MODERATING FACTORS IN THE RELATIONSHIP BETWEEN SOCIAL STRESSORS AND SYMPTOMS OF PSYCHOPATHOLOGY

By

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A THESIS PRESENTED TO THE GRADUATE SCHOOL
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To my parents

ACKNOWLEDGMENTS

I thank my chair and my committee for their guidance throughout this process. I also thank my family for their unwavering support.

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The experience of psychological disorders during adolescence results in impaired functioning concurrently and is a key predictor of problems later in life. At the same time, individuals may share similar experiences yet have very different outcomes, particularly in terms of psychopathology. While many young adolescents report some degree of distress associated with peer relationships, only a small portion develops lasting psychological problems, such as depression or aggression. This study assessed the moderating effects of parenting, environmental chaos, and the cortisol/DHEAS ratio on the relationship between peer problems and symptoms of depression and aggression. Participants were 194 young adolescent boys and girls (Time 1 Mage = 10.86) and their mothers, re-assessed approximately one year later. Parenting was coded from video-taped interactions for warmth and hostility, and the degree of consistency in the child's daily routine was determined from child and maternal interviews. The cortisol/DHEAS ratio was determined using saliva and urine samples, respectively, controlling for pubertal timing. Neither environmental chaos nor parenting were identified as significant predictors of symptoms of psychopathology; however, results indicated that the

cortisol/DHEAS ratio was a significant predictor of change in depressive symptoms over time, and the interaction between the cortisol/DHEAS ratio and child report of peer ridicule was a significant predictor of change in both aggression and depressive symptoms over time. Consistent with prior research on the ratio, high cortisol and low DHEAS was predictive of depressive symptoms while the opposite was found for aggression. This study is the first to examine the moderating effects of these three factors in the development of psychopathology in young adolescents.

CHAPTER 1
INTRODUCTION

The experience of psychological disorders during adolescence results in impaired functioning concurrently and is a key predictor of problems later in life. Many studies have identified stressful experiences with peers as predictors of increases in both aggressive and depressive symptoms during the early adolescent years (Laird, Jordan, Dodge, Pettit, & Bates, 2001; Panak & Garber, 1992; Sontag & Graber, 2010). While the relationship between social stressors during adolescence and abnormal psychological adjustment has been established in the literature, it is not yet understood why many adolescents experience social stress without lasting detrimental effects. This study examined environmental and biological factors that may influence the relationship between social stressors during adolescence and psychological well-being.

Even without counting the time spent in school, adolescents spend more time socializing with similar-aged peers than with any other group of people, including their families (Larson & Verma, 1999). When asked to list the most important people in their lives, a majority of those listed by adolescents were their peers. This represents a shift from childhood, when more time is spent with family members (Larson & Richards, 1991) and the importance of family is greater than that of peers (Furman & Buhrmester, 1992). It is not until adolescence that friendships begin to display the emotional intimacy characteristic of adult relationships and become based on personal beliefs and mutual trust (Brown & Larson, 2009). While social interaction is pivotal for healthy emotional development, with increased trust and personal investment come increased risk for emotional distress (Aboud & Mendelson, 1998).

Peer relationships can have significant positive or negative influences on the young adolescent. Beneficial relationships are characterized by emotional support and intimacy; they help the individual develop a positive self-image, thereby protecting against depression and the effects of future negative social influences (Hartup, 1996; LaGreca & Harrison, 2005). However, many adolescents report that social interactions are a source of stress in their daily lives (Brooks-Gunn, 1991). Negative peer relationships are unstable or hostile, causing the young adolescent to develop a poor or inconsistent self-image (Harter, 2001). This puts the individual at a higher risk for depression (Boivin, Hymel, & Bukowski, 1995; Panak & Garber, 1992), aggressive behavior disorders (Coie, Lochman, Terry, & Hyman, 1992; Laird et al., 2001; Werner & Crick, 2004), and substance abuse (Skara et al., 2008; Sullivan, Farrell, & Kliewer, 2006). Adolescents are typically identified as having negative peer relationships if they are often teased or bullied by other peers or have few or no same-aged confidants (Achenbach & Edelbrock, 1981). The importance of friendships has been illustrated in many studies in which adolescents who reported having few or no close friendships were shown to fare worse than their peers in terms of psychological adjustment (Nangle, Erdley, Newman, Mason, & Carpenter, 2003).

From adolescence on, strikingly more girls than boys display internalizing symptoms such as depression or anxiety (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993). While some internalizing disorders, such as anxiety disorders, show a gender gap even in childhood, rates of depressive symptoms are not significantly different between boys and girls until adolescence, during which time the gender difference emerges and is maintained through adulthood (Cyranowski, Frank, Young, & Shear, 2000). A recent national study of adolescents found that over 25% of adolescents 12-17 years old

endorsed having had a period of significantly depressed mood in the last 12 months, a majority of whom were girls (62.6%; Centers for Disease Control and Prevention, 2010). Of adolescents who experience negative peer interactions, more girls than boys report feeling sad or lonely because of it (LaGreca & Harrison, 2005; Rigby, 2002). In contrast, in at least one study, boys were found to display more delinquent behaviors when ridiculed by peers (Sullivan, Farrell, & Kliwer, 2006). Overall, serious aggressive behaviors, such as physical fighting, are significantly more common in boys (Lewinsohn et al., 1993). While it has come to be understood more recently that girls and boys engage in comparable rates of aggression (Card, Stucky, Sawalani, & Little, 2008), physical aggression, which is characteristic of problem behavior disorders, is more characteristic of the aggression displayed by boys.

Parenting and Family Context

Even though adolescents spend significantly more of their time socializing with peers than any other group, parents remain key factors in their social and emotional development. Much of the parenting literature has focused on responsiveness and demandingness as critical dimensions of parenting. These have been operationalized via a wide range of parenting behaviors that may be exhibited during parent-child interactions (e.g., Hetherington & Clingempeel, 1992). For example, young adolescents of parents who display warmth and support typically display lower rates of both internalizing and externalizing symptoms (Bowes, Maughan, Caspi, Moffitt, & Arsenaut, 2010; DeVore, 2005). In addition, children of hostile mothers display more aggression (Ho, Bluestein, & Jenkins, 2008; Zadeh, Jenkins, & Pepler, 2010) and depressive symptoms (Sheeber, Davis, Leve, Hops, & Tildesley, 2007). A study by Ge and colleagues found that adolescents who had comorbid depressive symptoms and conduct problems had parents

who displayed the highest levels of hostility and the lowest levels of parental warmth (Ge, Best, Conger, & Simons, 1996).

Robert Weiss (1974)'s theory of social provisions postulates that individuals receive particular types of support (companionship, guidance, affection) from various sources in their lives (e.g. friends, parents, siblings, teachers). Furman and Buhrmester (1985) found that there is a great deal of interplay among sources of support for most adolescents such that some sources (e.g. parents) may compensate for low support from others (e.g. peers). Additional research has further supported the findings of Furman and Buhrmester, showing that warm and supportive parenting has a protective effect against bullying and rejection by peers (Bowes et al., 2010; Patterson, Cohn, & Kao, 1989). Adolescents who lack support from two main sources, such as parents and peers, have been found to have the poorest adjustment (Gauze, Bukowski, Aquan-Assee, & Sippola, 1996).

In addition to the relationship the adolescent has with his or her mother, other aspects of the home environment can have distinct effects on development. Recent studies have identified environmental chaos, or the degree or lack of routine and organization that an adolescent experiences, as salient to adolescent well-being (Matheny, Wachs, Ludwig, & Phillips, 1995). A positive home environment, which includes low household chaos, is particularly important for adolescents who experience peer victimization (Bowes et al., 2010). Chaotic home environments that contain little or no consistency or few regular routines have been shown to have negative effects on adolescents' cognitive and psychosocial development (Deater-Deckard, Mullineaux, Beekman, Petrill, Schatschneider, & Thompson, 2009; Kliewer & Kluger, 1998), beyond

the effects of socioeconomic status (Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005). Ratings of noise, foot traffic, and crowding are typically used as measures of environmental chaos (Matheny et al., 1995), but only a small number of studies have examined additional information directly related to the individual such as bedtime consistency, number of different childcare arrangements, and related aspects of regular household routines. These studies have found that such routines have a significant impact on individuals' emotional and cognitive development (Evans, 2006; Fiese et al., 2002; Johnson, Martin, Brooks-Gunn, & Petrill, 2008; Wachs & Corapci, 2005). Hence, the present investigation considered effects of both parenting (as observed in a parent-child interaction task) and household routine as moderators of the link between social problems or stress and symptoms of psychopathology.

Individual Differences in Physiological Functioning

In addition to the potential buffering effects of parenting on the relationship between social stress and psychopathology, individual differences in activity in the hypothalamic-pituitary-adrenal (HPA) axis have been identified as potential sources of vulnerability to psychosocial stress. In response to a stressor, the hypothalamus releases corticotropin-releasing hormone (CRH). CRH acts on the pituitary gland, stimulating the release of adrenocorticotropic hormone (ACTH), which activates the adrenal glands. The adrenal glands then produce pregnenolone which is further metabolized into the adrenal hormones cortisol and dehydroepiandrosterone (DHEA; see Goodyer, Park, Netherton, & Herbert, 2001, and Wolf & Kirschbaum, 1999 for reviews). Cortisol then acts in various parts of the body to prepare the body to respond to the stressor. DHEA and its sulfate, DHEAS, can act throughout the brain and body or can be further metabolized into 50-75%

of the body's androgens and estrogens (Labrie, Bélanger, Cusan, Gomez, & Candas, 1997).

