparison to studies of parent-child relationships, very few studies have examined the role of cortisol within the context of friendships, particularly in adolescence or early adulthood. Further, no studies have examined cortisol-friendship relations in the context of sex-typical social patterns. Proposed relationships between early context and traits, HPA activity, and social style are presented below (page 4).

The dynamics of friendships show moderate yet stable sex differences (Lever, 1978; Savin-Williams, 1979). I argue here that sex differences in social style and social

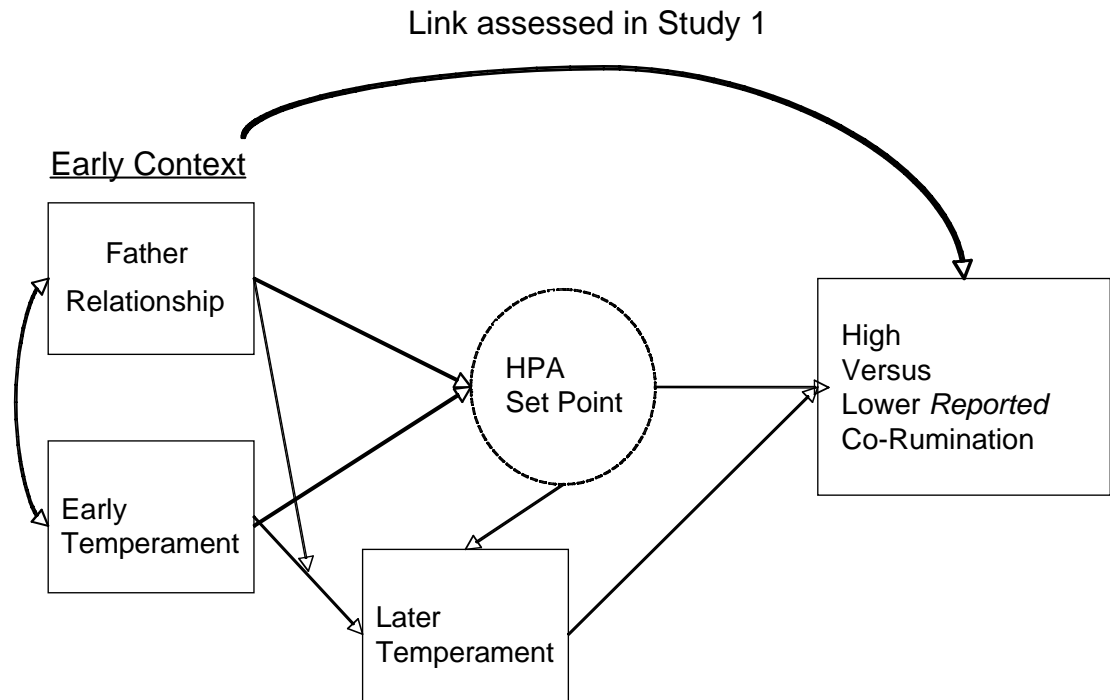
cognition lay the groundwork for sex-specific coping strategies in the context of peer relationships, also an evolutionary expectant context. These strategies, like many others and like parent-child relationships, have a range of effectiveness with extremes that may result in maladaptive responses and, perhaps, psychopathology.

The characteristics of adolescent girls' same-sex friendships and associated coping styles provide one avenue to assess the relation between these peer dynamics and cortisol secretion. This study explores potential mechanisms linking early experience (e.g., paternal relationship dynamics), temperament, friendship quality and coping (e.g., self-disclosure and co-rumination) to psychosocial adjustment and risk for psychopathology in late adolescence/early adulthood. Because cortisol has been shown to adaptively modify brain systems in response to social challenges (Heuther, 1996), it is predicted to play a key role in the focusing of attention to key aspects of these challenges and in adjusting neural and behavioral systems to cope with the challenges. If the HPA axis evolved to facilitate adjustment of cognitive and behavioral strategies for coping with common social dynamics, then central peer-related challenges in adolescents and young adults should include competition for potential mates (intrasexual competition) and the dynamics of choosing a mate (intersexual choice).

I give an overview of the cognitive and neural effects of cortisol and its role in coping with psychosocial stressors in the first section. In the second section, I discuss the mechanisms by which early social dynamics are thought to influence stress reactivity, including the influence of early parent-child interactions, temperament, and how these factors affect stress response, both physiological and behavioral, in peer groups. Next, I discuss the relation between early modifications to the HPA system and the development

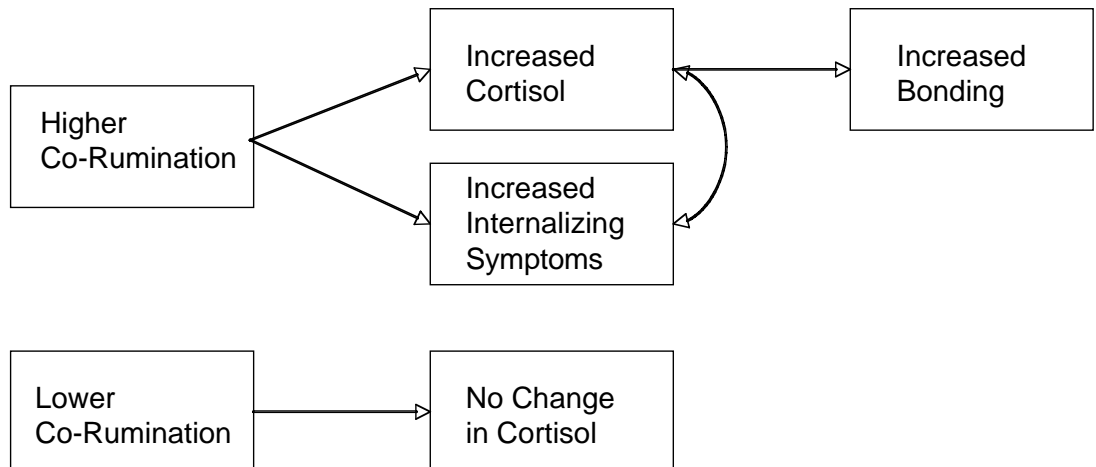
of psychopathologies, specifically, internalizing disorders. I then discuss social development and sex differences in peer relationships in the fourth section. In the final section, I discuss how peer groups can provide both the context of psychosocial stress (e.g., competition for mates) and the avenue by which to cope with these challenges (e.g., social support) and how they may be related to cortisol levels. Proposed models of how each of these factors is thought to influence stress reactivity and coping are shown below. Factors in an individual's early context, such as temperament and parental relationships (for girls, particularly with their fathers) influence the sensitivity or set-point of the Hypothalamic-Pituitary-Adrenal (HPA) Axis (not directly assessed in this study), which in turn, is thought to affect later temperamental traits and social style in peer relationships. Depending on which social style is adopted, cortisol and internalizing symptoms may decrease or show no change as a result of self-disclosure within friendships (normative self-disclosure), or increase as a result of a more maladaptive style of Co-rumination within friendships. Co-rumination is a construct that refers to excessively discussing and revisiting problems, speculating about the causes and consequences of the problem, focusing on negative affect, and mutual encouragement of problem discussion (Rose, 2002). The goal of the present study is to assess the links between early experiences, temperamental traits, social style, and cortisol levels.

## Study 1 Model



## Study 2 Model

### Observed Co-Rumination



## Cortisol

### *Cognitive Changes Associated with Cortisol.*

Glucocorticoids, cortisol in humans and corticosterone in rodents, are associated with a host of changes throughout the brain, both short-term and long-term (Rabin, 1999). Cortisol has multiple functions: to permit the HPA response, to stimulate or augment a stress response, to suppress an ongoing stress response, or to prepare for a subsequent stressor (Sapolsky, Romero, & Munck, 2000). In addition to structures in the HPA axis, the primary targets for glucocorticoids are the higher associative brain structures, particularly the prefrontal cortex (PFC), and structures associated with learning and memory, including the hippocampus (Bremner & Vermetten; Heim & Nemeroff, 1999; McEwen, 1998; Sapolsky et al, 2000). Glucocorticoid receptors in the PFC are primarily associated with terminating an ongoing stress response through a negative feedback loop, which returns cortisol levels to baseline (McEwen, 1998). Consequences of short-term cortisol secretion include focused attention and increased acquisition and retention of sensory cues, behavioral strategies, and other information related to the context (Heuther, 1996), increased vigilance and decreased sleep (Habib, Gold & Chrousos, 2001), impaired short-term memory performance (in areas unrelated to current context), and enhanced immune system functioning (McEwen, 1998).

Many researchers have noted damaging effects associated with *chronic* cortisol secretion, primarily associated with failure of the PFC to terminate HPA activity (Heim & Nemeroff, 1999; McEwen, 1998; Sapolsky et al, 2000). Long-term overexposure to cortisol results in reduction in the ability of the hippocampus to effectively form memory-related associations due to atrophy of dendrites of the pyramidal neurons in the

CA3 region (McEwen, 1998), and immune suppression (Sapolsky et al, 2000). During development, exposure to chronic cortisol secretion alters the sensitivity and activity of the HPA system and the targeted neural circuits directly involved in learning and memory, the ability to discriminate subtle variation in sensory information, and ultimately leads to degeneration of noradrenergic axons in the cerebral cortex (Heuther, 1996). These effects are thought to be responsible for the link between early stress and the later development of psychopathologies associated with these neural systems, such as depressive and anxiety disorders (Bremner & Vermetten, 2001; Habib, Gold & Chrousos, 2001; Sanchez, Lodd, & Plotsky, 2001).

However, chronic secretion of cortisol, while it has costs such as neural degeneration and immune suppression, may not be entirely maladaptive. Cortisol, when released in response to a controllable stressor, facilitates and stabilizes existing neural pathways (Heuther et al, 1999; McEwen, 1998). It is in response to *uncontrollable* stressors, as are characteristic of many social contexts, that HPA activity persists and can have neurodegenerative effects (Heuther et al, 1999). Heuther (1996) argues that if long-lasting activation of the HPA axis in response to uncontrollable stressors is entirely maladaptive, however, then selection pressures would have eliminated genotypes allowing for chronic activation of this system. He argues that cortisol functions to reorganize neural structures and increase specialization of the brain. In other words, cortisol appears to fine tune neural circuits to the nuances of the stress-eliciting context. Persistent activity by the HPA system in response to uncontrollable, rather than controllable stressors, and associated disruption of neural networks involved in previous responses to these stressors, suggests that prolonged HPA activity may function to disrupt

the use of ineffective cognitive and behavioral strategies, and through this, provide opportunities to construct potentially more effective strategies (Heuther, 1998; Heuther et al, 1999).

*The Role of Cortisol in Psychosocial Contexts.* The development of human stress response system, particularly the HPA system, is primarily suited to respond to psychosocial rather than physical stressors (e.g., predator avoidance) (Flinn, 2006; Heuther, 1998). Humans have constructed our environment in such a way that we are protected from many of the other types of stressors that are encountered by other species (e.g., predators), but this creates a context in which other people are the primary competitors for resource control or are the primary selective pressures from an evolutionary perspective (Alexander, 1989; Ellis et al, 2006; Flinn,2006; Geary, 2005; Heuther, 1996). It follows, then, that the release of glucocorticoids (e.g., cortisol) is delayed following a stressor and thus not immediately useful in predator avoidance (Sapolsky et al, 2000), but more useful in response to anticipated social stressors, particularly those involving social-evaluative threat (Dickerson & Kimeny, 2005), and those that are likely to recur (Flinn, 2006). This is because stressors involving other humans tend to be more prolonged and ambiguous than other types of stressors, and cortisol may function in these situations to prepare for a subsequent, similar stressor (Sapolsky et al, 2000). The ambiguous nature of the human social context limits the extent to which the stress response system can be canalized early in development, because social dynamics are fluid and never completely predictable (Flinn, 2006; Heuther, 1996).



These studies are consistent with the cost-benefit trade-offs common to evolved systems (Williams, 1957). Given there are costs (e.g., neurotoxic and immunosuppressive effects), the very presence of cortisol suggests that it serves a vital adaptive function. Neese and Young (2000) proposed cortisol is released under conditions of threats and opportunity, particularly in the social realm. However, I propose that cortisol is responsive to situations that involve opportunity for loss or gain, particularly of socially salient resources (e.g., social support). This framework is more parsimonious and helps to resolve conflicts in the literature that have shown that conditions of adversity fail to produce uniform effects in cortisol profiles (Ellis et al, 2006).

In other words, elevations in cortisol level are not always associated with negative affect, and can result from positive experiences that involve opportunity for *gaining* social resources or increasing social influence. For example, surgent children have high cortisol levels upon entering a new social group (Gunnar & Donzella, 2002), not because they are “stressed” per se, but because they see an opportunity for social engagement. This is consistent with Heuther’s (1996) assertion that cortisol functions to adaptively reorganize the brain by destabilizing existing ineffective neural pathways and facilitating the connection and stabilization of new ones (see also Heuther, 1998; Heuther et al, 1999). The high cortisol of surgent children may be part of a sequence of steps that result in the adjustment of neural networks and behavioral strategies in response to the new social context. These changes, in turn, may allow for better later control of social dynamics. Under this framework, cortisol can function to adaptively pattern behavior to the demands of the ever-changing social environment, and can be, therefore, ultimately

beneficial (Heuther, 1996). The mechanisms that mediate the relation between this neural and behavioral reorganization and cortisol include the dynamics of early social context (e.g., parent-child interactions), individual traits such as temperament, and later in development, peer relationships.

### *Predictors of Stress Reactivity*

*Early Social Context.* The HPA system, like many other neural systems, is exceptionally plastic during the course of development, presumably reflecting the need in our species' history to adjust this system to the demands of the unpredictable social climate (Alexander, 1989, Heuther, 1996). Plasticity will be advantageous when it is necessary to adjust to changes occurring within an individual's life span and not over generations (Geary, 2005). The largest source of this variation in many social species is social dynamics, as noted. Consistent with this perspective, early parent-offspring dynamics appear to calibrate the HPA system in a number of species, from rats to humans (Ellis et al, 2006; Hane & Fox, 2006; Hofer, 1994; Meaney, 2001). Infants and children react to relevant features of their social environment and adjust their cognitive and behavioral strategies accordingly (Belsky et al, 1991; Ellis et al, 1999, Moffit et al, 1992; Surbey, 1990). One such relevant feature is the predictability of maternal support.

Studies with both humans and nonhuman animals have shown that the quality of maternal care in the early postnatal period influences the development of the stress response system (Caldji, Tannenbaum, Sharma et al, 1998; Essex et al, 2002; Francis & Meaney, 1999; Liu et al, 1997; Lupien et al, 2000; Meaney, 2001). In rats, high quality maternal care typically consists of frequent nursing bouts and high-energy maternal behaviors such as arched-back, or kyphotic, nursing and extensive licking and grooming

of pups (Meaney, 2001; Moore & Power, 1992; Stern & Kerr, 2002). Offspring reared by mothers high on these behaviors show lower fearfulness in novel contexts in addition to increased glucocorticoid feedback sensitivity and reduced corticosterone response to acute stress (Liu et al, 1997). In humans, disruptions in maternal responsiveness and positive affect are linked with low quality maternal care and alterations in infant and child HPA reactivity (Essex et al, 2002; Lupien et al, 2000). In mammals with significant postpartum care, disruptions in the mother-infant relationship (e.g., maternal deprivation) often lead to a hyper-responsive (or in some cases hypo-responsive) HPA system, whereas high quality maternal care, on average, is associated with a stress response system that is more selective in its activation (Liu et al, 1997; Meaney, 2001; Suomi, 1997). Selective activation, in turn, reduces the costs of cortisol secretion.

In species with significant postpartum brain development, maternal behavior appears to serve as a cue to the demands of the ecological conditions she is experiencing (Cameron et al, 2005). In humans, children of depressed mothers have altered HPA responses to stressors (Essex et al, 2002; Lupein et al, 2000), demonstrating that maternal responsiveness results in rapid changes within the child's HPA system, which may serve to prepare this child for unpredictable and uncontrollable social dynamics.

Even in less severe cases, children react to their social environment and adjust the physiology of the HPA system, their behavior, and presumably their social cognitions (Ellis et al, 2006; Flinn, 2006), accordingly. Cortisol appears to play a key role in this behavioral and HPA adjustment to social context. In particular, the quality of family dynamics and associated stressors appear to influence social cognition (e.g., internal working models of social relationships) and later behavior. Children reared in

environments with unstable parental relationships, unpredictable or limited child investment, and insecure attachment to caregivers often show a constellation of traits and behaviors that indicate that these stressors resulted in some modification of behavioral and/or cognitive strategies relative to children who did not experience these stressors. The cognition of these children supports less trust in social relationships. These children are more likely to experience early menarche, engage in sexual activity at a younger age, have unstable pair bonds themselves, show limited investment in their own children, and have more children overall (Belsky et al, 1991; Byrd-Craven, Geary, Vigil, & Hoard, 2007; Moffit et al, 1992; Vigil, Geary & Byrd-Craven, 2006). Further, enduring familial stressors change the threshold for HPA activation, resulting in either hyper- or hypo-responsive neural pathways, which, in turn, may be associated with many of the behavioral changes listed above (e.g., unstable pair bonds) (Barr et al, 2004; Flinn, 2006; Flinn et al, 1996).

Paternal behaviors and other forms of investment, while much less studied, are an implicit part of the social context in which the child develops and thus, may have an influence on the development of HPA reactivity (Geary & Flinn, 2002). Warm father-daughter relationships are associated with delayed menarche and delayed sexual activity (Ellis et al, 1999), and with a tendency toward monogamy and high investment in children in adulthood (MacDonald, 1992). Father absence and associated factors (e.g., maternal stress) along with the presence of a step-father or maternal boyfriend, on the other hand, are associated with earlier menarche and an earlier onset of sexual behavior (Ellis et al, 1999; Ellis, 2004; Surbey, 1990). Thus, social dynamics in early to middle childhood may lay the groundwork for later behavior and perceptions of social

relationships, though some individuals may be more predisposed or genetically sensitive toward a high or low parental investment strategy (Figuerdo et al, 2006). As discussed below, experience with early social dynamics may also alter the nature of later peer relationships and methods coping within these relationships.

As noted, cortisol has a direct role in forming and modifying associated cognitive structures to better prepare the individual to cope with specific social dynamics (Heuther 1996, 1998). In theory, cortisol will be released, when, on average, this potentially costly destabilization and reorganization of cognitive structures and behavioral strategies might be advantageous. The cost-benefit trade off for false alarms (activating the HPA system when, in fact, there is no opportunity for loss or gain) or misses (failure to detect a threat or opportunity) will vary with predictability in the social context (Neese & Young, 2000). An increase in the probability of a false alarm will also result in a decrease in the probability of a miss, and this combination will be less costly in a risky and unpredictable social environment because the probability of threat and associated losses are much greater in these contexts. Similarly, the costs of a false alarm will be higher and the losses associated with missed opportunity will be lower in a less risky, relatively predictable context. Further, the stress response system is mediated, in part, by the *perception* of the situation (McEwen, 1998), which is in turn, influenced by individual characteristics such as temperament (Boyce & Ellis, 2005). These perceptions (e.g., social stimuli are overwhelming), along with early social adversity, may lead to a HPA system that over-reacts when exposed to subsequent uncontrollable or perceived uncontrollable psychosocial stressors (McEwen, 1998), such as peer interactions, discussed below.

*Temperament and Security of Attachment.* As noted, the HPA system and its threshold to respond to social stimuli are also influenced by child characteristics, such as temperament, and how those characteristics interact with parental behavior (i.e., attachment security) and early environmental demands (e.g., economic hardship). I discuss the relationships with temperament here, rather than personality, which is more typically measured later in childhood and early adulthood, for several reasons. First, much of the literature on traits that affect HPA system arousal, such as basic approach and avoidance tendencies, examine infants, toddlers, and very young children, making temperament rather than personality the most appropriate measure (Rothbart & Derryberry, 1981). In order to link the effects of these traits with cortisol, temperament is the closest measure to previous findings. Second, Rothbart and colleagues have noted considerable consistency between temperamental traits, and traits measured by personality assessments, such as the Big Five Personality Assessment in studies of adults. Specifically, Extraversion and Negative Affect (Neuroticism on the Big Five) are highly correlated ( $r = .59, .49$ , respectively). Although these scales don't overlap completely the purpose of this research is to uncover underlying individual differences in basic reactivity to the environment, and temperamental traits such as these have been reliably assessed in adults (Rothbart, Ahadi, & Evans, 2001).

Early adversity does not produce uniform effects, such as hyper-activation of the HPA system, across all individuals. The calibration and response sensitivity of this system (the phenotype) is heavily dependent on the genotype (Ellis et al, 2006). Children with extreme temperaments (e.g., behaviorally inhibited or surgent) seem to be biologically more sensitive to social context, and are thus more likely to be influenced by

features of their early rearing environment, be they secure and predictable or insecure and chaotic (Boyce & Ellis, 2005). In rhesus macaques (*Macaca mulatta*), for example, behaviorally inhibited individuals were disproportionately targeted for attacks under conditions of crowding stress, but had much lower incidents of injuries compared with their peers during low stress periods (Boyce, O'Neill-Wagner, Price, Haines & Suomi, 1998). In a related species, tufted capuchin monkeys (*Cebus apella*), individuals that were more apprehensive, fearful and submissive showed higher cortisol reactivity, higher baseline cortisol level, more solitary play and less social play than more aggressive, confident, curious, and opportunistic individuals (Byrne & Suomi, 2002). Similarly, in humans, children with more reactive temperaments and insecure attachments are more likely to have negative outcomes such as anxiety disorders later in childhood (Calkins & Fox, 1992), and have concurrent difficulty with peer relationships (Gunnar et al, 2003).