A negative feedback mechanism regulates activity of the HPA axis. Corticosteroids act on receptors in the hippocampus, which acts to decrease activity in the HPA axis following the termination of a stressful event. However, in the presence of chronic stress, such as that experienced in continued social rejection, the hypothalamus also releases vasopressin (Ma & Lightman, 1998); vasopressin amplifies the effects of CRH in the pituitary gland, thereby increasing production of pregnenolone even with the effects of the negative feedback system (see Yu, Holsboer, & Almeida, 2008, for review). Adults with depression have shown enhanced vasopressin receptivity (Dinan, O'Brien, Lavelle, & Scott, 2004), and blockage of that receptor has been shown to decrease depressive symptoms and aggressive behaviors (Heinrichs & Domes, 2008).

A majority of the research on HPA axis dysregulation has focused on changes in cortisol. While cortisol typically displays diurnal fluctuations, with peak levels appearing immediately after waking, abnormally high or low levels have been linked to internalizing and externalizing disorders, particularly depression and aggressive behavior disorders. In adults, high levels of cortisol after waking are associated with severity of depressive symptomatology as well as duration of depressive episode and likelihood of occurrence (Meador-Woodruff et al., 1990); patterns of increased basal cortisol levels and increased HPA axis response to psychological stressors have also been seen in many studies in children and adolescents with depression (Lopez-Duran, Kovacs, & George, 2009). In contrast, low cortisol levels after waking have been associated with increased aggression as well as accelerated appearance of adult-like aggressive behaviors in human and

animal models (for review, see Soma, Scotti, Newman, Charlier, & Demas, 2008). A study of children and adolescents with conduct disorder found that low cortisol levels are more strongly associated with the aggressive behaviors related to conduct disorder than the non-aggressive behaviors, such as delinquent behaviors (van Goozen, Matthys, Cohen-Kettenis, Gispen-de Wied, Weigant, & van Engeland, 1998).

In contrast, low DHEA(S) levels have been associated with depressive symptoms, and high levels have been linked with aggression. Though the mechanism of action is less clear, studies in children and adolescents have found that low levels of DHEA(S) were associated with higher levels of depressive symptoms (see Angold, 2003, for review). Other studies, however, have not shown this effect, and in one study of girls, high levels of DHEA(S) interacted with other risk factors (i.e., early pubertal timing) to predict higher depressive symptoms (Graber, Brooks-Gunn, & Warren, 2006). The role of high DHEA(S) in aggression is better understood (see Soma et al., 2008, for review). DHEA(S) acts in the brain to inhibit the activity of GABA, an inhibitory neurotransmitter. GABA has been identified as one of the neurotransmitters responsible for the control of aggressive behaviors, such that high levels of GABA inhibition cause an increase in such behaviors (Majewska, 1992). While it can also be metabolized into androgens such as testosterone, which have also been associated with aggression (see Soma et al., 2008, for review), DHEA(S) has been linked to aggression independent of testosterone levels (Pajer, Tabbah, Gardner, Rubin, Czambel, & Wang, 2006; van Goozen, Matthys, Cohen-Kettenis, Thijssen, & van England, 1998; van Goozen et al., 2000).

Because both cortisol and DHEA(S) are synthesized from pregnenolone, comparative ratios allow for the study of preferential production of one or the other

independent of overall HPA activity. It is typical and beneficial for high levels of cortisol to be secreted during transient stressful events (Lephart, Baxter, & Parker, 1987; Luppa, Munker, Nagel, Weber, & Englehardt, 1991; Parker, Levin, & Lifrak, 1985; Wade et al., 1988), but long-term exposure to high cortisol levels has been shown to cause neuronal death in the hippocampus and prefrontal cortex. While less is known about the physiological role of DHEA(S), it is believed to act as a protective agent, even promoting neurogenesis and thereby minimizing the negative effects of long-term cortisol exposure (see Maninger, Wolkowitz, Reus, Epel, & Mellon, 2009, for review). For example, high DHEA(S) levels have been shown to decrease the detrimental effects of high cortisol, suggesting an antidepressant property (Kaminska, Harris, Gijsbers, & Dubrovsky, 2000). However, as previously mentioned, DHEA(S) can have a negative psychological effect through excessive inhibition of GABA neurotransmitters. A balance between the two hormones is preferred, and significantly higher or lower cortisol/DHEA(S) ratios have been associated with depression (Goodyer et al., 1996; Goodyer, Herbert, & Tamplin, 2003) and aggression (Buydens-Branchey & Branchey, 2004; Pajer et al., 2006), respectively.

Many researchers have speculated as to why cortisol or DHEA(S) may be preferentially produced following HPA axis reactivity, but the exact mechanism is not yet known. Some have suggested that early experience of stress and/or long-term exposure to stressors may cause a stress sensitization or inoculation; the former causing heightened cortisol production and the latter resulting in heightened DHEA(S) production (Ozbay, Fitterling, Charney, & Southwick, 2008). This lends explanation as to why

individuals respond differently to similar social stressors, but it creates another question regarding what biological or psychosocial factors determine sensitization or inoculation.

Little research has examined the association of peer stressors and cortisol, and the research conducted to date on this or related areas has been somewhat inconclusive. A meta-analysis of 208 studies (Dickerson & Kemeny, 2004) revealed that laboratory stress tests that included the risk of social judgment, known as “social-evaluative threat”, were associated with greater cortisol reactivity than were those tests limited to mental stress (i.e., cognitive challenge tasks). In line with evolutionary theory and primate studies of cortisol response to social threats (Sapolsky, 1993), individuals high in defensiveness actually show lower cortisol levels following social rejection than do those low in defensiveness (Blackhart, Eckel, & Tice, 2007). In one of the first studies of peer stress, Gunnar and colleagues (2003) found that peer rejection in preschoolers was related to higher cortisol levels. To date, no studies (that the author is aware of) have examined whether social problems are associated with DHEA(S).

In addition, while there has been extensive study of cortisol levels in children who have experienced maltreatment or abuse (MacMillan et al., 2009), few studies have looked at the effects of normative parenting styles on cortisol reactivity. Animal studies have shown that the offspring of warm and attentive mothers (as indicated by species specific behaviors) have lower cortisol response to stressors (Repetti, Taylor, & Seeman, 2002) and faster decline in cortisol levels following a stressor than offspring with low maternal warmth (Gunnar, Gonzalez, Goodlin, & Levine, 1981; Meaney, Aitken, van Berkel, Bhatnagar, & Sapolsky, 1988). Paralleling the animal studies, Chorpita and Barlow (1998) found that children from families low in warmth display abnormal cortisol

response. A long-term study by Flinn and England (1995) showed that children in stable, affectionate families had moderate and more stable cortisol levels, while those households unstable in composition and parenting style had non-normal (either high or low) and highly variable cortisol levels. The effects of stability and routine have also shown effects separate from parenting behaviors, with lower levels of structure being associated with greater HPA axis activity (Ellenbogen & Hodgins, 2009).

The Present Study

The present study seeks to address gaps in the existing literature by examining the moderating effects of parenting characteristics, environmental chaos, and hormone levels on the relationship between peer problems and psychological adjustment both cross-sectionally and longitudinally. It was hypothesized that greater report of peer problems would be related to higher aggression and depressive symptoms and that this relationship would be moderated by biological and environmental factors (Figure 1). Based on the literature, it was also hypothesized that high or low cortisol/DHEAS ratios, negative parenting, and environmental chaos would be associated with higher reports of aggression or depressive symptoms. Specifically, high cortisol/DHEAS ratios were expected to predict higher depressive symptoms while low cortisol/DHEAS ratios were expected to predict higher aggression when combined with the effects of negative parenting and/or environmental chaos.

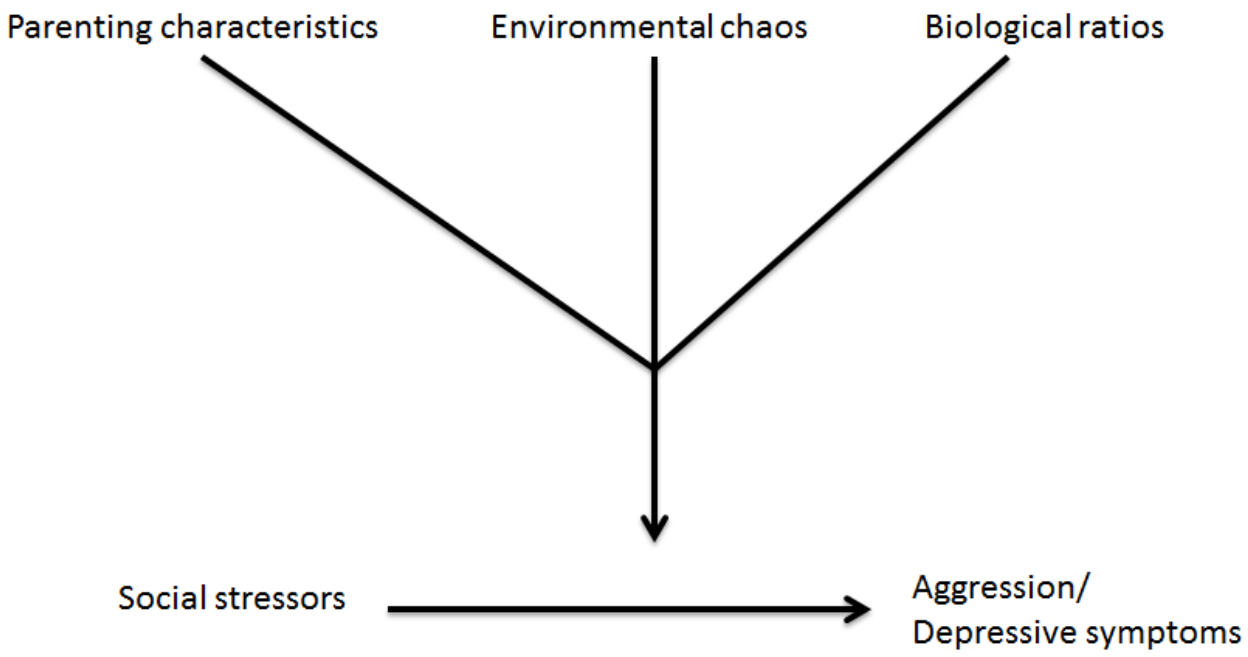

Figure 1-1. Moderated regression model.