Further evidence suggests that both cortisol response and attachment style are partially dependent on temperament, and that each of these factors is related to children's coping behaviors. Behaviorally inhibited children--children very reluctant to approach novel situations--are more likely to have insecure attachments and to use inadequate social coping skills, whereas securely attached children are more likely to use social information as a primary aspect of their coping strategy (Gunnar, 1994). For example, when placed in unfamiliar or strange situations, insecurely-attached inhibited children are more likely to use distraction by engaging in solitary play with familiar toys and avoid social contact. Securely attached children, on the other hand, whatever their temperament, are more likely to use social referencing (e.g., looking to a caretaker for emotional cues) in unfamiliar or novel contexts (Nachmias, 1993). Further, behavioral

inhibition may be a way of reducing arousal and cortisol secretion (Gunnar, 1992). Children with difficult temperaments show greater cortisol reactivity *only* when the children are insecurely attached (Gunnar & Donzella, 2002). Thus, caregivers—from rodents to humans—appear to buffer HPA axis activity (Gunnar & Donzella, 2002; Lui et al, 1997; Meaney, 2001). Sensitive and responsive caregiving allows children to express and experience distress in ways that do not elicit unnecessary cortisol responses (Gunnar & Donzella, 2002). It is likely that the same traits later in development influence peer interactions and the use of peer relationships as sources of support.

#### *Early Modification of the HPA System and its Relationship to Psychopathology*

Early and permanent modifications to the HPA system stemming from both psychosocial factors (e.g., predictability of social support) and individual differences (e.g., temperament) may well serve to better prepare the child to deal with likely future psychosocial stressors. However, difficult or traumatic early experiences, even those at the extreme end of the normal range for our species (e.g., emotional deprivation or physical abuse) result in modifications to the HPA and associated systems that lead to extreme phenotypic expressions, or psychopathology (Sanchez et al, 2001). Early social stress combined with genetic predisposition is related to a myriad of problematic behaviors such as antisocial behavior (Jaffe, Caspi, Moffit & Taylor, 2004; Caspi, 2000), pathological fear response (Bremner & Vermetten, 2001; Yehuda, Halligan, & Grossman, 2001), and anxiety and affective disorders (Hiem & Nemeroff, 1999; Kagan et al, 1999; Meyer, Chrousos, & Gold, 2001).

Further, rumination, a hallmark of anxiety and affective disorders (Hankin & Abramson, 2001, Keenan & Shaw, 1997), is associated with altered cortisol levels (Essex



et al, 2002; Lupien et al, 2000). The combination of negative or unpredictable early experiences along with the neurochemical profiles correlated with psychopathology may influence how these individuals interpret social information, such as the probability of stable male-female relationships or social support (Belsky et al, 1991; Draper & Harpending 1988). These changes in social cognition, along with the associated behaviors, may well lead to interpreting events more negatively, perpetuating the cycle of negative emotionality (Hankin & Abramson, 2001).

Internalizing symptoms are not equally distributed in the population. They are more commonly reported in girls and women, while boys and men are more likely to develop externalizing disorders (Crick & Zahn-Waxler, 2003; Hankin & Abramson, 2001; Lewinsohn et al, 1997; Zahn-Waxler, 2000). A recent review of the literature suggested that females are more likely than males to develop PTSD, even after controlling for levels of likelihood of exposure to potentially traumatic events (Tolin & Foa, 2006). Further, the way that the sexes cope with stress differs in some interesting ways related to differences in social styles (discussed below). I will now turn to a discussion of the origin of these differences in both social styles and psychopathology and how it relates to coping methods within the context of peer relationships.

#### *Stress Reactivity in Peer Groups*

Differential activation of the HPA system is, not surprisingly, seen in the context of peer groups as well as adult-child interactions, though much less research has been done in this area. Most of the research in this area has focused on children's peer relationships, and there is very little research on adolescents and young adults, a time when peer groups are not only highly salient, but significant sources of both psychosocial

stress and support. The rise in cortisol levels over the course of the day in daycare settings coincides with the age that peer relationships become salient, that is, during the preschool years (Gunnar & Donzella, 2002).

The rise in cortisol over the school year is largest for less socially competent children (Davis et al, 1999), suggesting that they may perceive the social dynamics that occur in these contexts as uncontrollable for them. On the other hand, surgent children, who are exceptionally high on approach and low on fear, are more likely to show an initial rise in cortisol levels upon entering a new social group, and then show decrease and leveling off as the school year progresses (Davis et al, 1999). The pattern suggests two things: first, surgent children may see a new social group as an opportunity for gain and may be adaptively adjusting their behavioral strategies and presumably their cognitive structures (Heuther et al, 1999) to best take advantage of this opportunity. Second, these findings suggest that peer groups are salient social stressors, as indicated by the rise in cortisol levels in these contexts. Cortisol levels of surgent children decline because these children have adjusted to the new social group. The cortisol levels of inhibited children remain relatively high because they have not behaviorally or cognitively integrated into the group.

## Peers and Coping

### *Salience of Peers*

Because the literature on peer relationships in late adolescence and early adulthood is so limited, I focus here on the research that is available, that is, peer research in children and adolescents. I will attempt to extrapolate to older adolescents and young adults where literature in the area is lacking, as many of the underlying dynamics are

similar. Whereas the family climate appears to be the most salient factor in early childhood (see sections above), peers become increasingly important sources of social support and conflict as children move into middle childhood and adolescence. This is true for other primate species as well (Suomi, Harlow, & Domek, 1970; Suomi, Eisele, Grady & Harlow, 1975). Family relationships often serve as social references, but they often do not have completely overlapping interests in the realms of mate selection and social network development (Flinn, 1988), two imperative aspects of the social context that increase in importance with development, reaching their peak importance in late adolescence and early adulthood. Thus, age mates may be better sources of support for developmentally contingent concerns, while at the same time providing the social arena itself. In other words, peers can be supporters and/or adversaries and set the tone for the social context in which the child or adolescent is situated.

The importance of peers is reflected in general adjustment and group acceptance in middle childhood and adolescence. Children who are not well accepted by peers often report feelings of loneliness and social dissatisfaction, but the effects of loneliness are significantly reduced if a child has just one good friendship (Parker & Asher, 1993). Further, rejected children (e.g., few if any friends) who are temperamentally more inhibited have higher cortisol levels than their more accepted peers over the course of the school year (Gunnar et al, 2003). This suggests that these children may perceive the social context as potentially threatening. However, these children may never devise an effective coping strategy (in the absence of direct instruction) to perceived threats in these situations, resulting in chronic cortisol secretion.

*Sex differences in social styles and peer relationships.* Consistent sex differences in social styles have been found across history and cultures (Best & Williams, 1993; Geary, 1998; Maccoby, 1990; Whitting & Edwards, 1988). From an evolutionary perspective, differences in social styles between boys and girls and men and women have emerged in humans largely as a result of sexual selection. Sexual selection refers to members of the same species competing with others of the same sex (intrasexual competition) for reproductive resources, including access to mates, and to the processes involved in choosing mates (intersexual choice) (Darwin, 1871). It follows analogously the laws of natural selection in that those individuals who possess physical, cognitive, or behavioral traits that allow them to out compete other individuals of the same sex will be more likely to have more genetic representation in subsequent generations. The process of sexual selection is related to sex differences in hundreds of species (Andersson, 1994).

The dynamics of intrasexual competition and intersexual choice are influenced by the typical social structure of the species (e.g., group living, solidarity) and the variation around this norm from one breeding season to the next. In humans, sex differences in social dynamics are influenced by philopatry. Philopatry is the tendency of members of one sex to stay in the social group they are born into and members of the other sex to migrate into the group of their mate. Male-biased philopatry is present in humans and some of our closest relatives, chimpanzees (*Pan troglodytes*) and bonobos (*P. panicus*), suggesting this may have been a common and reoccurring pattern in our ancestors (Foley & Lee, 1989; Ghiglieri, 1987; Goodall, 1986). Although there is substantial variation across human groups, especially in the past few hundred years, there is considerable evidence that humans evolved in a context of male philopatry that favored the formation

of kin-based groups of men (Chagnon, 1988; Horwitz, 2001; Keeley, 1996; Murdock, 1981; Pasternak et al, 1997; Wrangham & Peterson, 1996).

With male philopatry, most women in our evolutionary history likely immigrated into male-based kin groups, and while their kin networks were likely geographically close, they typically did not spend their day-to-day interactions in adult life with close kin (Seilstad, 2000; Seilstad et al, 1998; Wells et al, 2001). Because women were more likely to have day-to-day interactions with non-kin or distantly related kin, Geary and colleagues proposed that their same-sex relationships were better characterized by reciprocal altruism than by kin relationships, excluding relationships with their children (Geary, 2002; Geary et al, 2003; Geary & Flinn, 2002); see Taylor, Klein, Lewis, Gruenwald, Gurung, and Updegraff (2000) for an alternative view. Reciprocal altruism refers to a tit-for-tat relationship dynamic in which a partner's behavior is reciprocated, whether it be cooperation or defection (Trivers, 1971). These relationships are more likely to emerge among non-kin, because they are not based on shared genetic interests (Hamilton, 1964), and can only be maintained if both partners receive equal benefit from the relationship.

If this hypothesis is correct, then girls and women are predicted to more closely monitor their relationships for equity, and become more distressed by disruptions within them in comparison to boys and men (Geary et al, 2003). Further, girls' and women's relationships should be less stable across time and more easily dissolved as a result of conflict. In fact, dominance hierarchies of early adolescent girls are more likely to fluctuate compared with those of boys (Savin-Williams, 1979). Early and middle adolescent girls, in comparison to same-age boys, are more likely to report current

friendships of shorter duration, more former friendships that had dissolved as a result of conflict, and were more distressed when imagining the potential termination of current friendships (Beneson & Christakos, 2003). The establishment of intimacy within girls' friendships typically involves frequent bouts of dyadic self-disclosure (Parker & Asher, 1993; Rose & Rudolph, 2006). The distress surrounding the termination or potential termination of a friendship reflects not only the loss of a potential source of social support, but fear of potential use of information gained through these interactions to disrupt social networks (e.g., relational aggression, discussed below).

Since males and females likely evolved in somewhat different social contexts, the nature of within sex (intrasexual) competition likely varied between the sexes (Geary, 1998). The source of this variation lies with the types of social resources that are salient. Female-female competition, in contrast to male-male competition, primarily centers around controlling social dynamics, and often, manipulating these dynamics in one's favor, including gaining access to a desired mate. Instead of physical aggression, females pursue a less physically risky and more covert means of competing for social resources, especially access to high status men willing to invest in children. One way in which they do this is through indirect disruption of the social network of competitors (Geary, 1998). This is achieved through using personal information, perhaps gained in the context of a friendship, to spread gossip and/or rumors that devalue the target's reputation as both a mate and friend or to exclude the girl or woman from a social group. This tactic, relational aggression, is a primary form of female-female competition (Geary et al, 2003), and is salient aspect of the female social environment (Crick & Zahn-Waxler, 2003). This is not to say that men do not engage in social/political manipulation, they do. The

point is that when women are aggressive, it is likely to be relational rather than physical. Social network, support and reputation have consequences for a woman's mating prospects (Buss, 1989), as well as available support for assistance with raising children (e.g., alloparenting) (Geary, 1998; 2002).

It is clear that just as parents and other kin serve as socializers early in development, peers are powerful sources of socialization, particularly as children move through childhood into adolescence and young adulthood (Harris, 1995). Child-initiated sex segregation beginning in the preschool years and continuing until adolescence is an important feature of peer context. Preferences for same-gender play are temporally stable and are associated with amplified gender differences in social style across the elementary school years (Maccoby, 1998; Martin & Fabes, 2001). These sex-segregated contexts allow children to practice and refine the social skills necessary for same-sex interactions and social influence in adulthood. Girls and boys routinely and intuitively employ different strategies with same-sex peers. Boys tend to influence other boys through physical power assertions, whereas girls employ verbal requests and less direct evaluative behavior (Charlesworth & Dzur, 1987; Lever, 1978; Savin-Williams, 1979). Although these divergent strategies are useful in same-sex contexts, they are often ineffective in influencing of behavior of the opposite sex (Martin & Fabes, 2001), which may contribute to continued segregation during childhood.

Boys' groups are typically larger than girls' groups and provide practice with forming dominance hierarchies (e.g., rough and tumble play) and coalitional competition (e.g., team sports). For girls, experience with female friendship groups, typically consisting of cliques broken up into dyads or triads, is the norm (Benenson et al, 1997;

Eder & Hallinan, 1978; Lever, 1978). These smaller groups may provide practice with relationships based on reciprocal altruism, wherein there is high monitoring of the give and take within the relationship—monitoring for strict tit-for-tat equality and thus, greater fragility of the relationship when this equity is not achieved (Geary, 2002; Geary et al, 2003).

### *Characteristics of Girls' Friendships*

The use of social networks as coping resources (discussed in detail below) suggests that characteristics of girls' same-sex friendships, function in part, to serve the purpose of coping (Taylor et al, 2002). In other words, girls' friendships are an integrated component of their strategies for coping with stress, relationship stress in particular. This is reflected in goals within their relationships, the types of activities girls prefer, and the size of their groups. These relationships build on social-cognitive and behavioral skills needed to manage same-sex relationships in adulthood.

Within their groups, girls have been found to be more concerned with mutual, rather than individual, goals (Strough & Berg, 2000), consistent with the hypothesis that there is an emphasis on reciprocation within relationships. Similarly, girls have more explicit relationship and maintenance goals (Rose & Asher, 1999), as would be expected for relationships based on equity and reciprocal altruism. Girls' friendships, compared with those of boys, are often characterized by higher validation and support, guidance, conflict resolution, and intimate exchange (Parker & Asher, 1993). Combined with the female-typical cognitive style of internalization of distress and focus on relationship concerns, these characteristics provide an avenue to discuss stressful events with a close



friend, and receive social support in the form of validation of emotions, even if these emotions are negative.

Further, girls also tend to engage in activities that support their social style (Lever, 1978) and allow for intimate self-disclosure (Parker & Asher, 1993; Zabatany et al, 2000). Activities such as jumping rope, playing hop-scotch, or riding bikes allow girls to avoid direct competition with their friends (e.g., everyone can win) while at the same time creating a context in which they can discuss social challenges or problems. Experience in same-sex play groups appears to elaborate on and flesh out this style of social interaction and coping style (Lever, 1978). Girls spend more time in dyadic activities and boys more time in group-level activity (Benenson et al, 1997; Lever, 1978, Savin-Williams, 1987), each elaborating on important aspects of social style and skill used in same-sex contexts.

As described earlier, girls' relationships are more dependent on strict reciprocity (Geary & Flinn, 2002), and they are more likely than boys to closely monitor reciprocation and equality in their relationships and become distressed when it is not attained (Geary, 2002). Time and effort invested in their friendships significantly reduces the number of such relationships (Geary et al, 2003). Not surprisingly, then, girls are more likely to form exclusive dyads beginning in early elementary school, and are less likely than boys to include a third person in their group (Eder & Hallinan, 1978). This may reflect the intense intimate self-disclosure characteristic of girls' friendships, and the potential vulnerability that it brings. In other words, disclosing to a third person is not only time costly, but emotionally and relationally risky in terms of the potential

information that could be later used in spreading gossip and/or rumors or to exclude a girl from a social group should the relationship dissolve.

Although boys and girls report similar exposure to relational aggression, girls view it as more harmful than boys do (Galen & Underwood, 1997). Girls are more distressed by relational aggression (Paquette & Underwood, 1999), suggesting that it is more salient and it has greater consequences for their social standing and support. A goal of relational aggression is often to convince others that the victim is in some way not trustworthy as a same-sex friend or not sexually chaste. Since many males value chastity in a potential mate (Buss, 1989), the consequences of well-executed relational aggression include reduced ability to maintain same-sex relationships and reduce attractiveness as a potential mate (Geary, 1998). In other words, relational aggression functions to gain control of social dynamics in self-serving ways, manipulating both same-sex and opposite-sex relationships of the victim.

The loss of a close friendship can, thus, have an important influence on social dynamics. Girls are more distressed than boys when imagining a potential break-up of their best friendship. This concern follows from the fact that although girls are heavily invested in their friendships, they are more likely than boys' to dissolve the relationship over a real or perceived slight or non-reciprocation (Benenson & Christakos, 2003), again consistent with a relationship based on reciprocal altruism.

*Sex differences in stressful events.* Given the sex differences in social style, it is not surprising that research has revealed sex differences in the types of events that are upsetting or stressful (Gore & Colten, 1991; Kendler et al, 2001). There are, of course, similarities as well. Both sexes should show a stress response to the loss of social

resources, or the potential for such a loss, particularly loss of social influence. Social status and influence are particularly salient because of their relation to intrasexual competition and intersexual choice, but the nature of this competition varies by sex (Geary, 1998). As discussed above, sex differences emerge in the *types* of competition that are salient (e.g., dominance or subtle disruption of competitors' relationships), and the ways in which males and females go about gaining and maintaining status within their same-sex groups.

Research with adults has shown that women report being more distressed by disruptions in their social network (e.g., a friend's distress), whereas men report being distressed by events such as the loss of a job, but do not report distress as a result of a friend's distress (Gore & Colten, 1991; Kendler et al, 2001). The same has been found for adolescents (Leadbetter et al, 1995). Women's distress as a result of disruptions in their social network has been called the cost of caring hypothesis (see Belle, 1991), or similarly, referred to as "tend and befriend" (Taylor et al, 2002). Taylor and colleagues argued that in response to stress, women tend (e.g., protect and care for offspring) and befriend (e.g., form and maintain a small network with other women), and this is in contrast to the "fight-or-flight" mechanisms thought to be more common in men. Tending and befriending mechanisms are proposed to be part of an evolved strategy of women to protect their offspring with relationships formed with a small group of other women, and have been reported to reduce stress. These assertions are consistent with the prediction that male philopatry (women leaving their natal group upon marriage) may have created a context for the evolution of social-cognitive sex differences, particularly the elaboration of mechanisms that support reciprocal altruism within women's

friendships (Geary, 1998, 2002; Geary & Flinn, 2001). Stress within the social network has consequences for the resources necessary to successfully raise children, and thereby can affect the wellbeing of their children (Geary, 1998). On the other hand, a stable, reciprocal relationship with another female can serve the mutual best interest of both parties and as well as provide an ally in conflicts and an important source of alloparenting, or sharing childcare responsibilities.

The predominance of male philopatry throughout much of human history provides a context for better understanding the female-typical cognitive style of elaborated individual-level modules, those involved in dyadic interactions, such as language fluency, theory of mind (ToM), skill at decoding non-verbal cues (e.g., facial expressions) and emotional intonation (Geary, 2002). Elaboration of these modules provides necessary skills for subtle monitoring of relationships and for manipulating these relationships. These skills allow for not only increased empathy and anticipation of a friend's needs, but detection of potential cues related to relational aggression or non-reciprocation. In theory, relationships within children's and adolescent's peer groups provide experience that can result in the modification and elaboration of these systems.

Men's social cognition, on the other hand, appears to be more elaborated in terms of group-level inferences and attributions (e.g., social ideologies) that enable them to quickly form a large and cohesive group when threatened by another coalition of men (Geary, 2002; see Geary et al, 2003 for full discussion). Thus, extensive development and monitoring of individual-level cues is not as important for men's relationships as it is for women's. Similarly, men are more likely to become distressed over a public loss or defeat that results in loss of status (Gore & Colten, 1991) or more general loss involving

indicators of cultural success (Irons, 1979). In contemporary Western society, this can take the form of economic failure (e.g., loss of a job), which results in reduced ability to compete with other males for status, and affects female choice or marriage prospects.

*Sex Differences in Coping Styles.* Sex differences in social cognition and the nature of salient stressors leads, not surprisingly, to sex differences in coping with stressors. Relatively little is known about the coping styles of men and boys, other than they are more likely to use distraction to cope with stressors rather than utilizing social support (Lewinsohn et al, 1997). Extensive seeking of social support could signal vulnerability, and thus opportunity for other boys or men to move ahead of them in the dominance hierarchy.

Girls and women, on the other hand, use their social network (i.e., friendships) as important resources for coping (Rose & Rudolph, 2006; Taylor et al, 2002). Given that women's friendships are characterized by reciprocal altruism, it takes more effort to maintain their network and to monitor for defection or lack of reciprocation, which limits the size of their networks. It is not surprising, then, that females are both more distressed about relationships and more likely to use them as coping resources. Within these interactions, girls and women are more likely to use emotional venting (Hastings et al, 1996), where expressing emotions and having those emotions validated (e.g., "I would be upset too!") is the goal, rather than finding a solution to the problem. Girls are also more aware of distress in others (Crick & Zahn-Waxler, 2003), and are more empathetic, at least within their friendships (Roberts & Strayer, 1996). This combination of awareness and empathy may create an avenue whereby they are more vulnerable to relationship distress. It is this greater ability for empathy combined with greater concern for

maintaining reciprocity (e.g., guilt) and stability, also more common in girls and women, that can lead to the internalization of distress, relationship stress in particular (Zahn-Waxler, 2000).

Another female-typical characteristic of coping with distress is rumination about both current and possible future events (Lewinsohn et al, 1997). Rumination, repeatedly mentally rehearsing an event or possible event, may be an extreme form of detailed monitoring of relationship dynamics and development and rehearsal of strategies for managing these relationships. This is functional to a degree, but can become excessive. Girls may be more vulnerable to this coping style in response to negative life events, which is associated with anxiety and depressive disorders. Negative cognitions and the resulting behaviors characteristic of these disorders are likely to result in additional negative events (e.g., inability to concentrate leading to a failing grade), which then could create a cycle of negative events and affect, perpetuating the disorder (Hankin & Abramson, 2001). It appears that factors that protect girls and women from externalizing disorders, such as empathy and verbal fluency, serve as risk factors for internalizing disorders (Keenan & Shaw, 1997). Again, the overall pattern reflects the cost-benefit trade offs found in many evolved traits.