CHAPTER 2
METHOD

Participants

This study utilizes data collected as part of the Girls and Boys Health and Development Project (GBHD). This larger study examined the biological and psychosocial changes taking place during the transition from childhood to adolescence in a sample of children and their parents who were seen multiple times over the course of 3-4 years. Data from the girls were collected from 1996-2000, and data from the boys were collected from 2000-2005. Due to protocol changes over the course of the study, only the final two annual assessments were used for the girls, and the second and third assessments were used for the boys. These time points are most equally age-matched and contain measures tapping the constructs of the present study. For ease of understanding, “Time 1” will refer to the assessment when girls and boys were 10.86 years of age on average (SD = 0.77), “Time 2” will refer to the assessment when they were 12.04 years of age on average (SD = 0.77), and “enrollment” will refer to the initial interviews. Enrollment data are used for demographic and retention information only. All procedures in the GBHD were approved by the Institutional Review Board at Teachers College of Columbia University, and a protocol review exemption was granted by the Institutional Review Board at the University of Florida for the present investigation.

To recruit for this project, flyers were distributed to students at school in ethnically-diverse, working class areas in New York City. Students were instructed to give the flyers to their mothers or primary caregivers, who were to complete and return them if they were interested in learning more about the study. Mothers were then contacted, the study was

explained, and an in-home visit was scheduled if they desired to proceed. Due to the nature of the recruitment procedure, it is not known what percentage of students who received the flyers enrolled in the study, but approximately 85% of those mothers who returned cards enrolled.

Two hundred sixty-seven pre- to early-adolescent boys and girls (Ngirls = 138, N-boys = 129) enrolled in the study. The racial/ethnic makeup of the participants at enrollment was consistent with that of the surrounding area, 39% Caucasian, 32% African-American, 12% Hispanic, 2% Asian or Pacific Islander, and 15% multiracial or not-specified. One hundred ninety-four participants (Ngirls =92, Nboys = 102) participated at Time 1 (27% attrition). As all participants were contacted at each assessment, 202 families (Ngirls = 111, Nboys = 91) participated at Time 2 (24% attrition from enrollment). No significant differences were found on outcome variables between those who did and did not continue in the study, $p > .05$. Male participants were more likely than females to have discontinued from enrollment to time 2, but not from enrollment to time 1, likely because many females returned for the later time point who did not take part in the earlier one. Those who identified as Asian or Pacific Islander, multiracial, or not specified were more likely to have discontinued by time 2, and participants with lower socioeconomic status were more likely to have discontinued at both time points from enrollment.

Each in-home visit was approximately 1.5-2 hours long, and the entire visit was videotaped for coding and reliability purposes. After informed consent and assent were obtained, the mother and child completed self-report surveys and a series of tasks. At the end of each visit, children received a gift such as a t-shirt or tote bag.

Additional questionnaires were completed by the mother and child after the in-home visit, and saliva and urine samples were collected from the child immediately upon awakening for two (boys) or three (girls) days following the in-home visit. A research assistant returned to the participant's house between three and five days after the home visit to collect the forms and biological samples. At this time, mothers received a small payment ($75) for their family's time and participation.

Sampling Procedures

Saliva Sampling

Saliva samples were collected for the two (boys) or three (girls) days following the in-home visit. During the visit, research assistants explained the instructions for sample collection, and a detailed copy of the instructions was left with the family. Rather than setting a time, researchers asked that the samples be collected immediately upon the child's natural waking time, before eating, drinking, or brushing teeth. Mothers were asked to assist the child in completing the procedure. Saliva samples were collected using Salivette kits (Sarstedt, Germany); the instructions for the Salievette kits were altered slightly to assure sufficient amounts of saliva; the participant was instructed to remove the cotton swab from the tube and hold it in her/his mouth for two minutes (instructions stated 40 seconds) without chewing on it. The child then returned the cotton swab to the tube and closed it securely. Participants were instructed to label the sample with the date and time of collection and store them in coolers provided for sample storage until the research assistant returned to pick them up. Once the saliva samples were retrieved by the research assistant, they were stored at -25° Celsius until they were analyzed at the Columbia-Presbyterian Reproductive Endocrinology Department in New York City, NY. In order to stimulate saliva production, girls ingested a small amount of

sweetened Kool-Aid. At the time of these procedures, use of such substances was commonplace (Granger, Weisz, & Kauneckis, 1994; Gunnar, Brodersen, Nachimas, Buss, & Rigatuso, 1996; Hertsgaard, Gunnar, Larson, Brodersen, & Lehman, 1992; Nachimas, Gunnar, Mangelsdorf, Parritz, & Buss, 1996), but the amount used in this study was less than in other protocols (Gunnar, Brodersen, Nachimas, Buss, & Gigatuso, 1996). It was later found that this could alter the results of certain kits for salivary cortisol assays, but the kits used in this protocol were not affected by use of sweetened drink mix (Gordon, Peloso, Auker, & Dozier, 2005; Schwartz, Granger, Susman, Gunnar, & Laird, 1998; Talge, Donzella, Kryzer, Gierens, & Gunnar, 2005). This practice was discontinued prior to collection of saliva samples for the boys.

DHEAS Sampling

Urine samples were also collected each morning, immediately upon awakening, for the two (boys) or three (girls) days following the in-home visit. Urine was collected from girls in a pediatric urine hat and from boys in a urine collection container, a lid was secured, and the sample was placed into a supplied plastic bag. Mothers recorded the date and time of the sample on the containers and kept them in the cooler until a researcher returned to collect them. Participants were encouraged not to drink anything before bed in order to prevent the child from needing to urinate during the night. If the child did have to urinate during the night, both that and the morning sample were to be collected in the same container. The times for both samples were recorded on the lid. After the samples were picked up by a researcher, they were stored in a refrigerator until analysis at the Columbia-Presbyterian Reproductive Endocrinology Department in New York City.

Measures

Depressive Symptoms

Girls and boys completed the Children's Depression Inventory (CDI, Kovacs, 1982; Appendix C), a widely-used measure of depressive symptoms (Nolen-Hoeksema et al, 1992) adapted from the Beck Depression Inventory to assess depressive symptoms in children. As is common practice in non-clinical settings, the question regarding suicidality was removed for this study (Twenge & Nolen-Hoeksema, 2002), resulting in a 26-item CDI. The child selects which one of the three statements is most like how s/he has felt over the previous two weeks. These range from positive ("I have fun in many things.") to neutral ("I have fun in some things.") to negative ("Nothing is fun at all.") Statements are given scores ranging 0-2, and the score is summed with higher scores indicating higher levels of depressive symptomatology. This measure has displayed validity and reliability in normative samples of this age group (Smucker, Craighead, Craighead, & Green, 1986). Chronbach's alpha for this sample at Time 1 is .86 and at Time 2 is .85.

Aggressive Behaviors

Maternal report of aggression was assessed using the Aggressive Behavior subscale of the Child Behavior Checklist (CBCL; Achenbach, 1991 (Appendix D). The CBCL is a widely-used measure of social and emotional development that has demonstrated reliability and validity in this age group. This subscale consists of 20 items including "Argues a lot", "Cruelty, bullying, or meanness to others," and "Gets in many fights". Mothers rate statements from 0 (*not at all*) to 2 (*very much*) according to how true they are of their child. Items are summed such that higher scores indicate higher rates of aggressive behaviors. Chronbach's alpha for the Aggressive Behavior subscale in this study at Time 1 is .87 and at Time 2 is .86.

Peer Problems

Reports of problematic peer interactions were measured using the Social Problems subscale of the CBCL; (Achenbach, 1991; Appendix B) completed by the mother. The Social Problems subscale consists of 8 items including “doesn’t get along with other kids” and “gets teased a lot”. Cronbach’s alpha for the Social Problems subscale in this study at Time 1 is .73 and at Time 2 is .58. Examination of individual questions did not indicate any items responsible for the decrease in alpha value; Time 1 and Time 2 Social Problem subscale scores exhibited a strong correlation, $r = .61$, $p < .001$, and performance in the final analyses was comparable.

Peer problems were also assessed from participant reports of ridicule. During an interview in the home visit, boys and girls reported if they had ever been insulted, made fun of, or avoided for any of the following 12 reasons: size, skin color, clothes, hair, language, religion, age, weight, eye color, where they live, and the food they eat. “Yes” responses for each item were summed to create a total score reflecting ridicule experienced. This measure was created for the larger study to assess typical experiences of being picked on or teased and has not been validated. A subset of participants completed the Youth Self-Report in one of the years of the larger project; correlation of self-reported ridicule and the Social Problems scale of the YSR was $r = .408$, $p < .001$; $N = 107$.

Parenting Behaviors

Parenting characteristics were coded from video-taped mother-child interactions completed during the home visits. In separate rooms, mothers completed a self-report questionnaire and participants answered interview questions on issues about which parents and children typically disagree, such as household chores, interactions with

siblings, and the child's personal appearance. From that list, the research assistant selected two items that were endorsed as being the topics of frequent or heated disagreements. The research assistant presented these topics to the mother and child and asked them to discuss ways to resolve each problem. They were given a list of questions to consider, including "How does this problem begin?" and "What might be done to avoid this problem in the future?"; the research assistant left them for five to seven minutes to discuss the topics.

Interactions were coded on scales developed by Melby et al. (1998) and Graber et al. (1999) and adapted for this study. The mother and child were rated separately by coders using a five-point Likert scale for characteristics including warmth and hostility. Warmth was coded as the "degree to which the target is nice to the other person, takes an interest in the other person, and enjoys being with the other person." Nonverbal cues such as touching and making eye contact, positive verbal communication, and emotional expressions such as smiling, laughing, and showing interest through asking questions are examples of warmth behaviors. Hostility was defined as the "expression of verbal, nonverbal, or physical behavior that is aggressive… [and] has the potential for harming or injuring another individual, is intentional, and is aversive to the victim." Markers of hostility include grimaces or smirks, yelling or speaking in a sarcastic tone, assuming a defensive posture, or pushing. Due to the non-normal distribution of ratings, kappa statistics show only moderate inter-rater reliability, $\kappa_{warmth} = .63$ and $\kappa_{hostility} = .33$. In order to establish reliability unaffected by the truncated ratings, percentages within one point of the gold standard coder were calculated, resulting in warmth = 95% and hostility = 97.25%. Because hostility ratings were highly positively skewed, and in order to reduce

the number of variables entered into the models due to power considerations, both parenting characteristics were collapsed into one. Preliminary analyses indicated that the two variables were moderately correlated (Time 1 $r = -.36$, $p < .001$; Time 2 $r = -.45$, $p < .001$), so maternal warmth was reverse-coded and summed with hostility to form an overall measure of negative parenting.

Environmental Chaos

To determine the level of environmental chaos the child experienced in the home, a measure was developed using questions from the in-home interview with the mother, survey completed by the mother, and the interview with the child. These measures include questions on regularity of the child's sleep/wake cycle and on consistency of child caregiving. For child caregiving, mothers were asked to indicate who cared for the target child and where this child was cared for when the parent(s) were not home. Frequency analyses identified roughly one quarter of the sample with more variable childcare arrangements; specifically, 28% of the sample reported child self-care or two or more caregivers other than the parents and 23% reported two or more locations (outside of being cared for by the parents at home) in a typical week (Appendix D). These items were scored as 1 = self-care or two or more caregivers per week, and 0 = all others and 1 = two or more locations and 0 = less than two locations for out of home care. Although some of the non-parental caregivers listed may currently reside in the home with the participant and therefore be a part of the child's daily environment, these were not removed from the analysis. The purpose of this measure is to assess the degree of routine in the participants' lives, regardless of their familiarity, and only 22 participants (approximately 11%) resided with adult extended family members. The child was also asked with whom he or she usually eats dinner. Fourteen percent of participants reported

that they usually did not eat dinner with either parent; this was coded as 1, and all other responses were coded as 0. For the items regarding regular bedtimes, 24% of the mothers reported that their child did not have a regular bedtime on weeknights, and 66% reported a lack of regular bedtime on weekends. Because of this, only the weeknight item was used in the analysis (1 = no regular bedtime and 0 = regular bedtime). These four items (multiple caregivers, multiple locations, dinner without parent and no regular bedtime) were summed to create an overall score for environmental chaos ranging from 0-4.

Hormone Levels

Cortisol was assayed from saliva samples and DHEAS was assayed from urine samples at the Columbia-Presbyterian Reproductive Endocrinology Department in New York City, NY. Cortisol samples were centrifuged at 3000 rpm for 10 minutes. Cortisol level was determined using a radioimmunoassay adapted for use with saliva (Diagnostic Products Company) with a lower detection limit of 0.02 µl/dl per 200 µl of saliva. Every sample provided at least 400 µl of saliva; a 200 µl sample was used for duplicate analysis. All samples from each participant were analyzed in one assay run. The inter- and intra-assay variation coefficients were less than 3% and 5%, respectively. DHEAS level was determined using a commercial solid-phase, competitive chemiluminescent immunoassay (Immulite, Siemens, Los Angeles, CA) with a sensitivity of 3 g/dl. The inter- and intra-assay variation coefficients were less than 8.2% and 12.0%, respectively.

Due to the importance of time of day effects on cortisol values, the data were checked for significantly different sampling times prior to calculating the mean cortisol value. When outlying sampling times occurred with participants who had provided three samples, the two most similar times were retained. When only two samples were

provided, the sample with the highest cortisol value, which was typically the earliest sample, was retained. Individual samples from only 19 participants in Time 1 and 31 participants in Time 2 were removed. After this process was complete, the remaining scores were averaged to give a mean cortisol score for each time point.

While cortisol has a daily rhythm, DHEAS fluctuates throughout the lifetime, and very drastically during puberty. As the individual progresses through puberty, DHEAS levels increase. To control for this effect, pubertal status was residualized out of the mean DHEAS values. Pubertal status was measured using Tanner scoring (Marshall & Tanner, 1969, 1970), a five-point Likert scale based on drawings of pubic hair growth and gonadal development for boys and pubic hair growth and breast development for girls (Morris & Udry, 1980). Ratings for the two indicators (for each gender) were averaged to create a mean Tanner score. Mother reports were used; if mother reports were not available child ratings of Tanner scores were used. Mean Tanner scores were entered as the sole predictor of DHEAS score in a regression, and unstandardized residualized were saved. This procedure was repeated for both time points.

Mean cortisol values were then divided by residualized mean DHEAS values to create a ratio, and an inverse transformation was performed to normalize the distribution for analyses. Higher scores indicate high cortisol and low DHEAS values, and lower scores indicate low cortisol and high DHEAS values.

Covariates

Child's age, race/ethnicity, gender, and socioeconomic status were entered as covariates in the analyses. Child's age and ethnicity were reported by the mother during the in-home interview. Age was entered as a continuous variable, and race/ethnicity was dummy-coded into three racial groups: African American/Black, Hispanic, and other with

Caucasian as the omitted group. “Other” included Asian and Pacific Islander, multiracial, and other or not specified. Socioeconomic status (SES) was determined using Hollingshead’s (1975) Four Factor Index based on answers given during the in-home interview. Hollingshead scores for this sample ranged from 9 to 66, with higher scores indicating a higher socioeconomic status.

Analyses

Hierarchical regression analyses were used to test the hypotheses that parenting characteristics, chaos, and cortisol/DHEAS ratio, moderated the relationship between peer problems and psychological adjustment (Baron & Kenny, 1986). Prior to conducting these analyses, descriptive statistics including means, skewness, and kurtosis were run to ensure that all variables were normally distributed. The only variable requiring transformation was the cortisol/DHEAS ratio, as noted above. Correlations were also examined to assess the associations between the variables as well as to test for multicollinearity between predictors.

Hierarchical regressions were performed using parenting, environmental chaos, cortisol/DHEAS ratio, and peer measures predicting symptoms both cross-sectionally and longitudinally. The first block included covariates consisting of socioeconomic status, gender, race/ethnicity and age at the outcome time point. For the Time 2 cross-sectional and the longitudinal analyses, Time 1 symptoms were entered in Block 2. Because of high rates of comorbidity between internalizing and externalizing disorders and symptoms, particularly between aggression and depression (Rowe, Maughan, & Eley, 2006), comorbid symptoms were entered into the analysis in the block prior to the parenting, chaos and the hormone ratio. These predictors were entered into the next

block, followed by centered interaction terms in the final block, as per the specifications of Baron and Kenny (1986) for testing moderation.

All analyses were run for each dependent variable separately, resulting in six final analyses. Due to power concerns over entering all of the interaction terms into the same model simultaneously, separate analyses were run for mother report of social problems and child report of ridicule and their respective interaction terms in order to determine which interaction terms should be entered into the final analyses.

CHAPTER 3
RESULTS

Descriptives

The means and standard deviations for the predictor and outcome variables are reported in Table 3-1. The mean CDI total scores for Time 1 and Time 2 were 7.02 and 6.27, respectively, which are lower than expected for this age group. In particular, prior studies have reported CDI scores ranging from 8.36 to 9.08 for nine year olds and 9.30 to 9.91, for ten year olds (Smucker, Craighead, Craighead, & Green, 1986; Twenge & Nolen-Hoeksema, 2002). Serious levels of depressive symptoms are indicated by scores over 19 (Kovacs, 1980; Smucker et al., 1986). For this sample, high levels of depressive symptoms were reported by 4.9% of the Time 1 and 3.8% of the Time 2 participants. Again, this is fewer than expected. The cutoff of 19 was calculated from the top 10% of a normative sample, though those samples included older adolescents. Studies on younger samples have suggested cutoffs of 13 (Larson & Melin, 1992) and 15 (Almqvist et al., 1999). This would increase the percentage of the current sample endorsing high levels of depressive symptoms to 12.6% (Time 1) and 11.4% (Time 2) or 9.3% (Time 1) and 7.1% (Time 2), respectively. CDI scores did not change significantly from Time 1 to Time 2 for the total sample, $t(151) = .97$, *NS*, or by gender. Cross-sectional analyses also indicated no significant gender differences at either time point. The change from Time 1 to Time 2 CDI score ranged from -29 to 15 with a mean change statistic of -0.46, SD = 5.80. Change in CDI score was slightly negatively skewed (-0.97) and moderately kurtotic (4.85).