#### Girls' Friendships: The Paradox

Girls' friendships are typically characterized by dyadic interactions, intimate self-disclosure, empathy, and high validation and support (Parker & Asher, 1993). These characteristics are often linked with positive friendship adjustment (Camerena et al, 1990; Rose, 2002). Close, high quality friendships can provide an avenue to explore and practice social skills, as well as serve as sounding boards against which social attributions

and inferences about other relationships are checked and possibly reformulated in the relatively safe context of a trusted confidant.

Although social support can buffer the effects of depression and anxiety, girls' friendship characteristics also provide a context in which they can extensively discuss and speculate about social challenges and focus on negative affect. This processes, called co-rumination, is linked with both high quality friendships and symptoms of internalizing disorders (Rose, 2002). Many girls' friendships, then, are a paradox in that they provide high quality social support, but the nature of this support can facilitate repeated focus on a problem and negative affect related to the problem, two key features of internalizing disorders (Hart & Thompson, 1997; Schwartz & Koenig, 1996).

Further, friendships can be assets or liabilities, depending on the identity of one's friends and the quality of that friendship (Hartup & Stevens, 1997). Like boys' friendships in which boys who engage in antisocial behavior select friends likely to do the same (Moffitt et al, 1992), girls' friendships may also be self-selecting with respect to the construct of co-rumination. If so, as with some boys' antisocial friendships, some girls may encourage each other to co-ruminate, increasing the overall frequency of extensive revisiting of a potentially unsolvable problem, which in turn increases negative affect. Combined with empathy and high investment in a friendship, co-rumination can lead to increased negative affect for the dyadic partner, even if she does not directly experience the problem or the direct effects of it (Rose, 2002).

The ability of social support to buffer negative affect and outcomes may be influenced by individual stress reactivity (Quas et al, 2004), and early experiences (Boyce & Ellis, 2005). In other words, for some individuals, moderate amounts of emotional

venting and validation received within the context of a high quality friendship may function to reduce overall negative affect. For other individuals, cortisol release associated with actual or perceived uncontrollable social challenges may focus attention on negative affect and possible future recurrences of the same issue, even if they are acting as a confidant and have not directly experienced the stressor.

Despite the relationship between co-rumination and internalizing symptoms, co-rumination in the context of a high quality friendship may be adaptive in that it functions to increase bonding within the friendship, which can result in an ally in the social arena. Because co-rumination has been shown to increase anxiety and depressive symptoms in friends (Rose, 2002), it is possible that it also increases cortisol levels as friends work toward the mutual goal of understanding this potentially threatening or socially disruptive situation. Further, as features of opportunity for loss or gain become salient to the friend as well, and cortisol levels may be related to the possibility of the situation happening directly to her, or threatening her self-interest in some way. For closely connected friends, a social loss to one may affect the social opportunities of the other, increasing the likelihood that friends will be invested in reducing real or potential social disruption. The combination of empathy and investment in the friendship creates an opportunity for mutual distress, and as a result, increased feelings of investment and bonding within the friendship.

As noted in the sections above, social challenges that are uncontrollable and contain some social-evaluative threat are especially likely to elicit a cortisol response (Dickerson & Kimney, 2004). The characteristics of girls' friendships combined with social cognitions that are geared toward interpreting subtle social cues (Geary, 2002;



Geary et al, 2003) results in the prediction that the content of co-rumination will revolve around issues of female-female competition (e.g., relational aggression) and male choice in adolescence and young adulthood, as well as female friendships as these are a resource. Since co-rumination usually occurs within the context of an intimate friendship, and as noted previously, peers may be the best sources of support for these developmentally contingent concerns. In this case, these concerns are learning about competing with same-sex rivals and navigating heterosexual relationships.

Co-rumination, then, may ultimately serve two functions. First, the validation and social support characteristic of these interactions provides a safe context in which social attributions can be corroborated, or possibly reformulated. Second, as mentioned above, time and energy invested in this process can serve to maintain a social ally by reinforcing the friendship bond. Given the potential importance of same-sex relationships (Geary, 1998), a social ally can be far more advantageous than “solving” the problem, particularly if the problem is ambiguous or the subtleties of social dynamics change rapidly. In light of these assertions, then, solving the problem, if it even has a definitive solution, is unlikely to be the most important goal, or at least not the only goal, for co-ruminating friendship pairs. Rather, understanding the problem together, validating social cognitions and emotions, and getting feedback regarding whether she is reading the situation correctly are likely the most prominent goals. In this case, relatively little time should be spent during these conversations discussing solutions compared with validation and focus on negative affect.

Since Rose’s (2002) newly pioneered research on co-rumination has focused on children and adolescents, it is unclear whether this coping style continues into young

adulthood. Based on predictions regarding the primary content of co-rumination (intrasexual competition and intersexual choice), co-rumination should be a coping style that is common throughout young adulthood, or as long as women have developmentally contingent concerns, in this case intrasexual competition and intersexual choice, and value a social ally in helping to navigate these issues of relationships.

### Current Study

The goal of the current study is to better understand the role of cortisol and the dyadic self-disclosure process in coping with psychosocial stressors. Since girls and women utilize their close relationships as sources of support, these interactions can be directly examined and cortisol collected during the coping process. These results may clarify the role of co-rumination in girls' friendships, and help explain the relative lack of co-rumination in boys' friendships (Rose, 2002). Further, the use of a college sample will provide insights into the typical topic areas of co-rumination in this age group, and is predicted to show that young adult females continue to utilize this method of social support and validation. These two issues may be even more salient in this population than in younger dyads, as college students are at reproductive age.

Specific predictions associated with the above assertions are as follows:

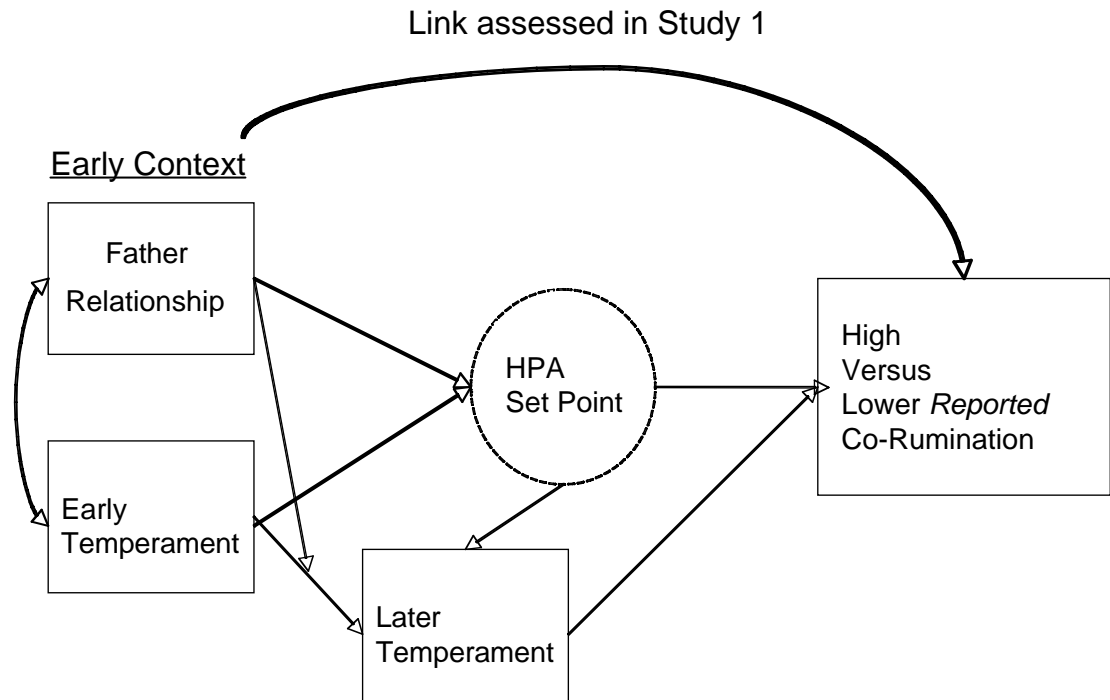
- 1) Young women reporting more unpredictable father-daughter relationships were expected to become more easily distressed by ambiguous social situations, and through this, be more likely to co-ruminate within their friendships.
- 2) Young women with more "reactive" temperaments were expected to be more likely to co-ruminate. Specifically, individuals with temperamental profiles

characterized by negative affect, approach, sensitivity to affective changes, and who are sociable were expected to be more likely to report co-ruminating with close friends than individuals lower on these characteristics.

- 3) The extent of co-rumination was expected to be associated with higher cortisol levels and reports of internalizing symptoms.
- 4) Cortisol levels were expected to be associated with reports of internalizing symptoms.
- 5) Higher co-rumination and cortisol was expected to be associated with in addition to higher feelings of investment or bonding within the friendship.
- 6) Individuals engaged in a cooperative, but non-social task should show no change in cortisol levels.
- 7) Co-ruminative conversations in this age group were expected to focus on topics of intrasexual competition (e.g., relational aggression), intersexual choice, and friendships.

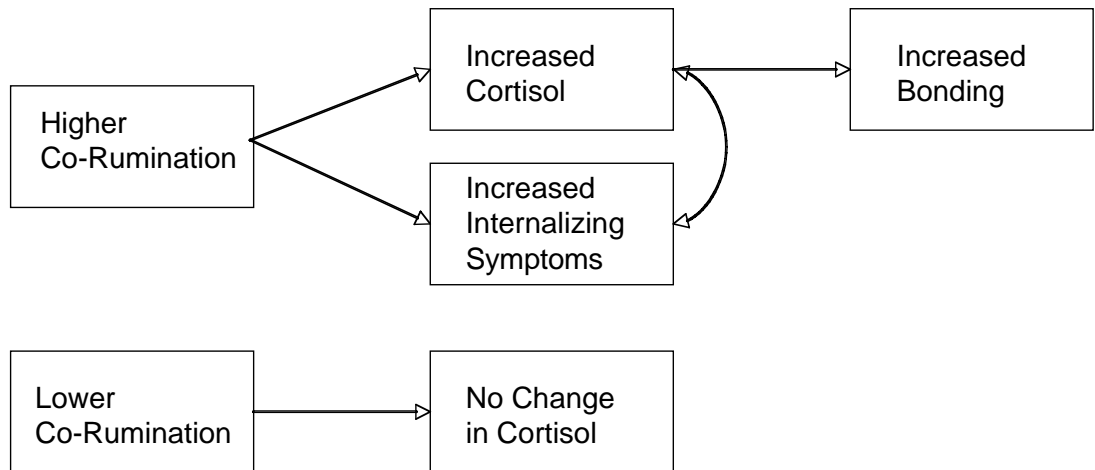
The relationships between the above-mentioned constructs are shown below. The nature and quality of the paternal relationship, in combination with early temperamental traits was hypothesized to affect the set-point of the HPA axis in response to psychosocial stressors (HPA set-point and early temperament were not directly assessed here), which in combination with later temperamental traits, also affected by the paternal relationship, was expected to affect social style in peer relationships (Study 1). Higher observed co-rumination was predicted to be associated with more internalizing symptoms and higher cortisol levels, which was expected to be associated with reports of increased friendship bonding (Study 2).

## Study 1 Model



## Study 2 Model

### Observed Co-Rumination



## CHAPTER 2: STUDY 1

The primary goals of Study 1 were to clarify the relationship between background variables, such as temperament and paternal relationship, and both normative self-disclosure processes and co-rumination. The paternal relationship was predicted to influence temperamental style, which in turn, was predicted to be associated with both co-rumination and self-disclosure within close friendships (see hypothesis 1, page 35). These results were used to guide selection of participants and to assign participants to experimental conditions in Study 2. Study 2 was designed to examine cortisol profiles between participants reporting and demonstrating (in the observational session) high normative self disclosure processes within their friendships and participants who are high in a more extreme form of self disclosure and ruminative style, co-rumination.

### Method

#### *Participants*

The 206 participants were recruited from the Psychology 1000 subject pool at the University of Missouri, Columbia; the potential participant pool was restricted to females. Participants completed a series of questionnaires in a session that lasted approximately 30 minutes; they received partial course credit for their participation.

#### *Measures and Procedure*

Participants completed questionnaires in a classroom with approximately 20 other students. Experimenters administered informed consent and then packets of questionnaires. Once the packets were distributed, the experimenter provided a brief set of instructions on to how to fill out the questionnaires (e.g., “circle the best answer; don’t think too much about your response”). The packets included the *Self-Disclosure*

*questionnaire* (modified from Parker & Asher, 1993; see Rose, 2002), the *Co-Rumination questionnaire* (Rose, 2002), demographic information (e.g., parent SES), the *Rothbart Adult Temperament Questionnaire-short version* (Rothbart et al, 2000), the *Six Dimensions of Parenting Questionnaire* (modified to assess the participant’s perspective on her relationship with her father); (Skinner et al, 2005). Internal reliabilities (e.g., Cronbach’s  $\alpha$ ) for all measures and those found in the current study are presented in Table 1.

Table 1  
*Internal validity of measures*

Measure	Cronbach’s $\alpha$	Source	Current Study
Beck Anxiety Inventory	.92	Beck et al (1988)	.83
Beck Depression Inventory-II	.94	Osman et al (2004)	.92
Co-Rumination Questionnaire	.96	Rose (2002)	.96
Network of Relationship Inventory	.80	Furman & Buhrmester (1985)	.93
Rothbart Adult Temperament Questionnaire—Short Version		Rothbart et al (2000)	
Negative Affect	.81		.78

(Table 1, cont.)

Effortful Control	.78	.68
Extraversion	.75	.72
Orienting Sensitivity	.85	.71
Six Dimensions of Parenting—father report		Skinner et al (2005)
Warmth	.70	.87
Rejection	.67	.70
Structure	.64*	.76
Chaos	.67	.54
Autonomy Support	.62*	.89
Coersion	.74	.82

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\*Unreliable items have been subsequently dropped from these scales. However, new internal reliability estimates are not yet available.

The *Self-Disclosure* questionnaire consists of 5 items rated on a 1-5 scale ranging from “not true at all” to “really true”. Items are designed to reflect normative self-disclosure processes within close or best friendships (e.g., “We are always telling each other about our problems.”). The *Co-Rumination* questionnaire contains 27 items, also rated on a 1-5 scale from “not true at all” to “really true.” Items include aspects of co-rumination such as mutual encouragement of discussing problems (e.g., “When my friend has a problem, I always try really hard to keep my friend talking about it”), rehashing the problem (“I always try to get my friend to tell me every detail about what happened”), speculating about the causes and consequences of problems (“we try to figure out every

one of the bad things that might happen because of the problem”), and focus on negative affect (“we talk a lot about how bad the person with the problem feels.”).

The *Rothbart Adult Temperament Questionnaire-Short Version* includes 77 items scored on a 1-7 scale ranging from “extremely untrue of you” to “extremely true of you.” It includes four general constructs or factor scales: Extraversion/Surgency, Negative Affect, Effortful Control, and Orienting Sensitivity. These general constructs are broken down into several sub-scales. Extraversion/Surgency includes Positive Affect (“Sometimes minor events cause me to feel intense happiness.”), Sociability, (“I usually like to spend my free time with people.”) and High Intensity Pleasure (“I would enjoy watching a laser show with lots of bright, colorful flashing lights.”). Negative Affect is comprised of Fear (“I become easily frightened.”), Frustration (“Whenever I have to sit and wait for something (e.g., a waiting room), I become agitated.”), Sadness (“Sometimes minor events cause me to feel intense sadness.”), and Discomfort (“Loud music is unpleasant to me.”). The Effortful Control subscale is made up of Inhibitory Control (“I can easily resist talking out of turn, even when I'm excited and want to express an idea.”), Activation Control (“I can make myself work on a difficult task even when I don't feel like trying.”), and Attentional Control (“When I am trying to focus my attention, I am easily distracted,” reverse scored). Finally, Orienting Sensitivity is comprised of Neutral Perceptual Sensitivity (“I usually notice visual details in the environment.”), Affective Perceptual Sensitivity (“I am often consciously aware of how the weather seems to affect my mood”, and Associative Sensitivity (“I don't have to think very hard to generate unique or creative ideas”).



The *Six Dimensions of Parenting Questionnaire* (modified for this study to reflect the participant’s relationship with her father) includes six major factors, and is scored on a 1 (Not at all true) to 4 (Very true) scale. Warmth (“My father and I do special things together.”), Structure (“My father’s expectations for me are clear.”), and Autonomy Support (“My father expects me to say what I really think.” are the three positive dimensions. Rejection (“Sometimes I feel like my father thinks I’m difficult to like”), Chaos (“My father changes the rules a lot at home.”, and Coercion (“I often get into power struggles with my father.” are the three negative dimensions.

Scores on the *Self-disclosure Questionnaire* and the *Co-Rumination Questionnaire* were used to select participants that varied along these continuums for the laboratory sessions in Study 2 (see Table 2). Responses from the *Six Dimensions of Parenting* questionnaire were used to predict temperamental profiles on the *Rothbart Adult Temperament-short version*, which was, in turn, used as predictors of levels of self-disclosure as measured with the *Self-Disclosure Questionnaire* and co-rumination as measured with the *Co-rumination Questionnaire*.

Table 2

*Means and Standard Deviations for Study 1 Questionnaires*

Variable	Range	Mean	Standard Deviation
Co-rumination	1.4-5.0	3.09	.75
Self-Disclosure	2.4-5.0	4.36	.58
Rothbart Adult Temperament Questionnaire			
Sadness	2.2-7.0	4.40	.98

(Table 2, cont.)

Discomfort	1.0-6.0	3.67	.98
Fear	1.6-6.1	3.88	.96
Frustration	1.5-6.8	4.20	1.02
Sociability	2.4-6.6	5.18	.79
Positive Affect	1.8-7.0	5.06	.97
High Intensity Pleasure	2.4-6.7	4.53	.83
Activation Control	1.9-6.9	4.62	.89
Affective Perceptual	1.4-7.0	4.57	1.08
Sensitivity			

Revised-Six Dimensions of Parenting (components of Negative  
Father)

Rejection	0-1.4	.54	.37
Chaos	0-1.3	.44	.32
Coercion	0-1.4	.58	.40

---

Before participating in this study, participants were asked whether they would be willing to participate in a follow-up laboratory study and whether they have a friend who would be willing and able to participate in the follow-up study; nearly all participants indicated they had friends willing to participate. They were informed that if they choose to participate in the follow-up study, they will either receive course credit if their participation occurs during the current semester, or that they will be paid if their participation occurs after the current semester in which they are enrolled in Psych 1000.

### Study 1 Results

Means, standard deviations, and ranges for all variables used in this analysis are presented in Table 2. Due to very low scores and low variability on the negative dimensions of the *Modified Six Dimensions of Parenting Questionnaire*, common log (base 10) scores were used for each of these variables to adjust for skewness in the distribution. The mean of the co-rumination and self-disclosure items were used as the indicators of each of these respective constructs. Further, the mean of the items comprising each of the temperament scales used as the indicators for each respective construct, per the scoring instructions. Table 3 presents the correlation matrix used in the initial analysis (Model 1). As expected, Co-rumination and Self-Disclosure were correlated ( $r = .35, p < .0001$ ).

Table 3

*Correlation Matrix for Model 1 (n = 206)*

	Co- Rumination	Self- Disclosure	Extraversion	Negative Affect	Affective Perceptual Sensitivity	Activation Control	Negative Father
Co- Rumination	1	<b>.35</b>	<b>.15</b>	<b>.14</b>	<b>.26</b>	<b>.14</b>	-.05
Self- Disclosure		1	<b>.17</b>	.01	.13	-.01	-.01
Extraversion			1	<b>-.35</b>	<b>-.14</b>	<b>.25</b>	<b>-.14</b>
Negative Affect				1	<b>.21</b>	<b>-.16</b>	<b>.15</b>
Affective Perceptual Sensitivity					1	.01	.06
Activation Control						1	<b>-.30</b>
Negative Father							1

Path analytic techniques were used to assess the potential contribution of paternal relationship and temperamental characteristics to level of self-disclosure and co-rumination. All of the data were of course obtained at the same time and thus causal relationships must be interpreted with caution. Even so, constructing and testing a theoretically plausible sequence of factors is possible. The initial variables included Self-Disclosure and Co-Rumination; Extraversion, Negative Affect, Affective Perceptual Sensitivity, and Activation Control (temperament scales), and a composite variable that consisted of the negative aspects of the paternal relationship (Chaos, Rejection and Coercion) to create a single Negative Father variable. All three of the negative aspects of the paternal relationship were hypothesized to influence stress response, and through this, influence temperament and coping style (Belsky et al, 1991; Boyce & Ellis, 2005;

Calkins & Fox, 1992; Caspi, 2000; Moffitt et al, 1992). Combining these variables into a single composite variable was thought to better capture the limited variability on these dimensions found in this sample.

All analyses were conducted using the SAS system's CALIS procedure, and were performed on the correlation matrix (Table 3) with Negative Father, Affective Perceptual Sensitivity, Negative Affect, and Extraversion as exogenous variables and Activation Control, Co-rumination, and Self-Disclosure as endogenous variables. The goodness-of-fit of the initial and subsequent models was evaluated by the goodness-of-fit index (GFI) and the normed-fit index (NFI; Bentler & Bonnet, 1980). Values greater than .90 are typically considered acceptable, indicating the model provides an acceptable representation of the covariation among the observed measures. Goodness-of-fit indices are presented in Table 4.

Table 4

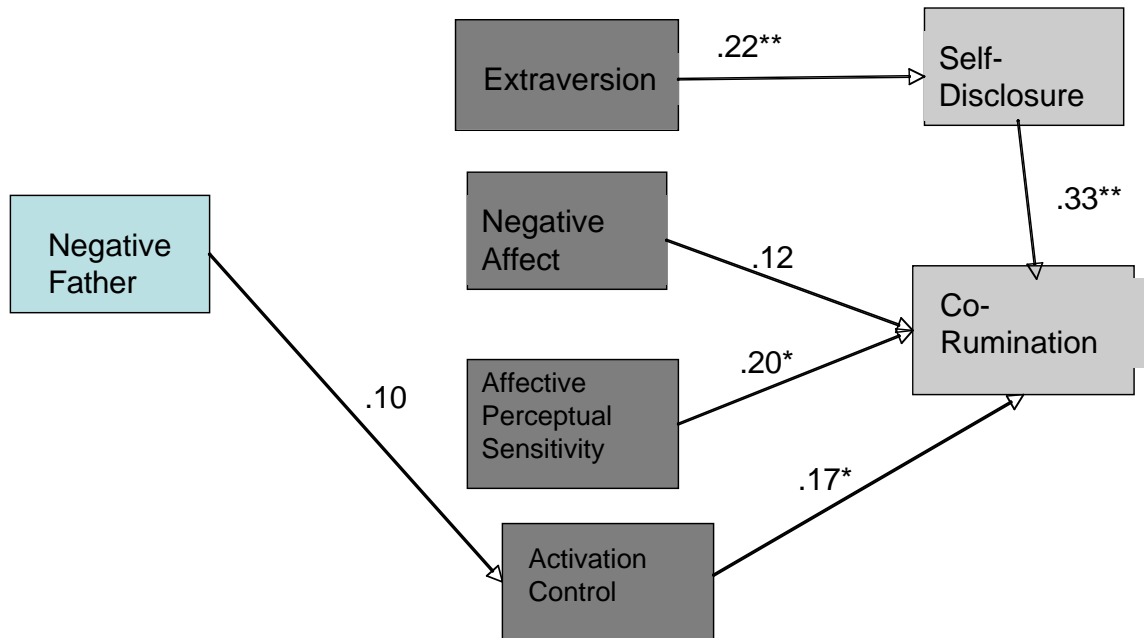
*Fit Indices*

	<i>df</i>	$\chi^2$	GFI	NFI
Model 1: Initial Model	15	17.28	.97	.84
Model 2: Replace Negative Affect with Sadness subscale; Add path between APS and Sadness	14	22.94	.96	.76
Model 3: Replace Extraversion with Sociability subscale	14	18.49	.98	.85
Model4: Drop Negative Father variable	9	4.31	.99	.90

For Model 1, paths were estimated from the exogenous to endogenous variables that were predicted based on theory or previous empirical research, but all possible paths were not estimated to avoid capitalizing on chance relations. These initial paths are shown in Figure 1. Estimation of this model resulted in an acceptable GFI (.97), but the NFI was low (.84). Examination of zero-order correlations revealed the Sadness subscale was more highly correlated with Co-Rumination than the other three subscales defining Negative Affect (others are Discomfort, Frustration, and Fear). As a result and to improve model fit, the Sadness subscale alone was used as the indicator of Negative Affect in Model 2. Further, a directed path between Affective Perceptual Sensitivity and Sadness was estimated based on the Lagrange multiplier test (Bentler, 1990). These modifications resulted in an acceptable GFI (.96), but the NFI remained low (.76).

Figure 1

Initial Model



Models 1 and 2 tested specific and restricted hypotheses, but did not result in overall satisfactory model fits. Further examination of the correlation matrix (see Table 5) and the residuals indicated that the fit of Model 2 could be improved by using the Sociability subscale of Extraversion rather than the entire scale (High Intensity Pleasure, Sociability, and Positive Affect). Further, for theoretical reasons, Sociability is more likely to be associated with self-disclosure than with the two other subscales—High Intensity Pleasure and Positive Affect—because the latter subscales do not necessitate social interaction per se. This modification (Model 3) resulted in an acceptable GFI (.98), and an improved but still unacceptable NFI (.85).

Figure 2

Model 2

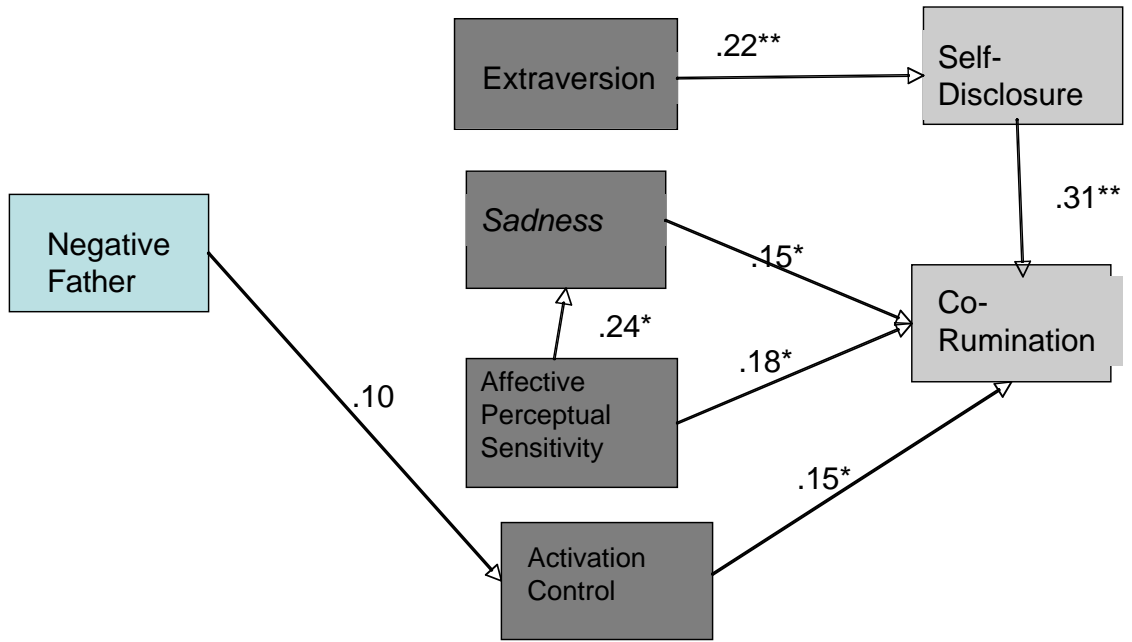




Figure 3

Model 3

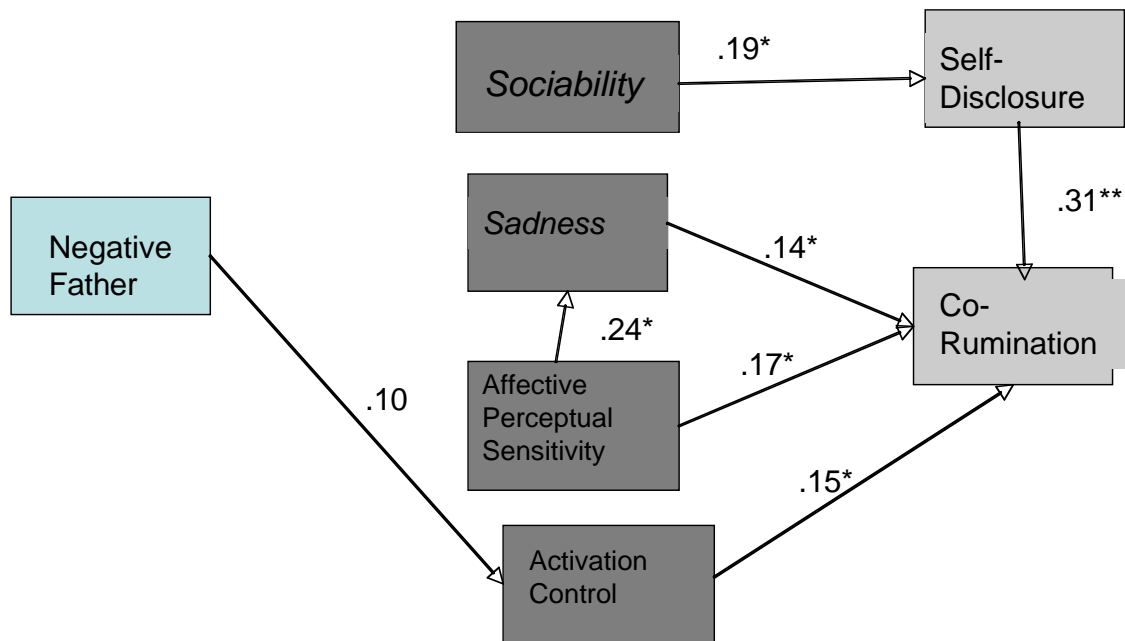


Figure 4

Model 4

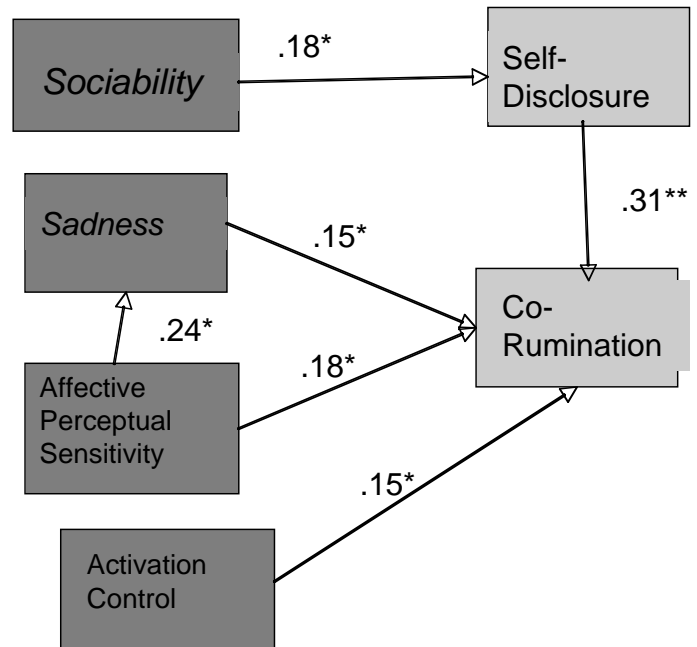


Table 5

*Correlation Matrix for Models 2-4 (n = 206)*

	Co- Rumination	Self- Disclosure	Sociability	Sadness	Affective Perceptual Sensitivity	Activation Control	Negative Father
Co- Rumination	1	<b>.35</b>	<b>.13</b>	<b>.21</b>	<b>.26</b>	<b>.14</b>	-.05
Self- Disclosure		1	<b>.13</b>	.08	.13	-.01	-.02
Sociability			1	-.07	<b>-.17</b>	<b>.17</b>	-.09
Sadness				1	<b>.24</b>	-.04	.12
Affective Perceptual Sensitivity					1	.01	.07
Activation Control						1	<b>-.20</b>
Negative Father							1

Next, the insignificant path between Negative Father and Activation Control was dropped, resulting in Model 4. Estimation of this model increased both the GFI (.99) and the NFI (.90), and the chi-square difference test indicated Model 4 was a better fit than Model 3,  $\chi^2(5) = 14.18, p < .05$ . Moreover, examination of Lagrange multiplier indices indicated that estimation of any additional paths would not have substantively improved model fit. Thus, Model 4 was accepted as the final model.

#### Study 1 Discussion

As shown in Figure 4, higher reported levels of sadness and affective perceptual sensitivity were associated with higher levels of Co-rumination. More frequent experienced negative affect, sadness in particular, and more attentional focus on affective states may result in heightened sensitivity to negative aspects of ambiguous social

interactions, providing an avenue, along with high self-disclosure, to co-ruminating about these interactions (Lewinsohn et al, 1997). Moreover, awareness, or perhaps hyper-awareness, of one's emotional state may provide additional material for co-rumination. And, cognitive persistence associated with Activation Control (e.g., "When I am afraid of how a situation might turn out, I usually avoid dealing with it", reverse scored) may facilitate discussing negative and unpleasant emotions and events: A tendency to want to approach and deal with negative situations may, in some cases, have the paradoxical effect of resulting in increased focus on and co-rumination about potentially unsolvable conflicts (Rose, 2002).

Further, an indirect relationship emerged between Sociability and Co-rumination through Self-Disclosure. Though many girls and women report high levels of self-disclosure in their friendships and do not report high levels of co-rumination, a bias toward higher levels of self-disclosure in friendships appears to be necessary but not sufficient for co-rumination to occur (Rose, 2002). Although not all sociable individuals co-ruminate, these results suggest that those individuals who are high in sadness, sensitive to their own emotional state, and who are sociable are more likely to have high levels of self-disclosure within their friendships, and through this, become more likely to focus on negative aspects of social interactions and to co-ruminate about these interactions.

Although the negative aspects of the paternal relationship were dropped in the final model, these effects may become apparent in a community, rather than a college sample. Previous studies of populations more economically diverse than college samples show that fathers impact the timing and nature of important life transitions (e.g., age at

first sexual intercourse, number of reproductive relationships) and that stress or absence within the father-daughter relationship impacts later cognitions about social relationships (Belsky et al, 1991; Byrd-Craven et al, 2007; Ellis et al, 1999). The economic background in this sample, as with most samples from major universities, reflects a range restricted toward the top end of the socio-economic spectrum, and is thus not as likely to represent the continuum of father-daughter relationships.

## CHAPTER 3: STUDY 2

### Method

In Study 2, I attempted to clarify the relationship between co-ruminative processes within the context of a peer relationship and cortisol levels after discussion of a stressor. Individuals allowed to co-ruminate (problem talk group;  $n = 14$  dyads) were compared to individuals engaged in a cooperative task that was non-social in nature (design a recreation center; control group;  $n = 10$  dyads). This study also attempted to provide insights into the content of co-rumination sessions and clarify the affect of co-rumination, cortisol levels and friendship investment.

### *Participants*

The data from Study 1 was used to select participants who were invited to participate in Study 2, as noted. Once selected, these participants were contacted and asked to complete two laboratory sessions and a follow-up assessment. Participants still in the Psych 1000 subject pool were given two credits for each of the laboratory sessions, and one credit for the follow-up session. Friends of the focal participant had their name entered into a raffle to win a palm pilot for themselves and their friend. If focal participants are no longer in Psych 1000 (e.g., the fall semester had ended at the time of their participation), the participant and friend were paid \$5 for their participation in the laboratory sessions and follow-up assessment. In addition, to add to the participant pool, students were recruited via fliers to participate in the study, and were paid \$20 for their participation. This added 18 individuals (9 dyads) to the study. These participants completed all questionnaires in the first laboratory session (Study 1 and Study 2

questionnaires), and participated in the observation and follow-up sessions identically to the participants from the Psych 1000 pool.

### *Measures and Procedure*

*Salivary Cortisol.* Dyads were trained to collect saliva at home for the baseline cortisol analysis during the first laboratory session (see below). Saliva was obtained by having participants place cotton rolls in their mouths until saturated. The cotton rolls were then placed in salivettes® (Salimetrics, State College, PA) and stored in the participants' freezer until the next laboratory session. The same procedure was followed for saliva collection during the second laboratory session (pre- and post-task samples) and for the follow-up sample taken 24 hours post-task. The salivettes were stored at -20 degrees C until assayed. Prior to the assay, the samples were thawed and the saliva expressed into vials.

Once all samples were collected, they were assayed using Enzymatic Immunoassay (EIA) (Salimetrics, Inc.), following standard procedures outlined by Salimetrics, State College, PA. This procedure is designed to capture the full range of salivary cortisol (0.003 to 3.00 ug/dL). Each EIA kit includes a microtitre plate coated with monoclonal antibodies to cortisol. Standard cortisol levels (supplied by Salimetrics) and unknown cortisol levels (study samples) compete with cortisol linked to horseradish peroxidase (the enzyme conjugate) for the antibody binding sites. Twenty-five mL of the standards, controls, and unknowns are pipetted into appropriate wells on the microtitre plate. Next, 25 mL of assay diluent were pipetted into two wells to serve as the zero for comparison purposes and into each of the other wells. A dilution (1:1600) of the enzyme conjugate was made by adding 15 µL of the conjugate to the 24 mL of assay diluent.

Two hundred  $\mu\text{L}$  of this solution was immediately pipetted into each well using a multichannel pipette. The plate was then mixed on a rotator for 5 minutes at 500 rpm and incubated at room temperature for 55 minutes.

After incubating, unbound components were washed out 4 times with a wash buffer. Next, 200  $\mu\text{L}$  of the substrate tetramethylbenzidine (TMB) was added to each well with a multichannel pipette. The solution was mixed on a plate rotator for 5 minutes at 500 rpm and the plate placed in the dark at room temperature for an additional 25 minutes. Finally, 50  $\mu\text{L}$  of stop solution was added to each well via a multichannel pipette to stop the enzymatic reaction. This was mixed on a plate rotator for 3 minutes.

The plate was placed on a plate reader within 10 minutes of adding the stop solution. Bound cortisol peroxidase was then measured by the reaction of the peroxidase enzyme on the substrate tetramethylbenzidine, which produces color differences. These differences in optical density were read on a standard plate reader. Brighter colors indicated less cortisol present in the sample.

All samples from an individual were assayed in duplicate in the same assay batch. Further, samples from each dyad were assayed in the same batch. Samples for two participants (one dyad) from the control group were lost, and therefore not included in the analysis. Two participants (one from the problem talk group, one from the control group) had sample volumes that were insufficient ( $<50 \mu\text{l}$ ), and were therefore excluded from the analysis. Since all samples were assayed in duplicate, the mean intracoefficient of variation provides a measure of the average variability for each assay from the same sample. Acceptable levels for social sciences research range from 3-10%. The mean intracoefficient of variation was 6.55%. The mean intercoefficient of variation provides a



measure of the average variation from the controls provided in the assay kits. In other words, it is the average difference from expected values for the control samples. Acceptable levels range from 5-20%. Mean intercoefficient of variation for this study was 15.95%.

*Laboratory Sessions.* During the first laboratory session, the dyads were trained on saliva collection and provided with a palm pilot. To get a baseline measure of cortisol, participants were asked to collect saliva upon wake-up, at mid-day, and in the evening before bed on a typical or average day and label and store it in provided vials. After collecting saliva, participants answered questions on the palm pilots. They were informed as to how to collect and store their samples, and turned them in at the next session. They were also trained to use the palm pilot to record their mood (positive or negative assessed on a 1 to 5 Likert scale), diet, and sleep within the past 3 hours, to control for these effects on cortisol (e.g., caffeine or napping).

Also during the first session, the dyad filled out a series of questionnaires. The questionnaires included the *Beck Depression and Anxiety Inventories* (Beck, 1996, 1990; 1996) to assess for internalizing symptoms; the *Network of Relationship Inventory* (NRI) (Furman & Buhrmester, 1985) to assess quality and investment in the focal friendship; and, the *Problem Generation and Salience Questionnaire* for use at the next session. The NRI contains 43 items rated from 1 (Little or None) to 5 (The Most). Subscales of the NRI that are of particular interest are Support (How often do you depend on this person for help, advice, or sympathy?) and Satisfaction (“How satisfied are you with your relationship with this person?”). These were used to predict levels of co-rumination in the observational assessment. Responses from the *Beck Depression and Anxiety*

*Inventories* were used to determine the relation between levels of co-rumination during the observational assessment and symptoms of depression and anxiety.

During the second laboratory session, participants along the co-rumination continuum (low, average, and high) were randomly assigned to one of two experimental conditions: Social Problem Talk and Control. In the Social Problem Talk Condition, dyads arrived at the laboratory and selected a problem to discuss from the *Problem Generation and Salience Questionnaire*, completed in the first laboratory session, or asked to select a new problem to discuss if they are not willing to discuss the problems listed on the questionnaire. First their saliva samples were collected, then they were told that they would be video recorded and asked to engage in a warm-up task of planning a menu for a party. The experimenter then left the room for about 5 minutes. The experimenter re-entered the room and gave the dyad instructions for the social problem talk task. Participants were given a copy of the selected problem on their questionnaire and told that they can discuss either of their problems or both of their problems. They were then asked to discuss the problem as closely as possible to the way they typically do. The experimenter left the room and returned after 17 minutes.

Then one member of the dyad was led to another room and they both were asked to engage in their choice of looking at home and garden, travel, furniture or architecture magazines for 15 minutes. The purpose of this task is to provide a 15 min delay so that saliva can be collected closer to the point when cortisol levels are close to their post-stressor peak (Granger et al, in press; Sapolsky et al, 2000). The dyad was separated to prevent further discussion. The delay activities were selected on the basis that they are *not* socially stressful so that any change in cortisol levels can be attributed to the problem

talk task. Saliva was collected after the delay task, and participants were given instructions for the follow-up assessment (described below).

The procedure for participants in the Control group was exactly the same as the Problem Talk group, with the exception of the focal task. Rather than engaging in discussion of a problem, participants in this group were asked to design a recreation center with their dyadic partner. This task required pairs to work together, but was not specifically related to psychosocial stressors. Participants were told to complete the task, but were not explicitly told that they cannot discuss a social problem. The purpose for this is to determine if individuals high in co-rumination would engage in co-rumination even when attempting another activity. They were asked to engage in the same warm up and delay tasks as the Problem Talk group. After the delay task, saliva was collected, and participants were given instructions for the follow-up assessment.

The follow-up assessment took place the day following the laboratory visit (24 hours +/- 1 hour) and consisted of saliva collection and responses on the palm pilot with the same questions as the initial assessment. The palm pilot was also programmed to prompt questions regarding whether or not the problem was resolved and feelings of bonding or investment in the friendship. Participants returned the palm pilots and saliva samples the following day.

#### *Coding of Observations*

In order to better examine the relative contribution of each process that occurs within the dyadic interaction to cortisol levels, these interactions were coded on four dimensions (see Appendix C). Mutual encouragement of problem talk, rehashing the problem, speculating about the causes and possible consequences of the problem, and the

extent of focus on negative affect across the entire session (17 min) were each rated on a 5 point Likert scale for each dyad. The use of the Likert scale for each construct is similar to the methodology used in the co-rumination questionnaire (Rose, 2002). Finally, the content of the dyad's conversations were coded for topics relating to intrasexual competition (e.g., can you believe she wore that?), intersexual choice (e.g., he didn't even notice me), or other topics (e.g., academic problems).