Aggressive Behavior Subscale scores from the CBCL were somewhat higher than scores previously reported for children/young adolescents of this age (Bongers, Koot, van

der Ende, & Verhulst, 2003). Longitudinally, Time 1 aggression was significantly higher than Time 2 aggression, $t(168) = 2.11$, $p < .05$. No significant gender difference was found in aggression cross-sectionally and neither males, $t(85) = 1.90$, *NS*, nor females, $t(82) = 1.08$, *NS*, showed significant differences in aggression across time points (Table 3-2). The change from Time 1 to Time 2 aggression score ranged from -11 to 17 with a mean change statistic of -0.63, SD = 3.87. Change in aggression score was slightly positively skewed (0.24) and moderately kurtotic (2.44).

Cross-sectional correlations among core variables in this study are shown in Tables 3.3-3.6. Child report of ridicule and parent report of social problems were not significantly correlated at either time point ($r = .11$, at both times); the size of this correlation indicates that there is no concern of multicollinearity when entering both into the same model. Parent report of social problems was moderately correlated with aggression (Time 1 $r = .51$, $p < .001$; Time 2 $r = .52$, $p < .001$) and weakly with depressive symptoms (rs = .24, $p < .01$) at both times. Child report of ridicule was weakly but significantly correlated with depressive symptoms (Time 1 $r = .18$, $p < .05$; Time 2 $r = .27$, $p < .05$) but not with aggression at both times. Chaos at Time 2 was weakly but significantly correlated with both aggression and depressive symptoms at Time 2, $r = .28$, $p < .001$ and $r = .16$, $p < .05$, respectively, indicating that higher levels of chaos were correlated with higher levels of psychological symptoms. However, these associations were not seen at Time 1. Few other significant associations among variables were found (see Tables 3-3 and 3-4).

Regressions

A hierarchical regression analyzing the cross-sectional relationship between the Time 1 predictors and Time 1 depressive symptoms (Table 3-5) indicated that concurrent

aggression and problematic peer relationships are both significant predictors of depressive symptoms. Correlation analyses had indicated that aggression and depressive symptoms were weakly though significantly positively correlated so it is not unexpected that aggression is a significant predictor of depressive symptoms in the model, explaining 4.1% of the variance (β = .215, p < .05). Also as expected, both child and mother report of peer problems were predictive of depressive symptoms with children who experienced more problematic peer relationships reporting significantly higher rates of depressive symptoms (β = .278, p < .01; β = .252, p < .01, respectively); these reports together explain 13.1% of the variance in depressive symptoms. The step including the main effects of cortisol/DHEAS, parenting, and chaos was not significant (ΔR^2 = -.34, *NS*).

Results from cross-sectional analysis of the Time 2 data using hierarchical regression is presented in Table 3-6. After entering the control variables, aggression showed only a trend (ΔR^2 = .022, p = .08). The step including the reports of peer problems was significant (ΔR^2 = .058, p < .05); mother report of social problems had a significant effect (β = .220, p < .05); however child report of ridicule demonstrated a trend for an association with depressive symptoms (β = .141, p < .09). The block containing the biological and environmental main effects was not significant (ΔR^2 = .001, *NS*). However, the interaction between child report of ridicule and parenting characteristics also demonstrated a trend for an association with depressive symptoms (ΔR^2 = .022, p = .08), suggesting that individuals who experience less warmth and more hostility from their mothers were more affected by peer ridicule (Figure 3-1). To create the graph, parenting was split such that values of 5 or higher were considered “negative parenting”, and those

below 5 were labeled “positive parenting”. This resulted in 25%, or 46 of 182 participants identified as having experienced negative parenting characteristics. Participants in the “negative parenting” group exhibited higher levels of depressive symptoms in response to peer ridicule than did those in the “positive parenting” group.

Results from the longitudinal analysis of depressive symptoms are presented in Table 3-7. Both the main effects and interactions steps were significant predictors of change in depressive symptoms from Time 1 to Time 2 ($\Delta R^2 = .071$, $p < .01$; $\Delta R^2 = .041$, $p < .01$, respectively). The cortisol/DHEAS ratio had a significant effect ($\beta = .255$, $p < .01$), with higher cortisol and lower DHEAS levels being associated with higher levels of depressive symptoms over time. There was a trend for an effect of the parenting variable ($\beta = .144$, $p = .065$), with less warmth and more hostility being associated with higher levels of depressive symptoms over time. The interaction term between child report of ridicule and the cortisol/DHEAS had a significant effect ($\beta = .220$, $p < .01$), indicating that in adolescents whose cortisol/DHEAS ratios are higher, peer ridicule is associated with higher rates of depressive symptoms, while in those whose ratios are lower, ridicule does not have as much of an impact on emotional development (Figure 3-2). Participants were divided into quartiles based on the cortisol/DHEAS ratio, and the highest and lowest quartiles were graphed in Figure 3-2. The “High Ratio” group contains the participants who had the top 25% of ratio values, and the “Low Ratio” group contains participants who were in the lowest 25% of ratio values. The high ratio group reported greater depressive symptoms at higher levels of ridicule than did the low ratio group.

The cross-sectional regression models of Time 1 variables predicting Time 1 aggression are presented in Table 3-8. The control block predicted a significant amount

of the variance in aggressive symptoms (R^2 = .113, p < .05). Socioeconomic status and race/ethnicity were both significant predictors with lower socioeconomic status being associated with higher rates of aggression (β = -.261, p < .01) and Hispanic children being significantly more likely than white children to exhibit aggressive symptoms (β = .200, p < .05). As would be expected from prior analyses showing a concurrent association between depressive and aggressive symptoms, depressive symptoms were a significant predictor of aggressive symptoms (β = .203, p < .05). The block including child and mother report of peer problems was significant (ΔR^2 = .114, p < .001), but only mother report of social problems was a significant predictor (β = .424, p < .001). Neither the main effect nor the interaction blocks were significant (ΔR^2 = .005, *NS*; ΔR^2 = .003, *NS*, respectively).

Results from the cross-sectional regression predicting Time 2 aggression are presented in Table 3-9. Again, the control block was significant (ΔR^2 = .131, p < .05); low socioeconomic status was a significant predictor of higher aggression (β = -.307, p < .01). Time 2 depressive symptoms demonstrated a trend for an association with aggressive symptoms when added to the model (ΔR^2 = .020, p = .08). As in the Time 1 analysis, the peer problems block was significant (ΔR^2 = .232, p < .001), but only the mother's report of social problems was a significant predictor of aggression (β = .521, p < .001). Neither the main effects of nor interactions with biological and environmental predictors were significant (ΔR^2 = .027, *NS*; ΔR^2 = .001, *NS*, respectively).

Results from the longitudinal regression predicting change in aggression are presented in Table 3-10. As in the previous two analyses on aggression, the control block was significant (ΔR^2 = .102, p < .05), and low economic status was a significant

predictor of high aggression (β = -.297, p < .001). Concurrent depressive symptoms, peer problems, and the main effects of the moderator variables were not significant predictors of change in aggression in this analysis. However, the block for the interaction terms was significant (ΔR^2 = .021, p < .05); the interaction at Time 1 between child report of ridicule and the cortisol/DHEAS ratio was a significant predictor of the change in aggression from Time 1 to Time 2 (β = -.117, p < .05). According to Baron and Kenny (1986), the interaction term may be interpreted regardless of whether or not the individual main effects are significant. This indicates that in participants who had low cortisol/DHEAS ratios, or low cortisol and high DHEAS, the effects of ridicule were associated with a greater increase in aggression than in those whose ratios were not as low (Figure 3-3). Participants were divided into quartiles based on the cortisol/DHEAS ratio, and the highest and lowest quartiles were graphed in Figure 3-3. The “High Ratio” group contains the participants who had the top 25% of ratio values, and the “Low Ratio” group contains participants who were in the lowest 25% of ratio values. The low ratio group reported higher levels of aggression at higher levels of ridicule than did the high ratio group. However, this difference was only notable at the highest levels of ridicule; group differences in aggression were not indicated at lower levels of ridicule, according to the standard errors for each group.

Table 3-1. Means and Standard Deviations for Time 1 Primary Variables

Variable	n	Min	Max	M	SD
T1 Aggression	190	.00	26.00	6.65	5.70
T1 CDI (Adjusted)	182	.00	39.00	7.02	6.33
T1 Ridicule	190	.00	7.00	1.16	1.36
T1 CBCL Social Problems	190	.00	15.00	1.83	2.29
T1 Cortisol/DHEAS[a]	163	.32	.53	.50	.019
T1 Parenting[b]	188	2.00	6.00	4.06	1.06
T1 Chaos[c]	187	.00	4.00	.88	.94

Note: [a] lower values indicate lower cortisol and higher DHEAS values. [b] higher values indicate more negative parenting characteristics. [c] higher values indicate higher levels of chaos

Table 3-2. Means and Standard Deviations for Time 2 Primary Variables

Variable	n	Min	Max	M	SD
T2 Aggression	195	.00	29.00	5.96	5.32
T2 CDI	184	.00	26.00	6.04	5.71
T2 Ridicule	191	.00	6.00	1.16	1.30
T2 CBCL Social Problems	195	.00	9.00	1.61	1.83
T2 Cortisol/DHEAS[a]	173	.36	.55	.50	.017
T2 Parenting[b]	182	2.00	6.00	3.88	.97
T2 Chaos[c]	196	.00	4.00	.91	.89

Note: [a] lower values indicate lower cortisol and higher DHEAS values. [b] higher values indicate more negative parenting characteristics. [c] higher values indicate higher levels of chaos