Coders were trained by going through a subset of the videos with the primary investigator. This training session included methods for rating mutual encouragement, focus on negative affect, speculation, and rehashing the problem. Coders were given a list of operational definitions for each level on the Likert scales for rehashing the problem, speculating about the causes and possible consequences of the problem, mutual encouragement of problem talk, and focus on negative affect. Coders were also trained to record the total amount of time discussing the problem, and to tally the number of solutions and decisions generated. Coders were not blind to the hypotheses, but were blind to level of reported Co-rumination. Inter-rater reliability was assessed with correlations between each coder on each of the four dimensions for Co-Rumination by having three coders rate a subset of the data (12 dyads). Additionally, at least two coders were used for the remaining 12 dyads. Inter-rater reliability ranged between .82 and .94 (see table 6).

Table 6

*Inter-rater Correlations for Observed Co-Rumination*

<b>Rehashing</b>			
	Coder 1	Coder 2	Coder 3
Coder 1	1.0	.93**	.84*
Coder 2		1.0	.85*
Coder 3			1.0
<b>Speculation</b>			
	Coder 1	Coder 2	Coder 3
Coder 1	1.0	.86**	.85*
Coder 2		1.0	.83*
Coder 3			1.0
<b>Negative Affect</b>			
	Coder 1	Coder 2	Coder 3
Coder 1	1.0	.90**	.90**
Coder 2		1.0	.82*
Coder 3			1.0
<b>Mutual Encouragement</b>			
	Coder 1	Coder 2	Coder 3
Coder 1	1.0	.94**	.91*
Coder 2		1.0	.83*
Coder 3			1.0

\*\*  $p < .0001$ \*  $p < .05$ 

## Study 2 Results

First, I sought to determine the effect of the experimental manipulation (problem talk versus control) on Observed Co-Rumination, and confirm that the groups were, indeed, random in their assignment. I then conducted a series of ANOVAs to determine the effect of experimental group on post-task cortisol levels. Next a series of regression equations were conducted to determine the relationship between Observed Co-Rumination, anxiety and depression symptoms (assessed via Beck Anxiety and Depression Inventories), post-task cortisol levels, follow-up mood, and friendship investment.

*Initial Group Differences*

To determine whether the experimental manipulation (e.g., Problem Talk versus Control) was successful in inducing co-rumination in the Problem Talk group and successful in inhibiting co-rumination in the Control group, an ANOVA was performed with Group (Problem Talk or Control) as the between subjects variable and Observed Co-Rumination as the dependent variable. Observed Co-Rumination was the sum of Rehashing, Speculating, Mutual Encouragement of problem talk, Dwelling on Negative Affect. The sum of these variables was used instead of the average for theoretical reasons; Co-Rumination was thought to be the sum of each of the above four components together, rather than their average. This revealed that the Problem Talk group had significantly higher mean Observed Co-rumination scores (13.68) compared with the Control group (7.65),  $F(1, 47) = 60.45, p < .0001$ . Correlations between each of the four components of Observed Co-Rumination and their means are shown in tables 7 and 8.

Table 7

*Means and Standard Deviations of Observed Co-Rumination and Components*

Variable	Problem Talk <i>n</i> =28	Standard Deviation	Control <i>n</i> =20	Standard Deviation
Observed Co-Rumination	13.68	2.56	7.65	2.77
Rehashing	3.82	.92	2.10	.85
Speculating	3.39	.89	2.25	.95
Dwelling on Negative Affect	2.86	.71	1.40	.68
Mutual Encouragement	3.61	.84	1.90	.72

Table 8

*Correlations between Observed Co-Rumination and Components*

	Observed Co- Rumination	Rehashing	Speculating	Dwelling on Negative Affect	Mutual Encouragement
Observed Co- Rumination	1.0	.92**	.87**	.87**	.91**
Rehashing		1.0	.81**	.66**	.80**
Speculating			1.0	.68**	.64**
Dwelling on Negative Affect				1.0	.79**
Mutual Encouragement					1.0

\*\* $p < .0001$

Next, to ensure that the dyads were, indeed, randomly assigned to groups, ANOVAs were performed on average Beck Depression and Anxiety Scores; recall these were administered before assignment to the experimental or control group, Reported Co-Rumination, Self-Disclosure, Rothbart Adult Temperament variables used in Study 1 (Sociability, Negative Affect, Activation Control, and Affective Perceptual Sensitivity), the Six Dimensions of Parenting variables used in Study 1 (Chaos, Rejection, Coersion), the Network of Relationship Inventory subscales of Support and Satisfaction, and the total of items from the Problem Generation and Salience Questionnaire . This analysis demonstrated that neither Beck Depression scores,  $F(1,45) = .86, p=.36$ , nor Beck Anxiety scores,  $F(1,39) = .65, p=.42$  differed between groups. The groups did not differ on Reported Co-Ruminatinon,  $F(1,34) = .59, p=.44$ , Self-Disclosure,  $F(1, 34) = .05, p=.82$ , any of the temperament scales ( $ps > .10$ ), negative aspects of the Six Dimensions of Parenting Questionnaire ( $ps > .09$ ), Relationship Support or Satisfaction, nor the Problem Generation and Salience Questionnaire ( $ps > .15$ ). The results from these analyses are shown in Table 9 and confirm that dyads were, indeed, randomly assigned to

the two groups, and did not have underlying differences prior to participating in the observation session.

Table 9  
*Results of analyses to ensure random group assignment*

Variable	F	<i>p</i>	Problem Talk Mean ( <i>n</i> =28)	Standard Deviation	Control Mean ( <i>n</i> =20)	Standard Deviation
Rothbart Adult Temperament Questionnaire						
Sociability	.41	.53	5.51	.66	5.32	.83
Negative Affect	.18	.67	4.05	.67	3.95	.35
Activation	2.45	.13	4.34	.91	4.86	.56
Control						
Affective Perceptual Sensitivity	.47	.49	4.50	1.11	4.18	1.15
Reported Co- Rumination	.59	.45	3.35	.77	3.17	.65
Self- Disclosure	.05	.82	4.33	.79	4.39	.65
Beck Anxiety Inventory	.86	.36	1.54	.33	1.45	.32
Beck Depression Inventory	.65	.42	.44	.30	.54	.50
Revised-Six Dimensions of Parenting Negative Subscales						
Rejection	2.51	.12	2.10	.86	1.75	.63
Chaos	3.12	.09	1.80	.52	1.43	.51
Coersion	1.13	.30	2.05	.30	1.70	.96
Network of Relationship Inventory						
Support	2.98	.13	4.03	.73	3.73	.77
Satisfaction	2.67	.11	4.33	.61	3.95	.69
Problem Generation & Salience Questionnaire						
Total of items	.72	.40	2.22	.21	2.27	.22

*Cortisol Analyses*



Table 10 shows cortisol levels for all 6 times of assessment for each group. A repeated measures mixed ANOVA with pre- and post-task cortisol levels as within subjects factors and group as a between subjects factor revealed no initial group differences in cortisol levels,  $F(1,39) = .92, p=.34$ . The group by time interaction was not significant. Next, to determine whether the groups differed on post-task cortisol levels as a function of Observed Co-Rumination, an ANCOVA was preformed using post-task cortisol as the dependent variable, group and Observed Co-Rumination as between-subjects factors, and pre-task cortisol levels and Reported Co-Rumination as covariates. Because each of these variables are measured on different scales, they were first standardized with a mean of 0 and a standard deviation of 1. The groups differed on post-task cortisol levels,  $F(1,30) = 4.35, p=.05$ . Further, the interaction between Group and Observed Co-Rumination was significant,  $F(1,30) = 5.53, p=.03; b = .55$ . These results indicate that dyads in the problem-talk group who were the highest in Observed Co-Rumination showed the greatest increase in post-task cortisol levels.

Table 10  
*Cortisol Levels for Each Assessment by Group*

Variable	Problem Talk Mean ( $n=26$ )	Standard Deviation	Control Mean ( $n=18$ )	Standard Deviation
Baseline 1	.48	.26	.46	.43
Baseline 2	.21	.15	.20	.11
Baseline 3	.20	.31	.16	.19
Pre-Task	.41	.31	.43	.32
Post-Task	.43	.32	.32	.22
Follow-up	.36	.25	.35	.32

Based on the a priori prediction that the groups would differ in pre- versus post-task cortisol levels as a function of Co-Rumination, a series of regressions were

performed to determine the relationship between Observed Co-Rumination and post-task cortisol levels. First, Observed Co-Rumination was used to predict post-task cortisol levels, while controlling for pre-task cortisol levels. The overall model was significant,  $F(1,45) = 8.98, p = .0006$ , as was the effect of Observed Co-Rumination ( $\beta = .26, p = .05$ ) once pre-task cortisol was held constant. To determine if any one aspect of Co-Rumination may be more predictive of cortisol levels, Rehashing, Speculating, Dwelling on Negative Affect, and Mutual Encouragement of Problem Talk were used as simultaneous predictors of post-task cortisol levels, while controlling for pre-task cortisol levels. Dwelling on Negative Affect emerged as the only significant predictor of post-task cortisol levels ( $\beta = .61, p = .0077$ ) (see Table 11). There were no significant interactions with pre-task cortisol levels. A graph of group differences on each of the Co-Rumination subscales are shown in Figure 5.

Table 11  
*Relations between four components of Co-Rumination and Post-task Cortisol*

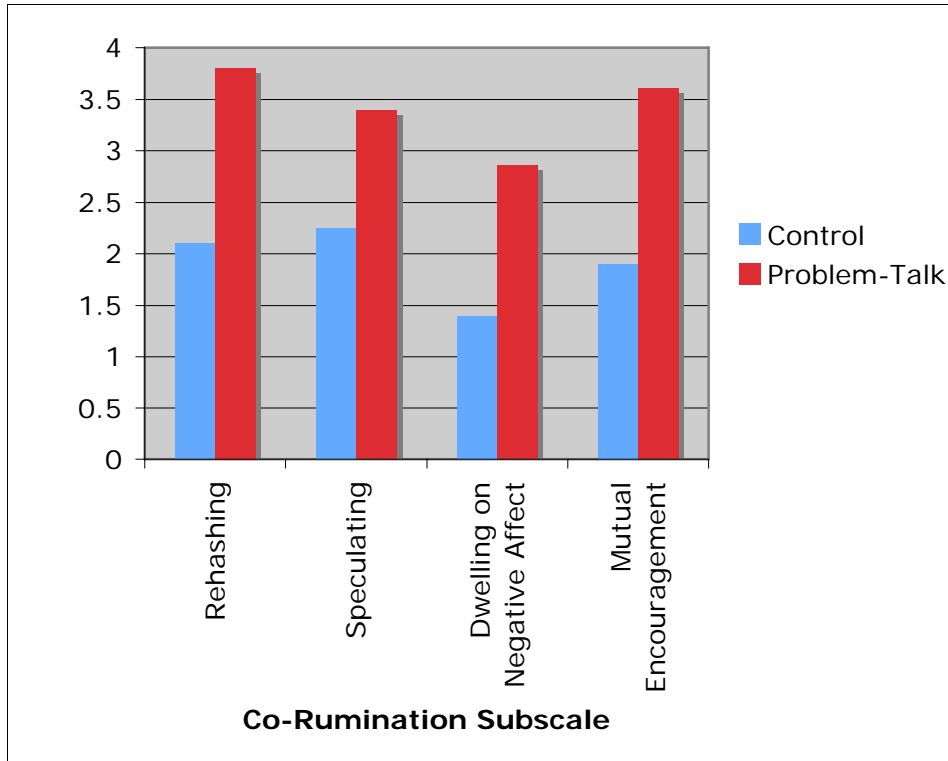
Predictor Variables	Post-Task Cortisol Levels	
	$\beta$	t
Rehashing	.04	.16
Speculating	-.31	-1.34
Dwelling on Negative Affect	.61	2.82*
Mutual Encouragement	-.06	-.24
Pre-Task Cortisol	.56	4.31**

\* $p < .05$

\*\* $p < .0001$

Figure 5

*Frequency of Co-rumination Subscales by Group*

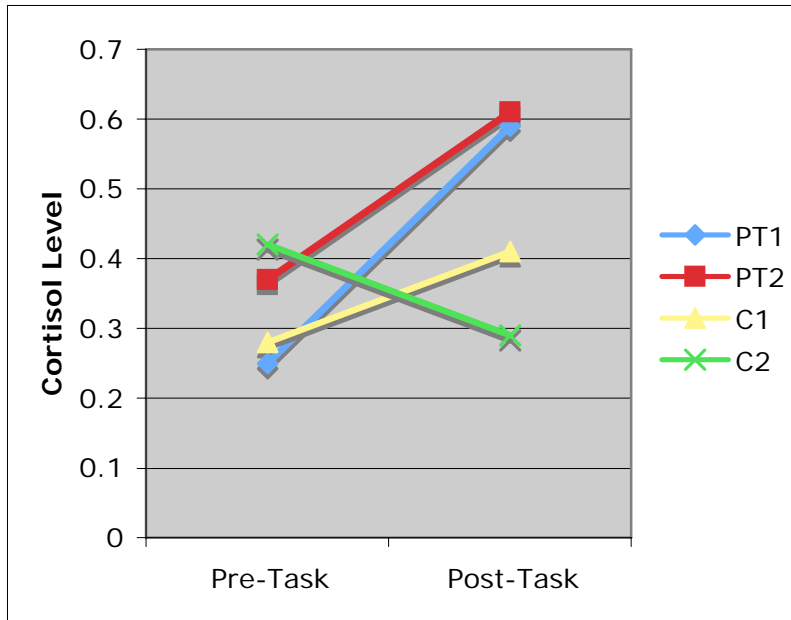


Because each of the subscales of Co-Rumination were highly correlated, it is therefore difficult for each subscale to predict post-task cortisol above and beyond the other subscales (see Table 8). To investigate the effect of each subscale of Co-Rumination on post-task cortisol levels, separate regression equations were run for each subscale, controlling for pre-task cortisol levels. Dwelling on Negative Affect again emerged as a significant predictor of post-task cortisol levels ( $\beta = .39, p = .004$ ), and Mutual Encouragement of Problem Talk emerged as a trend ( $\beta = .25, p = .06$ ). In a regression equation using Mutual Encouragement of Problem Talk and Dwelling on Negative Affect as simultaneous predictors of post-task cortisol levels, Mutual Encouragement failed to predict post-task cortisol levels above and beyond Dwelling on Negative Affect ( $\beta = .10, p = .59$ ). A graph of pre- versus post-task cortisol levels for two dyads (one from each group) chosen at random is depicted in Figure 6. For both

groups, pre-task cortisol levels are unrelated. Post-task cortisol levels between individuals in the problem talk group are much more similar than those of individuals in the control group.

Figure 6

*Sample of Dyadic Group Differences in Pre- versus Post-Task Cortisol Levels*



Next, a mediational model was tested to determine whether the group difference in post-task cortisol levels were mediated by differences in Dwelling on Negative Affect. However, this model failed to meet mediational requirements. Group differences were associated with Dwelling on Negative Affect ( $\beta = .73$ ), but group membership failed to adequately predict post-task cortisol levels ( $\beta = .19$ ). The same was true for Observed Co-Rumination. It appears that it is not group membership per se (e.g, the opportunity to discuss a stressor) that is associated with increases in cortisol levels, but rather the focus of these conversations.

Since Dwelling on Negative Affect emerged as the best predictor of post-task cortisol, it was next used as a predictor of follow-up cortisol, taken 24 hours post-task, while controlling for the effects of pre-task cortisol. However, Dwelling on Negative affect was not a significant predictor of follow-up cortisol levels,  $F(2, 41) = 1.21, p = .31$  nor was Observed Co-Rumination,  $F(2, 38) = .51, p = .48$ . Finally, to determine the role of cortisol in enhancing friendship investment after the discussion of a stressor, post-task cortisol was used to predict follow-up friendship investment, while controlling for pre-task cortisol levels. Post-task cortisol was not a significant predictor of follow-up friendship investment,  $F(2, 43) = .03, p = .86$ , suggesting that the rise in cortisol during co-rumination does not influence friendship investment, at least as it is measured here.

*Relations between Focus on Negative Affect, Friendship, and Internalizing Symptoms.* Next, to determine the relationship between Dwelling on Negative Affect during the observed assessment and follow-up measures of mood and friendship investment, two separate regression equations were performed. Dwelling on Negative Affect failed to predict mood 24 hours after the laboratory session,  $F(1,38) = .26, p = .61$ , and friendship investment 24 hours after the laboratory session,  $F(1,43) = .29, p = .59$ . The same was true for Observed Co-Rumination,  $F(1, 38) = .51, p = .48$ ;  $F(1, 43) = .03, p = .86$ . However, the Support subscale of the *Network of Relationship Inventory* was a significant predictor of Dwelling on Negative Affect,  $F(1,32) = 5.29, p = .02$ , suggesting that the more supportive the relationship, the more negative emotions may be discussed and validated. Further, Beck Depression and Anxiety scores were not significant predictors of Dwelling on Negative Affect during the observed assessment ( $F_s < .40$ ). The lack of findings here are not consistent with previous work (Rose, 2002). Given this, a

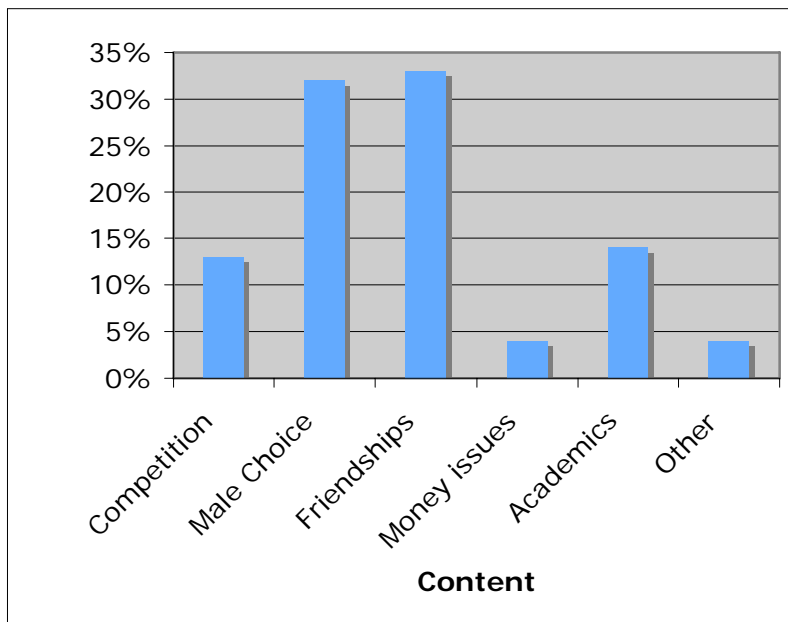
power analysis was conducted. Power for these analyses was .51; acceptable power for most social sciences research is .80 (Soper, 2007). In order to detect effect sizes of .15, similar to those reported by Rose (2002), the analysis would need a sample size of at least 84 participants.

*Content of Co-Rumination.* For participants in the Problem Talk group, the content of their conversations were coded for issues relating to 1) female-female competition; 2) male choice; 3) friendships; 4) money issues; 5) academic issues; or 6) other. Female-female competition, male choice, and friendships accounted for 78% of the discussion topics, while money, academic, or other non-social issues accounted for 22% of the topics discussed (see Figure 7). As predicted, the majority of the topics centered around the developmentally contingent issues of forming and maintaining a support system (e.g, friendships), attracting a mate (e.g., male choice) and competing for access to or keeping mates (e.g., female-female competition). Discussion of issues revolving around male choice and friendships were significantly correlated with Observed Co-Rumination ( $r_s = .63$  and  $.53$ , respectively). A series of regression equations were conducted using each of the content areas to predict Observed Co-Rumination. Male choice,  $F(1,47) = 30.73$ ,  $p < .0001$ , and friendships,  $F(1,47) = 18.31$ ,  $p < .0001$ , were significant predictors of Observed Co-Rumination. Female-female competition, academic issues, or other non-social issues failed to predict Observed Co-Rumination ( $p_s > .05$ ). However, none of the content issues were correlated with post-task cortisol levels. This may have been because participants discussed multiple issues during the session, making it difficult to define a content area specifically related to increases in cortisol. Finally, there was no relationship between post-task cortisol levels

and reported Co-Rumination ( $\beta = .20, p = .24$ ), suggesting that it is active co-rumination that influences cortisol levels.

Figure 7

*Content of Observed Co-Rumination*



### Study 2 Discussion

Overall, Observed Co-Rumination was associated with elevated post-task cortisol levels. Once the underlying components of Co-Rumination were analyzed as separate simultaneous predictors, Dwelling on Negative Affect emerged as the sole significant predictor of post-task cortisol levels. Since all four components of Co-Rumination were highly correlated, however, these results should be interpreted with caution. As shown above, it is the sum of these constructs that contributes to the rise in cortisol levels. Nevertheless, the implication of these results is that it is the extent of focus on negative affect, rather than rehashing details about the problem, speculating about causes and consequences of the problem, or mutual encouragement of problem discussion that

results in elevated cortisol levels and may lead to long-term negative consequences of this social style (as reported by Rose, 2002). Dyads higher in Dwelling on Negative Affect were more likely to have high cortisol levels after their discussion, above and beyond their pre-task cortisol levels. It appears that the extent of negative affect focus, most likely in addition to the other constructs, that may, paradoxically, be concurrent with dyadic self-disclosure of this type.

However, contrary to predictions, post-task cortisol levels failed to predict higher friendship investment 24 hours after discussion of the stressor. This may have been because these friendships had already reached a ceiling of investment, and co-ruminating was characteristic of their daily interactions. In this case, a single episode of co-ruminating (17 minutes) may be unlikely to yield significant differences in overall friendship investment. It is clear from these results, however, that more reported overall support within the friendship is, paradoxically, likely to lead to more dwelling on negative affect when discussing a stressor. It is possible that the perception of support creates a context in which negative emotions can be vented and perhaps, validated.