Table 3-3. Cross-Sectional Correlations of Time 1 Variables

Variable	1	2	3	4	5	6	7
T1 Aggression	-						
T1 CDI	.227**	-					
T1 Ridicule	.073	.266***	-				
T1 CBCL Social Problems	.512***	.239**	.110	-			
T1 Cortisol/DHEAS	.102	-.088	-.017	.116	-		
T1 Parenting	-.027	.094	.062	-.012	.094	-	
T1 Chaos	.076	.008	.019	.069	-.039	-.167*	-

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

Table 3-4. Cross-Sectional Correlations of Time 2 Variables

Variable	1	2	3	4	5	6	7
T2 Aggression	-						
T2 CDI	.211**	-					
T2 Ridicule	.033	.182*	-				
T2 CBCL Social Problems	.523***	.241**	.108	-			
T2 Cortisol/DHEAS	-.003	.035	-.127	.016	-		
T2 Parenting	-.094	-.025	.148†	-.008	.038	-	
T2 Chaos	.277***	.161*	.127†	.093	.100	-.146†	-

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

Table 3-5. Cross-sectional regression using Time 1 variables to predict Time 1 depressive symptoms, controlling for concurrent aggression

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Step 1					
SES	-.087	-.031	.017	.014	.029
Black	-.078	-.074	-.088	-.057	-.033
Hispanic	.158†	.115	.075	.077	.088
Other	.109	.093	.055	.051	.041
Sex	-.013	-.010	-.087	-.119	-.109
T1 Age	.066	.088	.057	.055	.072
Step 2					
T1 Aggression		.215*	.064	.066	.068
Step 3					
T1 Ridicule (R)			.278**	.260**	.250**
T1 Social Problems (SP)			.252**	.280**	.294**
Step 4					
T1 Cortisol/DHEAS				.158*	.165*
T1 Parenting				.120	.156†
T1 Chaos				.015	.001
Step 5					
SP*Parenting					-.103
SP*Chaos					.122
ΔR^2		.041*	.131***	.034	.018
Final R^2	.060	.101	.231	.265	.283
Final Model F	1.384	2.077†	4.275***	3.761***	3.467***

Note: Standardized beta weights are shown
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$

Table 3-6. Cross-sectional regression using Time 2 variables to predict Time 2 depressive symptoms, controlling for concurrent aggression

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Step 1					
SES	-.014	.035	.018	.020	.040
Black	.085	.081	.071	.066	.085
Hispanic	.104	.082	.086	.084	.087
Other	.034	.040	.011	.009	.012
Sex	-.028	-.032	-.016	-.011	-.016
T2 Age	.193*	.180†	.223*	.225*	.219*
Step 2					
T2 Aggression		.159†	.027	.023	.038
Step 3					
T2 Ridicule (R)			.141†	.146	.113
T2 Social Problems (SP)			.220*	.221*	.187†
Step 4					
T2 Cortisol/DHEAS				-.005	-.002
T2 Parenting				-.032	-.030
T2 Chaos				-.002	.000
Step 5					
R*Parenting					.156†
ΔR^2		.022†	.058*	.001	.022†
Final R^2	.065	.087	.145	.146	.167
Final Model F	1.497	1.748	2.389*	1.762†	1.902*

Note: Standardized beta weights are shown
†$p < .10$. *$p < .05$.

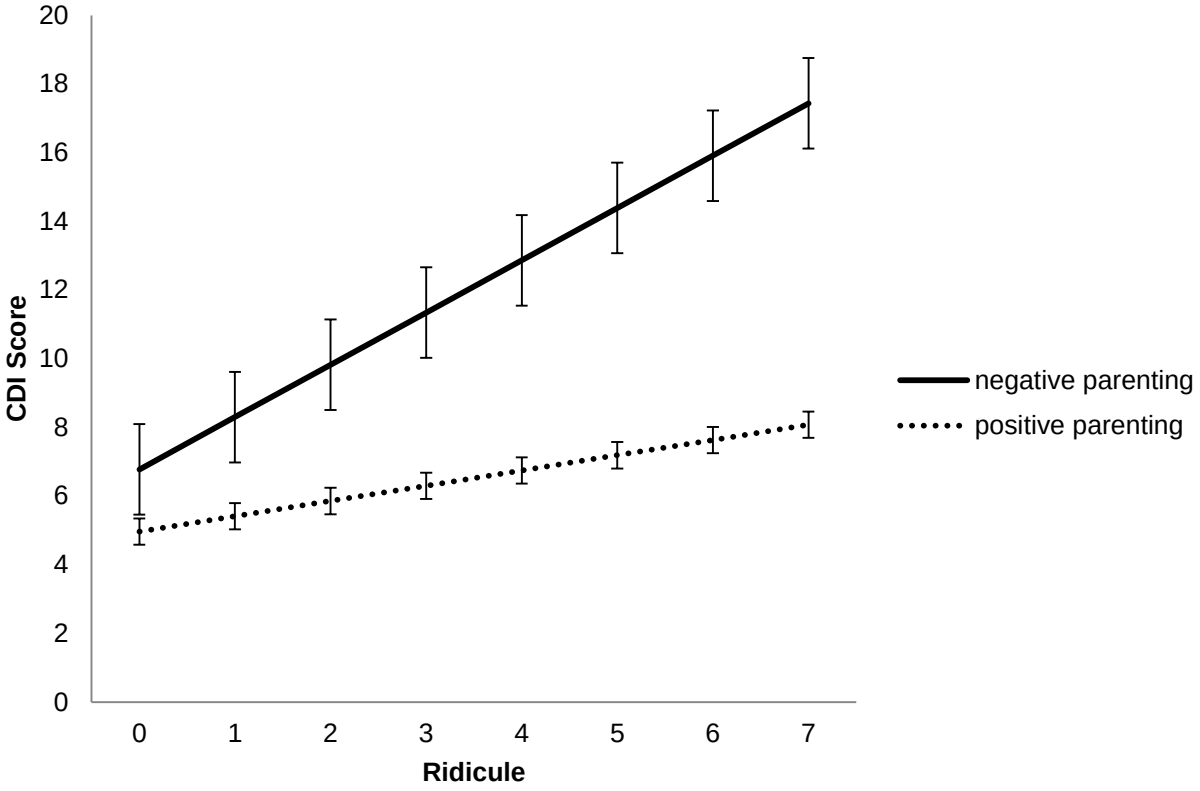

Figure 3-1. The interaction between parenting characteristics and ridicule in the prediction of depressive symptoms. When ridicule was high, participants with more negative parenting exhibited higher levels of depressive symptoms than did those with more positive parenting, $p < .10$. Error bars indicate the standard error.

Table 3-7. Longitudinal regression using Time 1 variables to predict change in depressive symptoms, controlling for concurrent aggression

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Step 1						
SES	-.042	-.038	-.009	-.004	-.006	-.008
Black	.101	.101	.102	.105	.146	.143
Hispanic	.134	.030	.023	.023	.028	-.030
Other	.112	.015	.018	.022	.030	.021
Sex	.072	.097	.092	.080	.015	.039
T2 Age	.143	.134	.129	.119	.103	.097
Step 2						
T1 CDI		.598***	.580***	.556***	.494***	.510***
Step 3						
T2 Aggression			.097	.096	.115	.125
Step 4						
T1 Ridicule (R)				.070	.059	.000
T1 Social Problems (SP)				.002	.060	.078
Step 5						
T1 Cortisol/DHEAS					.255**	.244**
T1 Parenting					.144†	.165*
T1 Chaos					-.009	-.009
Step 6						
R*Cortisol/DHEAS						.220**
ΔR^2		.338***	.008	.004	.071**	.041**
Final R^2	.054	.393	.401	.405	.476	.517
Final Model *F*	1.070	10.246	9.190***	7.345***	7.324***	7.938***

Note: Standardized beta weights are shown
$^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$

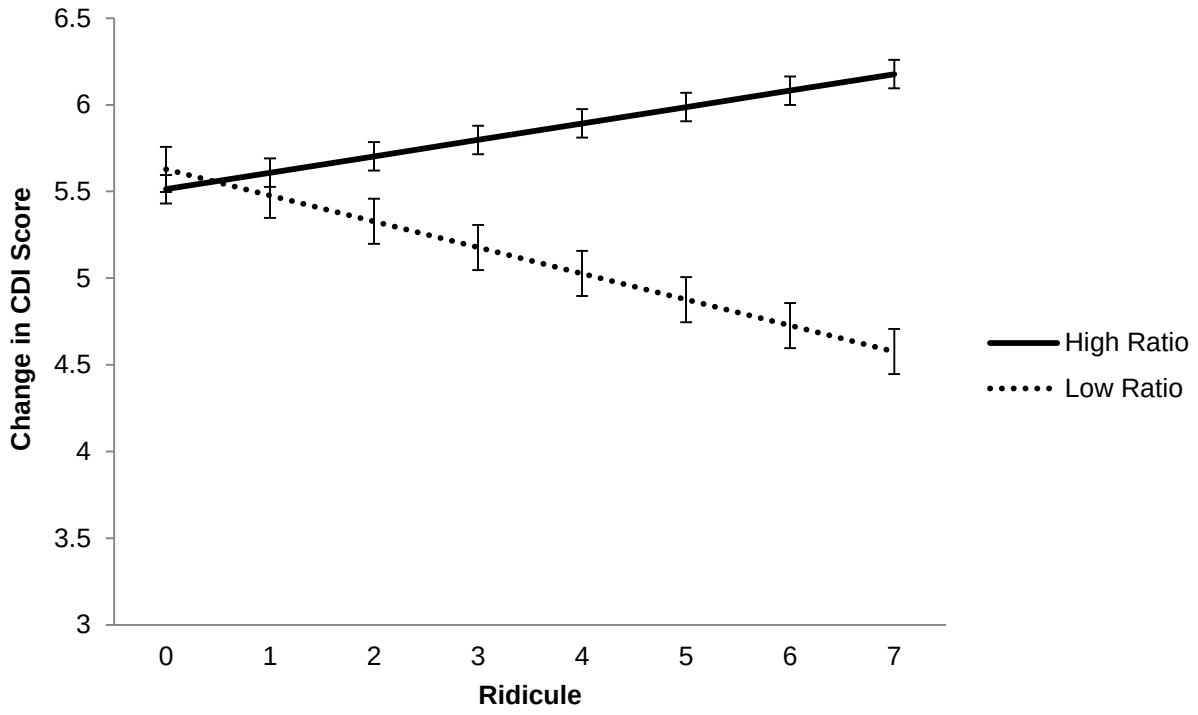

Figure 3-2. The interaction between Time 1 cortisol/DHEAS ratio and Time 1 ridicule in the prediction of change in depressive symptoms. Values represent the predicted CDI score when controlling for other variables, including Time 1 CDI score. When ridicule was high, participants with a higher cortisol/DHEAS ratio exhibited higher levels of depressive symptoms than did those with a lower cortisol/DHEAS ratio, $p < .01$. Error bars indicate the standard error.

Table 3-8. Cross-sectional regression using Time 1 variables to predict Time 1 aggression, controlling for concurrent depressive symptoms

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Step 1					
SES	-.261**	-.243**	-.163*	-.152†	-.163†
Black	-.017	-.002	-.044	-.045	-.054
Hispanic	.200*	.168†	.098	.100	.100
Other	.074	.052	-.019	-.017	-.018
Sex	-.017	-.014	-.062	-.054	-.053
T1 Age	-.103	-.116	-.062	-.061	-.051
Step 2					
T1 CDI		.203*	.059	.063	.069
Step 3					
T1 Ridicule (R)			.040	.040	.047
T1 Social Problems (SP)			.424***	.415***	.400***
Step 4					
T1 Cortisol/DHEAS				-.048	-.052
T1 Parenting				.026	.016
T1 Chaos				.052	.046
Step 5					
SP*Parenting					.063
ΔR^2		.039*	.114***	.005	.003
Final R^2	.113*	.151	.295	.300	.304
Final Model *F*	2.772*	3.312**	5.961***	4.475***	4.166***

Note: Standardized beta weights are shown
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$

Table 3-9. Cross-sectional regression using Time 2 variables to predict Time 2 aggression, controlling for concurrent depressive symptoms

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Step 1					
SES	-.307**	-.304**	-.235**	-.200**	-.197*
Black	.023	.011	-.036	-.080	-.076
Hispanic	.136	.120	.065	.050	.052
Other	-.040	-.045	-.134†	-.144†	-.139†
Sex	.025	.030	.072	.095	.093
T2 Age	.080	.052	.168*	.140†	.139†
Step 2					
T1 CDI		.148†	.020	.016	.011
Step 3					
T2 Ridicule (R)			-.021	-.036	-.034
T2 Social Problems (SP)			.521***	.499***	.489***
Step 4					
T2 Cortisol/DHEAS				-.005	-.007
T2 Parenting				-.076	-.075
T2 Chaos				.157*	.161*
Step 5					
SP*Chaos					.036
ΔR^2		.020†	.232***	.027	.001
Final R^2	.131*	.152	.384	.411	.412
Final Model *F*	3.271**	3.293**	8.791***	7.215***	6.637***

Note: Standardized beta weights are shown
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$

Table 3-10. Longitudinal regression using Time 1 variables to predict change in aggression, controlling for concurrent depressive symptoms

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Step 1						
SES	-0.297***	-.058	-.058	-.066	-.063	-.062
Black	-0.030	.018	.009	-.001	-.014	-.013
Hispanic	0.121	-.022	-.032	-.040	-.041	-.012
Other	-0.003	-.042	-.051	-.066	-.066	-.061
Sex	0.054	.065	.057	.063	.071	.041
T2 Age	0.051	.119†	.103	.123†	.119†	.096
Step 2						
T1 Aggression		.785***	.770***	.751***	.742***	.756***
Step 3						
T2 CDI			.094	.109†	.130*	.149*
Step 4						
T1 Ridicule (R)				-.105†	-.108†	-.086
T1 Social Problems (SP)				.058	.043	.040
Step 5						
T1 Cortisol/DHEAS					-.058	.001
T1 Parenting					-.009	.000
T1 Chaos					.048	.048
Step 6						
R*Cortisol/DHEAS						-.117*
SP*Cortisol/DHEAS						.107
ΔR^2		.543***	.008	.012	.005	.021*
Final R^2	.102*	.645	.653	.665	.669	.690
Final Model *F*	2.214*	30.094***	27.058***	22.401***	17.135***	16.025***

Note: Standardized beta weights are shown
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$

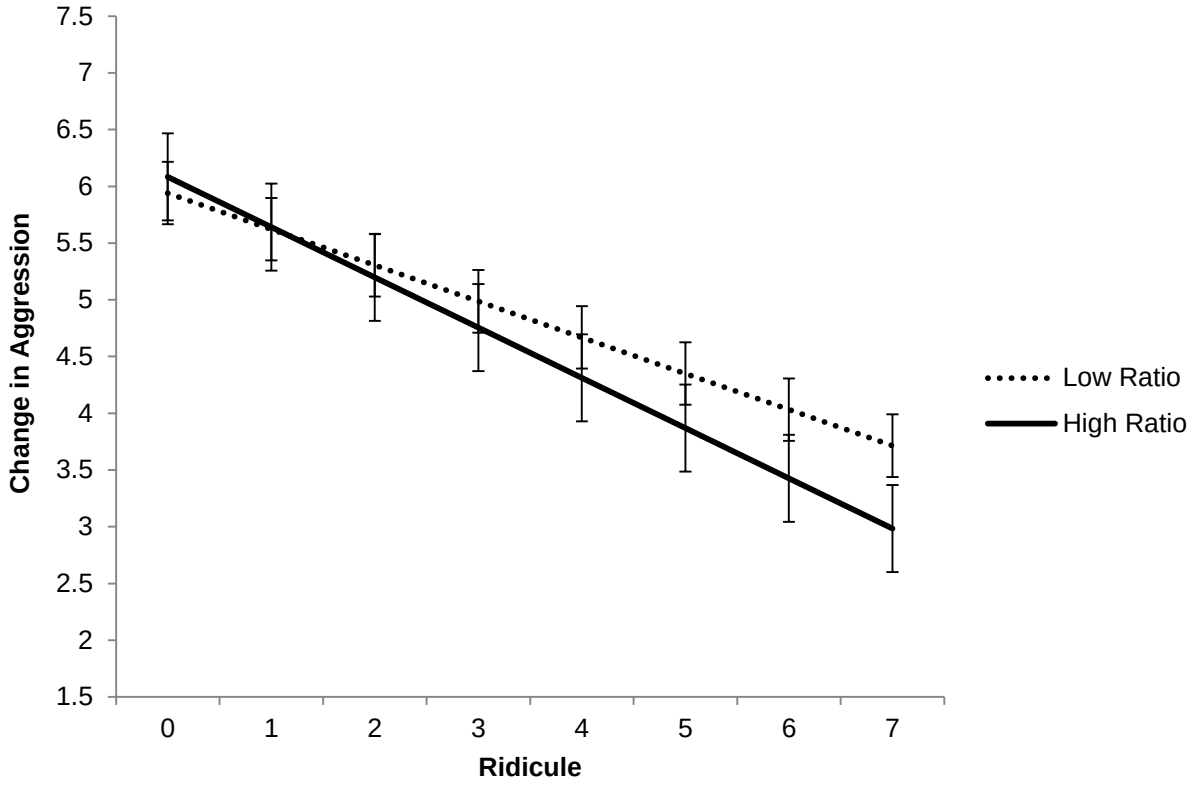

Figure 3-3. The interaction between Time 1 cortisol/DHEAS Ratio and Time 1 ridicule in the prediction of the change in aggression. Values represent the predicted aggression score when controlling for other variables, including Time 1 aggression score. When ridicule was high, participants with a higher cortisol/DHEAS ratio exhibited higher levels of aggression than did those with a lower cortisol/DHEAS ratio, $p < .05$. Error bars indicate the standard error.

CHAPTER 4
DISCUSSION

This study examined parenting characteristics, environmental chaos, and the cortisol/DHEAS ratio as possible moderators of the relationship between social stress and symptoms of psychopathology . Peer problems predicted depressive symptoms and aggression in all of the cross-sectional analyses, though it did not predict change in symptoms from Time 1 to Time 2. The first hypothesis for this study was that the environmental and biological factors would moderate the effects of peer problems on depressive symptoms or aggression; this hypothesis was partially supported. Specifically, the interaction between the cortisol/DHEAS ratio and child report of ridicule exhibited a significant moderating effect on peer problems for both depressive and aggressive symptoms in the longitudinal analyses. The second hypothesis in this study was that high cortisol/DHEAS ratios would be predictive of depressive symptoms while low cortisol/DHEAS would be predictive of aggression. This hypothesis was supported in some analyses. The main effect of the cortisol/DHEAS ratio was only significant in predicting longitudinal change in depressive symptoms, but the interaction of the cortisol/DHEAS ratio with child report of ridicule was significant in the prediction of change in both aggression and depressive symptoms. Prior research on the cortisol/DHEAS ratio in psychopathology has been limited primarily to high risk or clinical populations (Gallagher & Ritsner, 2009); notably, the present finding in a community sample suggests that this ratio may be used more broadly as an indicator of physiological vulnerability during the transition into adolescence.