The content of co-rumination seems to revolve around the developmentally contingent and evolutionarily-predicted concerns of creating an effective support system (e.g., friendships), effectively competing with other young women for choice mates (e.g., female-female competition), and navigating romantic relationships (e.g., male choice). These topics comprised 78% of the topics discussed during the problem-talk sessions and were correlated with Observed Co-Rumination scores, whereas other issues (e.g., academic or money issues) comprised only 22% of these discussions, and were not correlated with Observed Co-Rumination scores. This suggests that these



developmentally contingent concerns are salient, and therefore likely to lead to repetitive focus, particularly in the context of friendships where one's perceptions and relative standing can be validated or reformulated. The characteristics of female friendships (e.g., dyadic self-disclosure, high investment) may ultimately serve the purpose of providing support for these evolutionarily-expectant issues rather than more contemporary issues of academics or handling money.

## CHAPTER 4: GENERAL DISCUSSION

These results suggest that there is, indeed, a paradox within the friendships of late adolescent girls. Close friendships in this age group are characterized by frequent bouts of dyadic self-disclosure. Validation and social support that are characteristic of these bouts are typically thought to reduce stress (Taylor et al, 2002), and are associated with positive adjustment (Parker & Asher, 1993; Rose, 2002). However, the nature of social support within some friendships can facilitate repeated focus on negative affect and validation of that affective response. When the focus of these conversations is primarily negative affect resulting from a stressor, dyadic self-disclosure paradoxically increases stress, at least as measured by cortisol levels, for both members of the dyad. Further, as predicted, the content of dyadic self-disclosure of this type (e.g., co-rumination) revolves around developmentally contingent, and evolutionarily-expected concerns such as developing and maintaining a friendship network and romantic relationships. These issues involve the opportunity for gain or loss of social resources that have been predicted as the focus of conflict during human evolutionary history (e.g., Geary, 2002), and which are contexts known to produce HPA activation in other studies (Neese & Young, 2000).

Further, this study confirms that some individuals are more likely to engage in a potentially maladaptive coping style, co-rumination, than others. Results from Study 1 show that a temperamental profile characterized by high approach to social problems (e.g., activation control), awareness of affective changes, negative affect, and sociability is more likely to lead to co-rumination within friendships. Inconsistent with predictions, however, there were no effects of the reported paternal relationship on social style or likelihood of co-ruminating. This may be due to the demographic nature of the sample,

however. The vast majority of the sample reported positive relationships with their fathers. Had the sample been a community sample with more varied in background characteristics (see Belsky et al., 1991; Byrd-Craven et al, 2007; Ellis et al, 1999), paternal relationship effects on social style and stress reactivity may have emerged.

The results of Study 2, in particular, demonstrate that young women do, indeed, utilize their relationships as sources of social support. In fact, social support was shown to predict dwelling on negative affect. As discussed above, the perception of social support may create a safe context to vent negative emotions. Similarly, validating these emotions shows support for a friend. This validation may originate in the female-typical social cognitive style of attention to individual-level cues (e.g., facial expression, verbal tone) (Geary, 2002), awareness of distress in others (Crick & Zahn-Waxler, 2003) and empathy within friendships (Roberts & Strayer, 1996). The combination of these characteristics, high investment in friendships, the importance of maintaining social support, and the female-typical coping style of rumination provide an avenue where negative affect can be discussed and validated, and stress is paradoxically increased as a result of receiving this support.

Further, both members of the dyads high in negative affect focus showed increased HPA response after discussion of a stressor. Similar to parent-child interactions, the quality and nature of the interaction between friends has a pronounced physiological effect. These results are consistent with previous research in this area, showing that co-rumination increases negative affect in both members of the dyad, despite reports of positive friendship quality (Rose, 2002). This finding is also consistent with the prediction that female friendships are best characterized by reciprocal altruism

(Geary et al, 2003). The tit-for-tat nature of giving and receiving social support and validation, and guilt for failure to do so, could contribute to the affective and physiological response after co-ruminative conversations.

Dwelling on negative affect may also temporarily increase cortisol through its focus on the uncontrollable nature of the situation (McEwen, 1998; Huether et al, 1999). Discussing how upset, angry, or frustrated one is about the situation focuses control outside the individual (external locus of control). If the other member of the dyad validates the negative affect, it may be perceived as validation that the stressor is, in fact, uncontrollable, and therefore worthy of increased vigilance and attention to possibly form a new response. Just as parental behavior serves as a cue as to the demands of the social environment early in development (Caldji et al, 1998; Cameron et al, 2005; Essex et al, 2002; Francis & Meaney, 1999; Liu et al, 1997; Lupien et al, 2000; Meaney, 2001), so might peer relationships.

*Limitations.* The current study is not without limitations, however. First and foremost is the small sample size in Study 2. For many of the null results, particularly the lack of a relationship between cortisol and friendship investment and co-rumination and internalizing symptoms, it is not clear whether no relationship actually exists or that the sample size simply was not large enough to detect the subtle effects. Further, the design of the study did not allow for adequate assessment of the role of co-rumination and cortisol in friendship investment. As stated above, the lack of findings in this area may result from the fact that these friendships have already reached a ceiling of investment, and further co-rumination will not substantially increase the investment or bonding within the friendship. A design that allows for assessment of investment, co-

rumination, and cortisol concurrently as the friendship is developing would help to clarify these relationships.

*Future Directions.* From these results, the long-term effects of co-rumination within friendships are unclear. If co-rumination can be thought of as an extreme form of female friendships, it is likely that friendships characterized by co-rumination may be even more likely to dissolve as a result of non-reciprocation or conflict within the friendship. Co-rumination not only increases negative affect, but these results show that it has a physiological effect on both members of the dyad as well. The current study cannot clarify, however, how this may affect long-term friendship and individual adjustment. It may be that the demands that are placed on each member of the dyad in terms of listening, providing validation and support, and the physiological response (e.g., HPA activity) are much higher in co-ruminating dyads than in dyads characterized by more normative self-disclosure. Similarly, it is not clear whether experience with co-rumination affects individual HPA activity and coping strategies. Studies employing a longitudinal design would help to answer these questions.

#### *Summary and Conclusion*

The characteristics of female friendships provide an avenue by which to cope with stress, particularly stress related to relationships. However, these very relationships can also serve to increase stress levels, at least as measured by salivary cortisol levels after discussion of the stressor, if the conversations are characterized by Co-Rumination, specifically, dwelling on negative affect resulting from the stressor. Temperamental traits such as sociability, negative affect, and sensitivity to affective changes influence the likelihood of engaging in this potentially maladaptive coping style. These results suggest

that while these relationships may seem and be reported to be supportive, they may result in increased, rather than decreased HPA axis activity.

## Appendix 1: Informed Consent and Debriefing Forms

### INFORMED CONSENT (Focal Participant)

I consent to participate in this research project and understand the following:

**PROJECT BACKGROUND:** This project involves gathering data through a series of questionnaires and tasks that will examine the nature of the relationship between stress and coping within women's friendships in early adulthood. Based on the results, I may be invited back for follow-up sessions if I have a friend that is able and willing to participate. The data will be collected for the analysis and may be published. I understand that I will not be identified in any way in the publication. This study is being directed by Jennifer Byrd-Craven, M.S. and is under the supervision of Dr. David Geary, Department of Psychological Sciences, at the University of Missouri-Columbia.

**PURPOSE:** The purpose of this study is to identify factors related to neuroendocrine measures of stress, that is, stress hormones, and how women's friendships may help to cope with stress.

**VOLUNTARY:** This study is completely voluntary. I understand that I may refuse to answer any questions or choose to withdraw from participation at any time without any penalty or loss of benefits to which I am otherwise entitled. Should I choose to withdraw from the study, I will be compensated for the participation I have accrued up to that point. For example, I will receive 1 credit for filling out the initial questionnaire segment, and if I am invited for follow-up sessions, I will receive 4 credits for the two laboratory sessions, and 1 credit for the follow-up session (for a total of 6 credits).

In all Psychology 1000 classes, students are required to learn about psychological research beyond what is presented in their lectures and textbook. This is accomplished through one of two means. First, students may serve as subjects in psychological research projects that are offered through the Department of Psychological Sciences. Through their participation in these projects, students may earn up to 12 research/experiment credits (total of 6 hours of participation). Alternatively, students may demonstrate their knowledge of psychological research by completing a series of short papers (e.g., 1-2 pages) on some topic in research (determined by the individual instructor). Students are also welcome to use a combination of research participation and short papers. The research credits (via research participation and/or papers) figure into the students' final grades. They are required of every Psychology 1000 student (i.e., not simply extra credit). I am aware that my participation in this study will at least partially fulfill the research requirements for my Psychology 1000 class. I am also aware that there are alternative ways of fulfilling my research requirement (e.g., completing a short paper). These alternatives are described in the syllabus for my Psychology 1000 class.

**WHAT DO I DO?** First, I will fill out a series of questionnaires on the nature of my relationship with my closest or best friend, information about family background and parenting style, personality, and menstrual cycle. These should take approximately 30 minutes to complete, and I will receive 1 credit for your participation. Based on the results some participants will be invited back, provided they have a friend willing to participate, and the subsequent 3 sessions will be scheduled. Should my participation occur after this semester (Fall 2006) is over, I will be paid \$5 for participating in 3 laboratory sessions. In this case, should I decide to withdraw from participation, I will receive a pro-rated amount based on the participation that I have accrued to that point (e.g., \$2.50 for half of the sessions). In the first laboratory session, dyads (myself and friend) will be trained on how to collect saliva for the stress hormone (cortisol) measurement and how to use a palm pilot to record diet, sleep, general mood, and the presence of social problems around the time of saliva collection. My friend and I will be asked to take home vials and collect saliva upon wake-up, at mid-day, and in the evening before bed on a typical day. During the first session, we will also be asked to fill out questionnaires about mood and our friendship. We will also be asked to complete a short task in which we will judge emotions in facial expressions. This session will last approximately one hour, and I will receive 2 credits for my participation in this session.

The second session will be scheduled a few days after the first (within a week), and we (myself and my friend) will return vials of saliva during that time. During this session, we will come to the lab and complete a series of tasks designed to examine how friends interact with each other. Saliva will be collected at the beginning and end of this session. This session will take approximately one hour, and I will receive 2 credits for your participation in this session.

A follow-up assessment will take place the day after the second session. We will collect saliva in provided vials, and will answer questions on the palm pilot about general mood, diet, sleep, and our friendship. Once this has been completed, dyads will return the saliva assays and palm pilots to the laboratory as soon as possible. Once the palm pilots and saliva assays are returned to the laboratory, I will receive the final credit for my participation.

**BENEFITS:** Participants will receive six (6) research credits, for completing the entire study. I will receive 1 credit for my participation today. Should my participation in the laboratory sessions occur after this semester (Fall 2006) is completed, I will receive \$5 for your participation in all laboratory sessions. My participation in this research project will help improve our understanding of how women use friendships to cope with stressors.

**RISKS:** This project does not involve any risks greater than those encountered in everyday life. I will be asked to recount and discuss social problems that I am currently experiencing and would typically discuss with a friend. These problems may be stressful, but I will not be deliberately stressed as a result of participating in the project.

**CONFIDENTIALITY:** My confidentiality will be maintained in that my name will not appear on the survey or in the published study itself. My answers are entirely



confidential, and will not be revealed to anyone other than the researchers conducting the study.

**INJURY:** It is not the policy of the University of Missouri to compensate human subjects in the event the research results in injury. The University of Missouri does not have medical, professional and general liability self-insurance coverage for any injury caused by the negligence of its faculty and staff. Within the limitations of the laws of the state of Missouri, the University of Missouri will also provide facilities and medical attention to subjects who suffer injuries while participating in the research projects of the University of Missouri. In the event I have suffered injury as the result of participating in this research project, I am to immediately contact the Campus Institutional Review Board Compliance Officer at (573) 882-9585 and the Risk Management Center at (573) 882-3735 to review the matter and provide you further information. This statement is not to be construed as an admission of liability.

If you have any questions regarding the study, I will contact Jennifer Byrd-Craven at (573) 882-8529. If I have questions regarding my rights as a participant in research, I will contact the Campus Institutional Review Board at (573) 882-9585.

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Name

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Date

## INFORMED CONSENT (Friend)

I consent to participate in this research project and understand the following:

**PROJECT BACKGROUND:** This project involves gathering data through a series of questionnaires and tasks that will examine the nature of the relationship between stress and coping within women's friendships in early adulthood. The data will be collected for the analysis and may be published. I understand that I will not be identified in any way in the publication. This study is being directed by Jennifer Byrd-Craven, M.S. and is under the supervision of Dr. David Geary, Department of Psychological Sciences, at the University of Missouri-Columbia.

**PURPOSE:** The purpose of this study is to identify factors related to neuroendocrine measures of stress, that is, stress hormones, and how women's friendships may help to cope with stress.

**VOLUNTARY:** This study is completely voluntary. I understand that I may refuse to answer any questions or choose to withdraw from participation at any time without any penalty or loss of benefits to which I am otherwise entitled. I understand that my friend will be receiving research credit for Psychology 1000 for her participation. For my participation, my name will be entered into a raffle to win a palm pilot. My name will be entered for each of the 3 laboratory sessions I complete. There are approximately 100 other individuals that will be entered into the raffle and 3 palm pilots available. If my participation occurs after the Fall 2006 semester, I will receive \$5 for your participation in all laboratory sessions. Should I choose to withdraw prior to completing all 3 laboratory sessions, I will be compensated based on the participation you have accrued to that point.

**WHAT DO I DO?** In the first laboratory session, dyads (myself and my friend) will be trained on how to collect saliva for the stress hormone (cortisol) measurement and how to use a palm pilot to record diet, sleep, general mood, and the presence of social problems around the time of saliva collection. We will be asked to take home vials and collect saliva upon wake-up, at mid-day, and in the evening before bed on a typical day. During the first session, we will also be asked to fill out questionnaires about our friendship and mood. We will also be asked to complete a short task in which we will judge emotions in facial expressions. This session will last approximately one hour.

The second session will be scheduled a few days after the first (within a week), and we will return vials of saliva during that time. During this session, we will come to the lab and complete a series of tasks designed to examine how friends interact with each other. Saliva will be collected at the beginning and end of this session. This session will take approximately one hour.

A follow-up assessment will take place the day after the second session, whenever possible, and will be completed by both myself and my friend. We will collect saliva in provided vials, and will answer questions on the palm pilot about general mood, diet,

sleep, and the friendship. Once this has been completed, we will return the saliva assays and palm pilots to the laboratory as soon as possible.

**BENEFITS:** My name will be entered into a raffle for a chance to win a palm pilot, once per session. My participation in this research project will help improve our understanding of how women use friendships to cope with stressors.

**RISKS:** This project does not involve any risks greater than those encountered in everyday life. I will be asked to recount and discuss social problems that I am currently experiencing and would typically discuss with a friend. These problems may be stressful, but I will not be deliberately stressed as a result of participating in the project.

**CONFIDENTIALITY:** My confidentiality will be maintained in that my name will not appear on the survey or in the published study itself. My answers are entirely confidential, and will not be revealed to anyone other than the researchers conducting the study.

**INJURY:** It is not the policy of the University of Missouri to compensate human subjects in the event the research results in injury. The University of Missouri does not have medical, professional and general liability self-insurance coverage for any injury caused by the negligence of its faculty and staff. Within the limitations of the laws of the state of Missouri, the University of Missouri will also provide facilities and medical attention to subjects who suffer injuries while participating in the research projects of the University of Missouri. In the event I have suffered injury as the result of participating in this research project, I am to immediately contact the Campus Institutional Review Board Compliance Officer at (573) 882-9585 and the Risk Management Center at (573) 882-3735 to review the matter and provide you further information. This statement is not to be construed as an admission of liability.

If I have any questions regarding the study, I will contact Jennifer Byrd-Craven at (573) 882-8529. If I have questions regarding my rights as a participant in research, I will contact the Campus Institutional Review Board at (573) 882-9585.

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Name

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Date

## DEBRIEFING FORM

Thank you for participating in the study. This study is designed to explore how women's friendships may help individuals cope with stress; the saliva you provided will allow us to measure stress hormones during your discussions. Also, we are interested in how factors within the family of origin influence the strategies women use to cope with stress, and how these factors might relate to changes in stress hormones during your discussions.

In children and adolescents, unpredictable family interactions have been shown to influence the way they later interpret stressful events and how they cope with these stressors. These early family factors are also related to alterations in neurohormone levels (e.g., cortisol) as a result of stressors. Some individuals with this background have chronically high stress hormone levels, while others have chronically low stress hormone levels. For girls and women in particular, close friendships are used to help cope with stress, especially stress related to relationships with other people. However, little is known about how coping within friendships is related to stress hormones, especially in young adults. Since the college years are often a time of exploring relationships, it is particularly important that we know how young adults cope with these social stressors, what factors may influence the ability to effectively cope, and how this relates to stress hormones. We predict that young women with high quality friendships that provide them with social support will have more moderate stress hormone levels as a result of discussing social problems within these friendships. Your participation in this study will help us better understand how discussing problems with close friends affects stress hormone levels and coping efficacy.

Because this study is ongoing, we ask that you *please not discuss the study or what you have read on this debriefing sheet with your classmates*. It is important that incoming participants not know what the study is about because it could bias their responses and lead to incorrect conclusions in our research.

All information is kept strictly confidential. Your name will not be associated in any way with your responses or performance, and you will not be identified in any publication. This project is directed by Jennifer Byrd-Craven and is conducted under the supervision of Dr. David Geary, Department of Psychological Sciences, University of Missouri-Columbia. If you have any concerns about this project, you can contact Michelle Reznicek of the Institutional Review Board of the University of Missouri at (573) 882-9595.

Appendix 2: Measures

Self-disclosure Questionnaire

## Talking With Your Friends

Think about the way you usually are with your best of closest friends who are female if you are a female or male if you are a male and circle the number for each of the follow statements that best describes you.

1. We are always telling each other about our problems.

1	2	3	4	5
not at all true	a little true	somewhat true	pretty true	really true

2. When one of us is mad about something that happened to us, we can always talk to each other about it.

1	2	3	4	5
not at all true	a little true	somewhat true	pretty true	really true

3. We talk about things that make us sad.

1	2	3	4	5
not at all true	a little true	somewhat true	pretty true	really true

4. We tell each other private things a lot.

1	2	3	4	5
not at all true	a little true	somewhat true	pretty true	really true

5. I can think of lots of secrets we have told each other.

1	2	3	4	5
not at all true	a little true	somewhat true	pretty true	really true

Co-rumination Questionnaire

### When We Talk About Our Problems

Think about the way you usually are with your best or closest friends who are girls and circle the number for each of the following statements that best describes you.

1. We spend most of our time together talking about problems that my friend or I have.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

2. If one of us has a problem, we will talk about the problem rather than talking about something else or doing something else.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

3. After my friend tells me about a problem, I always try to get my friend to talk more about it later.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

4. When I have a problem, my friend always tries really hard to keep me talking about it.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

5. When one of us has a problem, we talk to each other about it for a long time.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

6. When we see each other, if one of us has a problem, we will talk about the problem even if we had planned to do something else together.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

7. When my friend has a problem, I always try to get my friend to tell me every detail about what happened.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

8. After I've told my friend about a problem, my friend always tries to get me to talk more about it later.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

9. We talk about problems that my friend or I are having almost every time we see each other.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

**10. If one of us has a problem, we will spend our time together talking about it, no matter what else we could do instead.**

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

**11. When my friend has a problem, I always try really hard to keep my friend talking about it.**

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

**12. When I have a problem, my friend always tries to get me to tell every detail about what happened.**

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

***When we talk about a problem that one of us has....***

**1. ... we will keep talking even after we both know all of the details about what happened.**

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

**2. ... we talk for a long time trying to figure out all of the different reasons why the problem might have happened.**

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

**3. ... we try to figure out every one of the bad things that might happen because of the problem.**

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

**4. ... we spend a lot of time trying to figure out parts of the problem that we can't understand.**

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

**5. ... we talk a lot about how bad the person with the problem feels.**

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

6. ... we'll talk about every part of the problem over and over.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

*When we talk about a problem that one of us has...*

7. ... we talk a lot about the problem in order to understand why it happened.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

8. ... we talk a lot about all of the different bad things that might happen because of the  
problem.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

9. ... we talk a lot about parts of the problem that don't make sense to us.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

10. ... we talk for a long time about how upset is has made one of us with the  
problem.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

11. ... we usually talk about that problem every day even if nothing new has  
happened.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

12. ... we talk about all of the reasons why the problem might have happened.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

13. ... we spend a lot of time talking about what bad things are going to happen  
because of  
the problem.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True

14. ... we try to figure out everything about the problem, even if there are parts that  
we  
may never understand.

1                      2                      3                      4                      5  
Not At All True    A Little True    Somewhat True    Mostly True    Really True



**15. ... we spend a long time talking about how sad or mad the person with the problem feels.**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Not At All True</b>	<b>A Little True</b>	<b>Somewhat True</b>	<b>Mostly True</b>	<b>Really True</b>

Problem Generation Questionnaire

**Problems**

List three problems that you have and answer the following questions about each problem.

**PROBLEM**

#1: \_\_\_\_\_

**1. How upsetting is this problem?**

1	2	3	4	5
Not at All				Very
Upsetting				Upsetting

**2. How important is this problem?**

1	2	3	4	5
Not at All				Very
Important				Important

**3. How hard would it be to solve this problem?**

1	2	3	4	5
Not at All				Very
Hard				Hard

**4. How hard would it be to feel better about this problem?**

1	2	3	4	5
Not at All				Very
Hard				Hard

**5. How much do you want to feel better about this problem?**

1	2	3	4	5
Not At				Very
All				Much

**6. How much do you want this problem not to bother you?**

1	2	3	4	5
Not At				Very
All				Much

**7. How much do you want to not be upset about this problem?**

1	2	3	4	5
Not At				Very
All				Much

**PROBLEM**

**#2:** \_\_\_\_\_

**1. How upsetting is this problem?**

1	2	3	4	5
Not at All				Very
Upsetting				Upsetting

**2. How important is this problem?**

1	2	3	4	5
Not at All				Very
Important				Important

**3. How hard would it be to solve this problem?**

1	2	3	4	5
Not at All				Very
Hard				Hard

**4. How hard would it be to feel better about this problem?**

1	2	3	4	5
Not at All				Very
Hard				Hard

**5. How much do you want to feel better about this problem?**

1	2	3	4	5
Not At				Very
All				Much

**6. How much do you want this problem not to bother you?**

1	2	3	4	5
Not At				Very
All				Much

**7. How much do you want to not be upset about this problem?**

1	2	3	4	5
Not At				Very
All				Much

**PROBLEM**

**#3:** \_\_\_\_\_

**1. How upsetting is this problem?**

1	2	3	4	5
Not at All				Very
Upsetting				Upsetting

**2. How important is this problem?**

1	2	3	4	5
Not at All				Very
Important				Important

**3. How hard would it be to solve this problem?**

1	2	3	4	5
Not at All				Very
Hard				Hard

**4. How hard would it be to feel better about this problem?**

1	2	3	4	5
Not at All				Very
Hard				Hard

**5. How much do you want to feel better about this problem?**

1	2	3	4	5
Not At				Very
All				Much

**6. How much do you want this problem not to bother you?**

1	2	3	4	5
Not At				Very
All				Much

**7. How much do you want to not be upset about this problem?**

1	2	3	4	5
Not At				Very
All				Much

Palm Pilot Prompts

1) What is your mood for the past hour?

1	2	3	4	5
Very Negative	Somewhat Negative	Neutral	Somewhat Positive	Very Positive

2) Have you consumed caffeine in the past 6 hours? Y N

If yes, what was it?

Coffee Soda Chocolate

3) Have you had a meal in the past 3 hours? Y N

If Yes, what was the size of your meal?

Snack Small Meal Medium Meal Large Meal

4) Have you slept in the past 3 hours? Y N

If Yes, for how long?

½-1 hour 1-2 hours 2-3 hours 3-4 hours 4-5 hours over 5 hours

5) Have you had any social problems (problems related to other people) in the past 3 hours? Y N

If Yes, did you discuss this problem with a friend? Y N

If Yes, how long did you spend discussing the problem? \_\_\_\_\_ minutes

---

6) To what extent has the problem you and your friend discuss in the laboratory visit been resolved?

1	2	3	4	5
Not at all	A little	Somewhat	Mostly	Yes, absolutely

7) How invested do you feel in your friendship compared with a few weeks ago?

1

2

3

4

5

Much less

A little less

Same

A little more

Much more

*\*Note: items 6 and 7 will only be administered in the follow-up assessment*

Rothbart Adult Temperament Questionnaire

**Please provide the following information by checking the appropriate response or filling in the blank.**

**Sex:**            Male \_\_\_\_\_            Female

**Is English your first language?**    Yes \_\_\_\_\_            No

**Age:** \_\_\_\_\_

**Country of Origin:** \_\_\_\_\_

**ADULT TEMPERAMENT QUESTIONNAIRE (VERSION 1.3)**

**Directions**

On the following pages you will find a series of statements that individuals can use to describe themselves. There are no correct or incorrect responses. All people are unique and different, and it is these differences which we are trying to learn about. Please read each statement carefully and give your best estimate of how well it describes you. Circle the appropriate number below to indicate how well a given statement describes you.

<u>circle #:</u>	<u>if the statement is:</u>
1	extremely untrue of you
2	quite untrue of you
3	slightly untrue of you
4	neither true nor false of you
5	slightly true of you
6	quite true of you
7	extremely true of you

If one of the statements does not apply to you (for example, if it involves driving a car and you don't drive), then circle "X" (not applicable). Check to make sure that you have answered every item.

1. I become easily frightened.  
1 2 3 4 5 6 7  
X
2. I am often late for appointments.  
1 2 3 4 5 6 7 X
3. Sometimes minor events cause me to feel intense happiness.  
1 2 3 4 5 6 7  
X
4. I find loud noises to be very irritating.  
1 2 3 4 5 6 7  
X
5. It's often hard for me to alternate between two different tasks.  
1 2 3 4 5 6 7  
X
6. I rarely become annoyed when I have to wait in a slow moving line.  
1 2 3 4 5 6 7  
X
7. I would not enjoy the sensation of listening to loud music with a laser light show.  
1 2 3 4 5 6 7  
X
8. I often make plans that I do not follow through with.  
1 2 3 4 5 6 7  
X
9. I rarely feel sad after saying goodbye to friends or relatives.  
1 2 3 4 5 6 7  
X
10. Barely noticeable visual details rarely catch my attention.



1            2            3            4            5            6            7

X

11. Even when I feel energized, I can usually sit still without much trouble if it's necessary.

1            2            3            4            5            6            7

X

12. Looking down at the ground from an extremely high place would make me feel uneasy.

1            2            3            4            5            6            7

X

13. When I am listening to music, I am usually aware of subtle emotional tones.

1            2            3            4            5            6            7

X

14. I would not enjoy a job that involves socializing with the public.

1            2            3            4            5            6            7

X

15. I can keep performing a task even when I would rather not do it.

1            2            3            4            5            6            7

X

16. I sometimes seem to be unable to feel pleasure from events and activities that I should enjoy.

1            2            3            4            5            6            7

X

17. I find it very annoying when a store does not stock an item that I wish to buy.

1            2            3            4            5            6            7

X

18. I tend to notice emotional aspects of paintings and pictures.

1            2            3            4            5            6            7

X

19. I usually like to talk a lot.

1 2 3 4 5 6 7

X

20. I seldom become sad when I watch a sad movie.

1 2 3 4 5 6 7

X

21. I'm often aware of the sounds of birds in my vicinity.

1 2 3 4 5 6 7

X

22. When I am enclosed in small places such as an elevator, I feel uneasy.

1 2 3 4 5 6 7

X

23. When listening to music, I usually like turn up the volume more than other people.

1 2 3 4 5 6 7

X

24. I sometimes seem to understand things intuitively.

1 2 3 4 5 6 7

X

25. Sometimes minor events cause me to feel intense sadness.

1 2 3 4 5 6 7

X

26. It is easy for me to hold back my laughter in a situation when laughter wouldn't be appropriate

1 2 3 4 5 6 7 X

27. I can make myself work on a difficult task even when I don't feel like trying.
- 1          2          3          4          5          6          7
- X
28. I rarely ever have days where I don't at least experience brief moments of intense happiness.
- 1          2          3          4          5          6          7
- X
29. When I am trying to focus my attention, I am easily distracted.
- 1          2          3          4          5          6          7
- X
30. I would probably enjoy playing a challenging and fast paced video-game that makes lots of noise and has lots of flashing, bright lights.
- 1          2          3          4          5          6          7
- X
31. Whenever I have to sit and wait for something (e.g., a waiting room), I become agitated.
- 1          2          3          4          5          6          7
- X
32. I'm often bothered by light that is too bright.
- 1          2          3          4          5          6          7
- X
33. I rarely notice the color of people's eyes.
- 1          2          3          4          5          6          7
- X
34. I seldom become sad when I hear of an unhappy event.
- 1          2          3          4          5          6          7
- X

35. When interrupted or distracted, I usually can easily shift my attention back to whatever I was doing before.

1 2 3 4 5 6 7

X

36. I find certain scratchy sounds very irritating.

1 2 3 4 5 6 7

X

37. I like conversations that include several people.

1 2 3 4 5 6 7

X

38. I am usually a patient person.

1 2 3 4 5 6 7 X

39. When I am resting with my eyes closed, I sometimes see visual images.

1 2 3 4 5 6 7

X

40. It is very hard for me to focus my attention when I am distressed.

1 2 3 4 5 6 7

X

41. Sometimes my mind is full of a diverse array of loosely connected thoughts and images.

1 2 3 4 5 6 7

X

42. Very bright colors sometimes bother me.

1 2 3 4 5 6 7

X

43. I can easily resist talking out of turn, even when I'm excited and want to express an idea.

1 2 3 4 5 6 7

X

44. I would probably not enjoy a fast, wild carnival ride.

1 2 3 4 5 6 7

X

45. I sometimes feel sad for longer than an hour.

1 2 3 4 5 6 7

X

46. I rarely enjoy socializing with large groups of people.

1 2 3 4 5 6 7

X

47. If I think of something that needs to be done, I usually get right to work on it.

1            2            3            4            5            6            7

X

48. *It doesn't take very much to make feel frustrated or irritated.*

1            2            3            4            5            6            7

X

49. It doesn't take much to evoke a happy response in me.

1            2            3            4            5            6            7

X

50. When I am happy and excited about an upcoming event, I have a hard time focusing my attention on tasks that require concentration.

1            2            3            4            5            6            7

X

51. Sometimes, I feel a sense of panic or terror for no apparent reason.
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
- X
52. I often notice mild odors and fragrances.
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
- X
53. I often have trouble resisting my cravings for food drink, etc.
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
- X
54. Colorful flashing lights bother me.
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
- X
55. I usually finish doing things before they are actually due (for example, paying bills, finishing homework, etc.).
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
- X
56. I often feel sad.
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
- X
57. I am often aware how the color and lighting of a room affects my mood.
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
- X
58. I usually remain calm without getting frustrated when things are not going smoothly for me.
- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
- X

59. Loud music is unpleasant to me.

1 2 3 4 5 6 7

X

60. When I'm excited about something, it's usually hard for me to resist jumping right into it before I've considered the possible consequences.

1 2 3 4 5 6 7

X

61. Loud noises sometimes scare me.

1 2 3 4 5 6 7

X

62. I sometimes dream of vivid, detailed settings that are unlike anything that I have experienced when awake.

1 2 3 4 5 6 7

X

63. When I see an attractive item in a store, it's usually very hard for me to resist buying it.

1 2 3 4 5 6 7

X

64. I would enjoy watching a laser show with lots of bright, colorful flashing lights.

1 2 3 4 5 6 7

X

65. When I hear of an unhappy event, I immediately feel sad.

1 2 3 4 5 6 7

X

66. When I watch a movie, I usually don't notice how the setting is used to convey the mood of the characters.

1 2 3 4 5 6 7

X



67. I usually like to spend my free time with people.  
1            2            3            4            5            6            7  
X
68. It does not frighten me if I think that I am alone and suddenly discover someone close by.  
1            2            3            4            5            6            7  
X
69. I am often consciously aware of how the weather seems to affect my mood.  
1            2            3            4            5            6            7  
X
70. It takes a lot to make me feel truly happy.  
1            2            3            4            5            6            7  
X
71. I am rarely aware of the texture of things that I hold.  
1            2            3            4            5            6            7  
X
72. When I am afraid of how a situation might turn out, I usually avoid dealing with it.  
1            2            3            4            5            6            7  
X
73. I especially enjoy conversations where I am able to say things without thinking first.  
1            2            3            4            5            6            7  
X
74. Without applying effort, creative ideas sometimes present themselves to me.  
1            2            3            4            5            6            7  
X
75. When I try something new, I am rarely concerned about the possibility of failing.

1 2 3 4 5 6 7

X

76. It is easy for me to inhibit fun behavior that would be inappropriate.

1 2 3 4 5 6 7

X

77. I would not enjoy the feeling that comes from yelling as loud as I can.

1 2 3 4 5 6 7 X

Modified Network of Relationship Inventory

**My Relationship**

Now we would like you to answer the following questions about your best friend.

**1. How much free time do you spend with this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**2. How much do you and this person get upset with or mad at each other?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**3. How much does this person teach you how to do things that you don't know?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**4. How much do you and this person get on each other's nerves?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**5. How much do you talk about everything with this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**6. How much do you help this person with things she/he can't do by her/himself?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**7. How much does this person like or love you?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**8. How much does this person treat you like you're admired and respected?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**9. Who tells the other person what to do more often, you or this person?**

	S/he Always Does	S/he Often Does	About the Same	I Often Do	I Always Do
(FRIEND)	1	2	3	4	5

**10. How sure are you that this relationship will last no matter what?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**11. How satisfied are you with your relationship with this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**12. How often does this person point out your faults or put you down?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**13. How often does this person get his/her way when you two do not agree about what to do?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**14. How often do you turn to this person for support with personal problems?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**15. How much do you play around and have fun with this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**16. How much do you and this person disagree and quarrel?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**17. How much does this person help you figure out or fix things?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**18. How much do you and this person get annoyed with each other's behavior?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**19. How much do you share your secrets and private feelings with this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**20. How much do you protect and look out for this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**21. How much does this person really care about you?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**22. How much does this person treat you like you're good at many things?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**23. Between you and this person, who tends to be the BOSS in this relationship?**

	S/he Always Does	S/he Often Does	About the Same	I Often Do	I Always Do
(FRIEND)	1	2	3	4	5

**24. How sure are you that your relationship will last in spite of fights?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**25. How good is your relationship with this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**26. How often does this person criticize you?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**27. How often does this person end up being the one who makes the decisions for both of you?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**28. How often do you depend on this person for help, advice, or sympathy?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**29. How often do you go places and do enjoyable things with this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**30. How much do you and this person argue with each other?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**31. How often does this person help you when you need to get something done?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**32. How much do you and this person hassle or nag one another?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**33. How much do you talk to this person about things that you don't want others to know?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**34. How much do you take care of this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**35. How much does this person have a strong feeling of affection (loving or liking) toward you?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**36. How much does this person like or approve of the things you do?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**37. In your relationship with this person, who tends to take charge and decide what should be done?**

	S/he Always Does	S/he Often Does	About the Same	I Often Do	I Always Do
(FRIEND)	1	2	3	4	5

**38. How sure are you that your relationship will continue in the years to come?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**39. How happy are you with the way things are between you and this person?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**40. How often does this person say mean or harsh things to you?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**41. How often does this person get you to do things his/her way?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**42. When you are feeling down or upset, how often do you depend on this person to cheer things up?**

	Little or None	Somewhat	Very Much	Extremely Much	The Most
(FRIEND)	1	2	3	4	5

**43. How long have you been friends with (FRIEND)?**

less than 1 yr.     1 – 2 yrs.     2 – 3 yrs.     3 – 4 yrs.     4 – 5 yrs.  
 5 – 6 yrs.     6 – 7 yrs.     7 – 8 yrs.     8 – 9 yrs.     more than 9 yrs.



Modified Six Dimensions of Parenting Questionnaire  
Response scale for all items is:

A) Not at all true  
D) Very true

B) Not very true

C) Sort of true

(scored as 1)

(scored as 2)

(scored as 3)

(scored as 4)

I.

Modified--Parents as Social Context Questionnaire (PASCQ ) (Parent-Report)

Warmth

1. My father knows a lot about what goes on with me. (I know a lot about what goes on for my child.)
2. My father really knows how I feel about things. (I really know how my child feels about things.)
3. My father and I do special things together. (I do special things with my child.)
4. My father lets me know he loves me. (I let my child know I love him/her.)

Rejection

5. My father doesn't understand me very well. (I don't understand my child very well.)
6. Sometimes I feel like my father thinks I'm difficult to like. (Sometimes my child is hard to like.)
7. At times, I feel like my father thinks the requests I make are a burden. (At times, the demands that my child makes feel like a burden.)
8. I feel like I need more time than my father can give me. (My child needs more than I have time to give him/her.)

Structure

9. My father makes it clear what will happen if I don't follow his rules. (I make it clear what will happen if my child does not follow our rules.)
10. My father's expectations for me are clear. (I make it clear to my child what I expect from him/her.)
11. My father expects me to follow our family rules. (I expect my child to follow our family rules.)
12. When my father tells me that he will do something, he does it. (When I tell my child I'll do something, I do it.)

Chaos

13. When I get in trouble, my father's reaction is not very predictable. (When my child gets in trouble, my reaction is not very predictable.)
14. I don't know what my father expects from me. (My child doesn't seem to know what I expect from him/her.)
15. My father changes the rules a lot at home. (I change the rules a lot at home.)

16. My father gets mad at me with no warning. (I can get mad at my child with no warning.)

Autonomy Support

17. My father encourages me to express my feelings even when they're hard to hear. (I encourage my child to express his/her feelings even when they're hard to hear.)

18. My father encourages me to express my opinions even when he doesn't agree with them. (I encourage my child to express his/her opinions even when I don't agree with them.)

19. My father encourages me to be true to myself. (I encourage my child to be true to her/himself.)

20. My father expects me to say what I really think. (I expect my child to say what he/she really thinks.)

Coercion

21. I fight with my father frequently. (My child fights me at every turn.)

22. My father often yells at me to get me to do something. (To get my child to do something, I have to yell at him/her.)

23. My father has to push me to do things. (I sometimes feel that I have to push my child to do things.)

24. I often get into power struggles with my father. (I find getting into power struggles with my child.)

Note. Modified from the original version to reflect *child's* perspective of *only* the paternal relationship.

Original items are in parentheses, but will not be administered to participants. Adapted from an earlier version of Parents as Social Context Questionnaire (PASCQ) (Skinner, Regan, & Wellborn, 1986).

Responses ranged from "Not at all true" (1) to "Very true" (4).

See: Skinner, E., Johnson, S., & Snyder, T. (2005). Six dimensions of parenting: A motivational model. *Parenting: Science and Practice*, 5, 175-235

C: Video Coding Form

Dyad Number: \_\_\_\_\_

Group: (PT/C): \_\_\_\_\_

Date: \_\_\_\_\_

Coder: \_\_\_\_\_

Length of Time Spent Discussing Problem (total): \_\_\_\_\_

Start: \_\_\_\_\_ Stop: \_\_\_\_\_

Start: \_\_\_\_\_ Stop: \_\_\_\_\_

Start: \_\_\_\_\_ Stop: \_\_\_\_\_

Start: \_\_\_\_\_ Stop: \_\_\_\_\_

	Very Untrue of Dyad			Very True of Dyad	
Rehasing	1	2	3	4	5
Speculating	1	2	3	4	5
Dwelling on Negative Affect	1	2	3	4	5
Encouraging Problem Talk	1	2	3	4	5

Rehasing: e.g., talking about every detail about the problem, talking about parts of the problem over and over

Speculating: e.g., talking about why the problem may have happened, talking about bad things that might happen because of the problem, talking about parts of the problem that are not understood

Dwelling on Negative Affect: e.g., talking about how bad the person with the problem feels, talking about how upset, sad, or mad the person with the problem feels

Encouraging Problem Talk: e.g., trying to keelp one another taling about the problems, trying to get each other to tell every detail about the problems

Number of solutions generated: \_\_\_\_\_

Solution decided? \_\_\_\_\_

Content of problem discussed: (e.g., female-female competition, male choice, friendships, or non-psychosocial—money issues, academic issues): \_\_\_\_\_

\_\_\_\_\_

## REFERENCE LIST

- Alexander, R.D. (1989). Evolution of the human psyche. In P. Mellars &
- Adersson, M. (1994) *Sexual Selection*. Princeton, N.J.: Princeton University Press.
- Barr, C.S., Newman, T.K., Shannon, C., Parker, C., Dvaskin, R.L., Becker, M.L. et al. (2004). Rearing condition and rh5-HTTLPR interact to influence limbic-hypothalamic-pituitary-adrenal axis response to stress in infant macaques. *Biological Psychiatry*, 58, 733-758.
- Beck, A.T., Epstein, N., Brown, G., & Steer, R. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, 56, 893-897.
- Belle, D. (1991). Gender differences in the social moderators of stress. In. A. Monat & R. Columbia University Press.
- Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Dev*, 62, 647-670.
- Benenson, J.F., Apostoleris, N.H., Parnass, J. (1997). Age and sex differences in dyadic and group interaction. *Developmental Psychology*, 33, 538-543.
- Benenson, J. F; Roy, R.; Waite, A.; Goldbaum, S.; Linders, L.; Simpson, A. (2002) Greater discomfort as a proximate cause of sex differences in competition. *Merrill-Palmer Quarterly*, 48, 225-247.
- Benenson, J. F., & Christakos, A. (2003). The greater fragility of females' versus males' closest same-sex friendships. *Child Development*, 74, 1123-1129.
- Bentler, P.M. (1990). Comparative fit indexes in structural models. *Psychological*

*Bulletin*, 107, 238-246.

- Bentler, P.M. & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures, *Psychological Bulletin*, 88, 588-606.
- Best, D. L. & Williams, J.E. (1993). A cross-cultural viewpoint. In A.E. Beall & R. J. Sternberg (Eds.), *The psychology of gender* (pp.215-248). New York: Guilford Press.
- Boyce, W.T, O'Neill-Wagner, P., Price, C.S., Haines, M., & Suomi, S.J. (1998). Crowding stress and violent injuries among behaviorally inhibited Rhesus Macaques. *Health Psychology*, 17, 285-289.
- Boyce, W.T., & Ellis, B.J. (2005). Biological Sensitivity to Context: An Evolutionary-Developmental Theory of the Origins and Functions of Stress Reactivity. *Development and Psychopathology* 17: 271-301.
- Bremner, J. D., & Vermetten, E. (2001). Stress and development: Behavioral and biological consequences. *Development & Psychopathology*, 13, 473-489.
- Buss, D.M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences*, 12, 1-49.
- Byrd-Craven, J., Geary, D.C., Vigil, J.M., & Hoard, M.K. (2007). One mate or two? Life history traits and reproductive variation in low income women. *Acta Psychologica Sinica*, 39, 469-480.
- Byrne, G., & Suomi, S.J. (2002). Cortisol reactivity and its relation to homecage behavior and personality ratings in tufted capuchin (*Cebus apella*) juveniles from birth to six years of age. *Psychoneuroendocrinology*, 27, 139-154.
- Caldji, C., Tannenbaum, B., Sharma, S., Francis, D. Plotsky, P.M., & Meaney, M.J.

- (1998). Maternal care during infancy regulates the development of neural systems mediating the expression of fearfulness in the rat. *Proceedings of the National Academy of Sciences USA*, 95, 5335-5340.
- Calkins, S. D., & Fox, N. A. (1992). The relations among infant temperament, security of attachment, and behavioral inhibition at twenty-four months. *Child Dev*, 63(6), 1456-1472.
- Camarena, P.M., Sarigiani, P.A., & Peterson, A.C. (1990). Gender-specific pathways to intimacy in early adolescence. *Journal of Youth and Adolescence*, 19, 19-32.
- Cameron, NM, Champagne, F. A., Parent, C., Fish, E.W., Ozaki-Kuroda, K., & Meaney, M.J. (2005). The programming of individual differences in defensive responses and reproductive strategies in the rat through variations in maternal care. *Neuroscience and Biobehavioral Reviews*, 29, 843-865.
- Caspi, A. (2000). The child is the father of the man: Personality continuities from childhood to adulthood. *Journal of Personality and Social Psychology*, 78, 158-172.
- Chagnon, N.A. (1988). Life histories, blood revenge, and warfare in a tribal population. *Science*, 239, 985-992.
- Charlesworth, W.R., & Dzur, C. (1987). Gender comparisons of preschoolers' behavior and resource utilization in group problem-solving. *Child Development*, 58, 191-200.
- Crick, N. R., Bigbee, M. A., & Howes, C. (1996). Gender differences in children's normative beliefs about aggression: How do I hurt thee? Let me count the ways. *Child Development*, 67, 1003-1014.

- Crick, N. R., & Zahn-Waxler, C. (2003). The development of psychopathology in males and females: Current progress and future challenges. *Development and Psychopathology, 15*, 719-742.
- Darwin, C. (1871). *The descent of man, and selection in relation to sex*. London: John Murray.
- Davis, E.P., Donzella, B., Krueger, W.K., & Gunnar, M.R. (1999). The start of a new school year: Individual differences in salivary cortisol response in relation to child temperament. *Developmental Psychobiology, 35*, 188-196.
- Derryberry, D. & Rothbart, M.K. (1988). Arousal, affect, and attention as components of temperament. *Journal of Personality and Social Psychology, 55*, 958-966.
- Dickerson, S.S. & Kemeny, M.E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin, 130*, 355-391.
- Draper, P. & Harpending, H. (1988). A sociobiological perspective on the development of human reproductive strategies. In K.B. MacDonald (Ed.), *Sociobiological perspectives on human development* (pp. 340-372). New York: Springer-Verlag.
- Eder, D. & Hallinan, M.T. (1978). Sex differences in children's friendships. *American Sociological Review, 43*, 237-250.
- Ellis, B. J., McFadyen-Ketchum, S., Dodge, K. A., Pettit, G. S., & Bates, J. E. (1999). Quality of early family relationships and individual differences in the timing of pubertal maturation in girls: A longitudinal test of an evolutionary model. *Journal of Personality & Social Psychology, 77*(2), 387-401.
- Ellis, B. J. (2004) Timing of Pubertal Maturation in Girls: An Integrated Life History Approach. *Psychological Bulletin 130*: 920-958.

- Ellis, B.J., Jackson, J.J., & Boyce, W.T. (2006). The stress response systems: Universality and adaptive individual differences. *Developmental Review, 26*, 175-212.
- Essex, M. J., Klein, M. H., Cho, E., & Kalin, N. H. (2002). Maternal stress beginning in infancy may sensitize children to later stress exposure: Effects on cortisol and behavior. *Biol Psychiatry, 52*, 776-784.
- Figueredo, A. J., Vasquez, G. Brumbach, B.H., et al. (2006) Consilience and Life History Theory: From Genes to Brain to Reproductive Strategy. *Developmental Review, 26*: 243-275.
- Flinn, M. V. (1988) Mate guarding in a Caribbean village. *Ethology and Sociobiology, 8*, 1-28.
- Flinn, M.V., Turner, M.T., Decker, S.A. & England, B.G. (1996). Male-female differences in effects of parental absence on glucocorticoid stress response. *Human Nature, 7*, 125-162.
- Flinn, M.V. (2006). Evolution and ontogeny of the stress response to social challenges in the human child. *Developmental Review, 26*, 138-174.
- Foley, R.A. & Lee, P.C. (1989). Finite social space, evolutionary pathways, and reconstructing hominid behavior. *Science, 243*, 901-906.
- Francis, D.D. & Meaney, M.J. (1999). Maternal care and the development of stress responses. *Current Opinion in Neurobiology, 9*, 128-134.
- Furman, W. & Buhrmester, D (1985). Children's perceptions of the personal relationship and their social networks. *Developmental Psychology, 21*, 1016-1024.
- Galen, B. R., & Underwood, M. K. (1997). A developmental investigation of social



- aggression among children. *Developmental Psychology*, 33, 589-600.
- Gore, S., & Colten, M. E. (1991). Gender, stress, and distress: Social relational influences. In J. Eckenrode (Ed.), *The social context of coping* (pp. 139-163). New York: Plenum Press.
- Geary, D.C. (1998). *Male, female: The evolution of human sex differences*. Washington, DC: American Psychological Association
- Geary, D. C. (2002). Sexual selection and sex differences in social cognition. In A. V. McGillicuddy-De Lisi & R. De Lisi (Eds.), *Biology, society, and behavior: The development of sex differences in cognition* (pp. 23-53). Greenwich, CT: Ablex/Greenwood.
- Geary, D. C. (2005). *The origin of mind: Evolution of brain, cognition, and general intelligence*. Washington, DC: American Psychological Association.
- Geary, D. C. (2006). Evolutionary developmental psychology: Current status and future directions. *Developmental Review*, 26.
- Geary, D. C., Byrd-Craven, J., Hoard, M.K., Vigil, J. & Numtee, C. (2003). Evolution and development of boys' social behavior. *Developmental Review*, 23, 444-470.
- Geary, D.C., & Flinn, M.V. (2001). Evolution of human parental behavior and the human family. *Parenting: Science and Practice*, 5-61.
- Andersson, M. (1994). *Sexual selection*. Princeton, NJ: Princeton University Press.
- Geary, D.C. & Flinn, M.V. (2002). Sex differences in behavioral and hormonal response to social threat: Commentary on Taylor et al (2000). *Psychological Review*, 109, 745-750.
- Ghinglieri, M.P. (1987). Sociobiology of the great apes and the hominid ancestor.

*Journal of Human Evolution*, 16, 319-357.

Goodall, J. (1986). *The chimpanzees of Gombe: Patterns of behavior*. Cambridge, MA: The Belknap Press.

Gunnar, M.R. (1992, August). *Psychoendocrine studies of adaptation in normally functioning nursery school children*. Invited address for the XXIII Congress of International Society of Psychoneuroendocrinology, Madison, WI.

Gunnar M.R. (1994). Psychoendocrine studies of temperament and stress in early childhood: Expanding current models. In Bates, J.E. & Wachs, T.D. *Temperament: Individual differences at the interface of biology and behavior* pp. 175-198. Washington, DC: APA press.

Gunnar, M.R., Bruce, J., Grotevant, H.D. (2000). International adoption of institutionally reared children: Research and policy. *Development & Psychopathology*, 12, 677-693.

Gunnar, M.R., Larson, M.C., Hertzgard, L., Harris, M.L. & Brodersen, L. (1992). The stressfulness of separation among 9 month old infants: Effects of social context variables in infant temperament. *Child Development*, 63, 290-303.

Gunnar, M. and Vasquez, D.M. (2001). Low cortisol and a flattening of expected daytime rhythm: Potential indices of risk in human development. *Development & Psychopathology*, 13, 515-538.

Gunnar, Megan R; & Donzella, Bonny (2002). Social regulation of the cortisol levels in early human development. *Psychoneuroendocrinology*, 27, 199-220.

Gunnar, M.R., Morison, S.J., Chisholm, K., Schuder, M. (2001). Salivary cortisol levels in children adopted from Romanian orphanages, *Development &*

- Psychopathology*, 13,611-628.
- Gunnar, Megan R; Seban, Anne M; Tout, Kathryn; Donzella, Bonny; van Dulmen, & Manfred M. H. (2003). Peer Rejection, Temperament, and Cortisol Activity in Preschoolers. *Developmental Psychobiology*, 43, 346-358.
- Habib, K. E., Gold, P. W., & Chrousos, G. P. (2001). Neuroendocrinology of stress. *Neuroendocrinology*, 30(3), 695-728.
- Hamilton, W.D. (1964). The genetical evolution of social behavior II. *Journal of Theoretical Biology*, 7, 17-52.
- Hane, A.A & Fox, N.A. (2006). Ordinary variations in maternal caregiving influence human infants' stress reactivity. *Psychological Science*, 17, 550-556.
- Hankin, B. L., & Abramson, L. Y. (2001). Development of gender differences in depression: An elaborated cognitive vulnerability-transactional stress theory. *Psychological Bulletin*, 127, 773-796.
- Hart, B.I., & Thompson, J.T. (1997). Gender role characteristics and depressive symptomatology among adolescents. *Journal of Early Adolescence*, 16, 407-426.
- Hartup, W.W., & Stevens, N. (1997). Friendships and adaptation in the life course. *Psychological Bulletin*, 121, 355-370.
- Harris, J.R. (1995). Where is the child's environment? A group socialization theory of development. *Psychological Review*, 18, 1189-1203.
- Hastings, T. L., Anderson, S. J., & Kelley, M. L. (1996). Gender differences in coping and daily stress in conduct-disordered and non-conduct-disordered adolescents. *Journal of Psychopathology and Behavioral Assessment*, 18, 213-226.
- Heim, C., & Nemeroff, C. B. (1999). The impact of early adverse experiences on brain

- systems involved in the pathophysiology of anxiety and affective disorders. *Biol Psychiatry*, 46(11), 1509-1522.
- Hofer, M.A. (1994). Early relationships as regulators of infant physiology and behavior. *Acta Paediatrica Supplementum*, 397, 9-18.
- Horowitz, D.L. (2001). *The deadly ethnic riot*. Berkeley, CA: University of California Press
- Huether, G. (1996). The central adaptation syndrome: Psychosocial stress as a trigger for adaptive modifications of brain structure and brain function. *Progress in Neurobiology*, 48, 569-612.
- Huether, G. (1998). Stress and the adaptive self-organization of neural connectivity during childhood. *International Journal of Developmental Neuroscience*, 16, 297-306.
- Huether, G., Doering, S., Ruger, U., Ruther, E., Schussler, G. (1999). The stress-reaction process and the adaptive modification and reorganization of neuronal networks. *Psychiatry Research*, 87, 83-95.
- Irons, W. (1979). Cultural and biological success. In N.A. Chagnon & W. Irons (Eds), *Natural Selection and social behavior* (pp. 257-272). North Scituate, MA: Duxbury Press.
- Jaffe, S.R., Caspi, A., Moffit, T.E., Taylor, A. (2004). Physical maltreatment victim to antisocial child: Evidence of environmentally mediated process. *Journal of Abnormal Psychology*, 113, 44-55.
- Kagan, J., Snidman, N., Zentner, M., & Peterson, E. (1999). Infant temperament and anxious symptoms in school age children. *Development and Psychopathology*,

11(2), 209-224.

Keeley, L.H. (1996). *War before civilization: The myth of the peaceful savage*. New York: Oxford University Press.

Keenan, K., & Shaw, D. (1997). Developmental and social influences on young girls' early problem behavior. *Psychological Bulletin*, 121, 95-113.

Kendler, K. S., Thornton, L. M., & Prescott, C. A. (2001). Gender differences in the rates of exposure to stressful life events and sensitivity to their depressogenic effects. *American Journal of Psychiatry*, 158, 587-593.

Leadbeater, B.J., Blatt, S.J. & Quinlan, D.M. (1995). Gender-linked vulnerabilities to depressive symptoms, stress, and problem behaviors in adolescents. *Journal of Research on Adolescence*, 5, 1-29.

Lever, J. (1978). Sex differences in the complexity of children's play and games. *American Sociological Review*, 43, 471-483.

Lewinsohn, P. M., Gotlib, I. H., Lewinsohn, M., Seeley, J. R., & Allen, N. B. (1997). Gender differences in anxiety disorders and anxiety symptoms in adolescents. *Journal of Abnormal Psychology*, 107, 109-117.

Liu, D., Diorio, J., Tannenbaum, B., Caldji, C., Francis, D., Freedman, A., et al. (1997). Maternal care, hippocampal glucocorticoid receptors, and hypothalamic-pituitary-adrenal responses to stress. *Science*, 277, 1659-1662.

Lupien, S. J., King, S., Meaney, M. J., & McEwen, B. S. (2000). Child's stress hormone levels correlate with mother's socioeconomic status and depressive state. *Biological Psychiatry*, 48(10), 976-980.

Maccoby, E.E. (1988). Gender as a social category. *Developmental Psychology*, 24,

755-765.

Maccoby, E. E. (1990). Gender and relationships: A developmental account. *American Psychologist*, 45, 513-520.

MacDonald, K. (1992). Warmth as a developmental construct: An evolutionary analysis. *Child Development*, 63, 753-773.

Martin, C. L., & Fabes, R. A. (2001). The stability and consequences of younger children's same-sex peer interactions. *Developmental Psychology*, 37, 431-446.

McEwen, B. S. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine*, 338(3), 171-179.

Meaney, M. J. (2001). Maternal care, gene expression, and the transmission of individual differences in stress reactivity across generations. *Annu Rev Neurosci*, 24, 1161-1192.

Meyer, S. E., Chrousos, G. P., & Gold, P. W. (2001). Major depression and the stress system: a life span perspective. *Dev Psychopathol*, 13(3), 565-580.

Moffitt, T. E., Caspi, A., Belsky, J., & Silva, P. A. (1992). Childhood experience and the onset of menarche: A test of a sociobiological model. *Child Development*, 63, 47-58.

Moore, C.L. & Power, K.L. (1992). Variation in maternal care and individual differences in play, exploration, and grooming of juvenile Norway rat offspring. *Developmental Psychobiology*, 25, 165-182.

Murdock, G.P. (1981). *Atlas of world cultures*. Pittsburgh: University of Pittsburgh Press.

Nachmias, M. (1993). *Maternal personality relations with toddler's attachment*

*classification, use of coping strategies, and adrenocortical stress response.*

Paper presented at the 60<sup>th</sup> annual meeting of the Society for Research in Child Development, New Orleans, LA.

Nesse, R. M., & Young, E. A. (2000). Evolutionary origins and functions of the stress response. In G. Fink (Ed.), *Encyclopedia of Stress* (Vol. 2, pp. 79-84): Academic Press.

Osman, A., Kopper, B.A., Barrios, F, Gutierrez, P.M., & Bagge, C. L. (2004). Reliability and validity of the Beck Depression Inventory-II with adolescent psychiatric inpatients. *Psychological Assessment*, 16, 120-132.

Parker, J.G. & Asher, S. R. (1993). Friendship and friendship quality in middle childhood: Links with peer group acceptance and feelings of loneliness and social dissatisfaction. *Developmental Psychology*, 29, 611-621.

Pasternak, B., Ember, C.R., & Ember, M. (1997). *Sex, gender, and kinship: A cross-cultural perspective*. Upper Saddle River, NJ: Prentice-Hall.

Paquette, J. A., & Underwood, M. K. (1999). Gender differences in young adolescents' experiences of peer victimization: Social and physical aggression. *Merrill-Palmer Quarterly*, 45, 242-266.

Quas, J. A., Bauer, A. M., & Boyce, W. T. (2004, In press). Physiological reactivity, social support, and memory in early childhood. *Child Development*.

Rabin, B.S. (1999). *Stress, Immune Function, and Health: The Connection*. Wiley-Liss, Inc.

Roberts, W., & Strayer, J. (1996). Empathy, emotional expressiveness, and prosocial behavior. *Child Development*, 67, 449-470.

- Rose, A. J., & Asher, S. R. (1999). Children's goals and strategies in response to conflicts within a friendship. *Developmental Psychology, 35*, 69-79.
- Rose, A. J. (2002). Co-rumination in the friendships of girls and boys. *Child Development, 73*, 1830-1843.
- Rose, A. J., & Rudolph, K. D. (2006). A review of sex differences in the peer relationship processes: Potential trade-offs for the emotional and behavioral development of girls and boys . *Psychological Bulletin, 132*, 98-131.
- Rothbart, M.K., Ahadi, S.A. & Evans, D.E. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology, 78*, 122-135.
- Sanchez, M. M., Ladd, C. O., & Plotsky, P. M. (2001). Early adverse experience as a developmental risk factor for later psychopathology: evidence from rodent and primate models. *Dev Psychopathol, 13*(3), 419-449.
- Sapolsky, R. M., Romero, L. M., & Munck, A. U. (2000). How do glucocorticoids influence stress responses? Integrating permissive, suppressive, stimulatory, and preparative actions. *Endocrine Reviews, 21*(1), 55-89.
- Savin-Williams, R. (1979). Dominance hierarchies in groups of early adolescents. *Child Development, 50*, 923-935.
- Savin-Williams, R.C. (1987). *Adolescence: An ethological perspective*. New York: Springer.
- Schwartz, J.A.J. & Koenig, L.J. (1996). Response styles and negative affect among adolescents. *Cognitive Therapy and Research, 20*, 13-36.
- Seielstad, M. (2000). Asymmetries in the maternal and paternal genetic histories of



- Columbian populations. *American Journal of Human Genetics*, 67, 1062-1066.
- Seielstad, M.T., Minch, E. & Cavalli-Sforza, L.L. (1998). Genetic evidence for a higher female migration rate in humans. *Nature Genetics*, 20, 278-280.
- Sherif, M., Harvey, O.J., White, B.J., Hood, W.R., & Sherif, C.W. (1961). *Intergroup conflict and cooperation: the Robbers Cave experiment*. Normal, OK: Institute of Group Relations, University of Oklahoma.
- Skinner, E., Johnson, S., & Snyder, T. (2005). Six dimensions of parenting: A motivational model. *Parenting: Science and Practice*, 5, 175-235.
- Soper, D. S. (2007). A-priori sample size calculator. *Free Statistics Calculations* (Online Software), <http://www.danielsoper.com/statcalc>.
- Stern, J.M. & Kerr, S.E. (2002). Acute hunger of rat pups elicits increased nursing and shorter intervals between nursing bouts: Implications for changes in nursing with time postpartum. *Journal of Comparative Psychology*, 116, 83-92.
- Strough, J., & Berg, C. A. (2000). Goals as a mediator of gender differences in high-affiliation dyadic conversations. *Developmental Psychology*, 36, 117-125.
- Suomi, S. J. (1997). Early determinants of behaviour: evidence from primate studies. *British Medical Bulletin*, 53, 170-184.
- Suomi, S.J., Eisele, C.D., Grady, S.A., & Harlow, H.F. (1975). Depressive behavior in adult monkeys following separation from family environment. *Journal of Abnormal Psychology*, 84, 576-578.
- Suomi, S.J., Harlow, H.F. & Domek, C.J. (1970). Effect of repetitive infant-infant separation of young monkeys. *Journal of Abnormal Psychology*, 26, 161-172.
- Surbey, M. K. (1990). Family composition, stress, and the timing of human menarche. In

- T. E. Ziegler (Ed.), (1990) (pp. 11-32). New York, NY, US: Wiley-Liss
- Taylor, S.E., Klein, L.C., Lewis, B.P. Gruenwald, T.L., Gurung, R.A.R, & Updegraff, J.A. (2002). Sex differences in biobehavioral response to stress in females: Tend-and-befriend, not fight-or-flight. *Psychological Review*, *107*, 411-429.
- Tolin, D.F & Foa, E. B. (2006). Sex differences in Posttraumatic Stress Disorder: A Quantitative review of 25 years of research. *Psychological Bulletin*, *132*, 959-992.
- Trivers, R.L. (1971). The evolution of reciprocal altruism. *Quarterly Review of Biology*, *46*, 35-37.
- Vigil, J.M. , Geary, D. C., Byrd-Craven (2006). Trade-offs in low income women's preferences for long-term and short-term mates: Within-sex differences in reproductive strategy. *Human Nature*, *17*, 319-336.
- Wells, R. S., Yuldasheva, N., Ruzibakiev, R. Underhill, P.A., Evseeva, I., Blue-Smith, J., Jin, L, Su, B., Pitchappan, R., Shanmugalakshmi, S., Balakrishnan, K., Read, M., Pearson, N.M., Zerjal, T., Webster, M.T., Zholoshvili, I., Jamarjashvili, E., Gambarov, S., Nikbin, B., Dostiev, A., Aknazarov, O., Zalloua, P., Tsoy, I., Kitaev, M., Mirrakhimov, M., Chariev, A., & Bodmer, W.F. (2001). The Eurasian heartland: A continental perspective on Y-chromosome diversity. *Proceedings of the National Academy of Sciences USA*, *98*, 10244-10249.
- Whiting, B. B. & Edward, C. P. (1988). *Children of different worlds: The formation of social behavior*. Cambridge, MA: Harvard University Press.
- Williams, G.C. (1957). Pleiotropy, natural selection and evolution of senescence. *Evolution*, *11*, 398-411.

Wrangham, R & Peterson, D. (1996). *Demonic males*. New York: Houghton Mifflin Company.

Yehuda, R., Halligan, S. L., & Grossman, R. (2001). Childhood trauma and risk for PTSD: Relationship to intergenerational effects of trauma, parental PTSD, and cortisol excretion. *Development & Psychopathology, 13*, 733-753.

Zahn-Waxler, C. (2000). The development of empathy, guilt, and internalization of distress: Implications for gender differences in internalizing and externalizing problems. In R. J. Davidson (Ed.), *Anxiety, depression, and emotion* (pp. 222-265). New York: Oxford.

Zarbatany, L., McDougal, P., & Hymel, S. (2000). Gender-differentiated experience in the peer culture: Links to intimacy in preadolescence. *Social Development, 9*, 62-79.

## VITA

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