Depressive symptoms

Many previous studies in young adolescents have found significant associations between problematic peer relationships and depressive symptoms. In the Time 1 and Time 2 cross-sectional analyses, maternal report of social problems was a significant predictor of depressive symptoms, supporting prior research on peer relations and depression (Boivin, Hymel, & Bukowski, 1995; Panak & Garber, 1992) at the younger age (time 1), child report of ridicule was also a significant predictor of concurrent symptoms of depression. Because of the potential comorbidity of depressive and aggressive symptoms often reported in studies of adolescents, effects of peer problems were tested after controlling for concurrent aggression. Note that in the present study correlations of aggressive behaviors and depressive symptoms were similar at both times but demonstrated a weak association (Time 1 $r = .23$, $p < .01$; Time 2 $r = .21$, $p < .01$). Concurrent aggression was a significant predictor of depressive symptoms in the Time 1 cross-sectional analysis; at Time 2, this association was not significant at the .05 level. In the longitudinal model, after controlling for previous depressive symptoms, none of the main effects for prior aggression or social problems were present. This indicates that peer problems and concurrent aggression are predictive of depressive symptoms in this sample but not change in symptoms over time.

Contrary to previous research, none of the biological or environmental variables had a significant main effect on depressive symptoms in the cross-sectional analyses, and only the cortisol/DHEAS ratio was significant in the longitudinal analysis. A significant moderating effect was present in the interaction between the cortisol/DHEAS ratio and child report of ridicule in the longitudinal analysis. However, a trend for the interaction between parenting and child report of ridicule was found in the cross-sectional

Time 2 analysis, suggesting that, as ridicule is more prevalent and parenting is more negative, the adolescent experiences higher levels of depressive symptoms. This finding is in need of additional research, as it would support Weiss's theory of social previsions. Weiss's theory would suggest that, as adolescents experience more rejection from their peers, they would compensate by seeking parental support. If the parent-child relationship is also harsh or cold, the adolescent may experience a negative emotional reaction, such as the development of depressive symptoms.

Aggression

As has been reported in prior studies, socioeconomic status was a significant predictor of current aggression as well as change in aggression over time, with lower SES predicting higher aggression. In the Time 1 cross-sectional analysis, comorbid depressive symptoms predicted higher rates of aggression, as was discussed above, but this relationship was not present in either the Time 2 cross-sectional or the longitudinal analyses. This inconsistency may be due to the difference in symptoms; while aggression, specifically irritability, is a symptom of depression, comorbid depressive symptoms may not be present in adolescents with high levels of aggression. As was reported above for depressive symptoms, maternal report of social problems was a significant predictor of aggressive behaviors in both cross-sectional analyses. Interestingly, child report of ridicule was not predictive of aggressive behaviors as a main effect. This may be due to the salience of behaviors in the mothers' knowledge of peer problems (Sourander, Helstä, & Helenius, 1999) or to the differences in the types of rejection being assessed in each measure as discussed in the following section. No main effects of the biological or environmental factors were found in the cross-sectional or longitudinal analysis. However, the interaction between child report of ridicule and the

cortisol/DHEAS ratio was significant in the longitudinal analysis such that, as ridicule increased and the cortisol/DHEAS ratio decreased, adolescents experienced an increase in aggressive behavior. The difference between the groups, while significant, is small and is only apparent at higher levels of ridicule. However, to the author's knowledge, this interaction has not been previously studied in children or adolescents, the direction of these effects is consistent with prior studies of the cortisol/DHEAS and its role as a predictor of aggression in adolescents (Buydens-Branchey & Branchey, 2004; Pajer et al., 2006). The direction of the cortisol/DHEAS ratio interaction for aggression is opposite of that for depression, partially supporting the study's hypotheses.

Peer problems

Given the absence of correlation between child and mother reports of peer problems, it was not unexpected that the predictive ability of the two would differ. While mother report of social problems was a significant predictor in all of the cross-sectional analyses for both aggression and depressive symptoms, child report of ridicule was only a significant predictor in the Time 1 cross-sectional analysis for depressive symptoms. Interestingly, all of the significant interaction terms included child rather than mother report of peer problems. This may be due to the difference in the constructs assessed in each of these measures. Child report of ridicule measures strictly the amount of rejection the child has experienced, while mother report of social problems using the CBCL measures additional aspects including the child's social preferences and physical characteristics. The results from this study suggest that the interactions with parenting (CDI Time 2) and the cortisol/DHEAS ratio (longitudinal CDI and Aggression) were dependent on the amount of rejection the child experienced or the child's perception of rejection rather than the other aspects measured by the CBCL. This may be due to the

child experiencing more distress from rejection than from the other aspects of social problems that the CBCL measures.

Another possible explanation for these differences is that mothers were not aware of the extent to which the child experienced ridicule from his or her peers. The social problems subscale scores rated by parents and youth have been shown in many studies to have a low correlation (Achenbach, McConaughy, & Howell, 1987; Ferdinand, van der Ende, & Verhulst, 2006), suggesting that the parent may be misjudging the child's experience of social problems or focusing on social behaviors in different contexts than those reported on by youth. Studies have indicated that parent-child agreement of social abilities and social problems is greater during middle childhood than during early and middle adolescence (Achenbach, McConaughy, & Howell, 1987; Renk & Phares, 2004), which would impact the parents' abilities to accurately report such problems.

Cortisol/DHEAS ratio

While Goodyer and his colleagues have previously published studies on the cortisol/DHEAS in adolescents (see Angold, 2003, for review), this is the first study to examine this relationship while controlling for puberty. Controlling for puberty in adolescent studies of the cortisol/DHEAS ratio is crucial due to the effects of pubertal development on DHEAS (Matchock, Dorn, & Susman, 2007). As the individual progresses through puberty, DHEAS levels increase significantly; if pubertal stage was not accounted for in the calculation of the ratio, more developed adolescents would have an artificially lower cortisol/DHEAS ratio value. In the present study, when DHEAS levels were not adjusted for pubertal stage, effects were no longer significant. As has been found in previous studies in adults (Michael, Jenaway, Paykel, & Herbert, 2000) and adolescents (Goodyer, Herbert, & Tamplin, 2003), the present study found that high

cortisol and low DHEAS values at Time 1 were significant predictors of change in depressive symptoms. The interaction between ridicule and the cortisol/DHEAS ratio was also significant in the longitudinal analysis; adolescents who experienced more ridicule and had high cortisol/DHEAS ratios were more likely to have higher depressive symptoms at Time 2, which was not true of adolescents without high cortisol/DHEAS ratios.

While many studies have been published on the effects of the cortisol/DHEAS ratio on depression, very few have examined these effects on aggressive behaviors. While the main effect of the cortisol/DHEAS ratio in the current study was not significant, contrary to previous research (Buydens-Branchey & Branchey, 2004; Pajer et al., 2006), adolescents who had experienced ridicule and had a low cortisol/DHEAS ratio were more likely to display more aggression at Time 2 compared to those without a low cortisol/DHEAS ratio. While the interaction is significant, it is small, and difference between the groups is only apparent at higher levels of ridicule. To the author's knowledge, no previous studies have examined the effect of the interaction between peer ridicule and the cortisol/DHEAS ratio on aggression.

Parenting and Environmental Chaos

Though various types of chaos, including lack of daily routine, have been extensively linked to adolescent aggression (Deater-Deckard, Mullineaux, Beekman, Petrill, Schatschneider, & Thompson, 2009), this effect was not found in the current study. While the main effect of environmental chaos in the Time 2 cross-sectional analysis was significant, this finding cannot be reliably interpreted because the step was not significant. None of the interaction terms including chaos were significant, contrary to the hypothesis that chaos would act as a moderator of the effect of peer problems on symptoms of psychopathology. One explanation for this lack of significance is that many of the

previous studies were conducted with at-risk adolescents while this study utilized a normative community sample recruited from a working-class neighborhood. Additionally, because the chaos variable was calculated by summing dichotomous values for four items, it produced a truncated range of scores, possibly affecting the accuracy of the chaos measure. This may be particularly true in adolescents who experienced the highest levels of chaos, who were also expected to be the most affected by chaos.

As part of a large study of early adolescent boys and girls, Sentse and colleagues (2010) found a significant interaction between the quality of parental and peer relationships in the prediction of psychopathology. For both internalizing and externalizing symptoms, the authors found that adolescents who reported less warmth and more hostility from their parents and who were also rated as the least accepted by their classmates had the highest symptom levels. In the present study, the interaction between parenting and child report of ridicule demonstrated a trend for an association in the Time 2 cross-sectional prediction of depressive symptoms, but no main effects or interactions were significant for depressive symptoms or aggression.

Implications and Limitations

Despite the strengths of this study, limitations to the study merit discussion. First, although the experimenter left the room during the conflict discussion tasks, the parent and child may not have responded as they typically would due to the researcher's presence in the home or the presence of video camera. This could have resulted in the coded interaction styles being atypical for the mother-child dyad. Additionally, the full range of parenting behaviors were not captured by the task used, and other parent behaviors may have been more salient to adjustment. Though mothers are not always the primary caregivers, they were used in the parent-child interaction task, which could

present a different parenting experience than what is typical for the child. However, while the mother is not always the primary caregiver, Baumrind (1991) found that mothers and fathers have similar parenting styles in roughly 75% of households studied.

As indicated, this study was conducted in a home rather than laboratory settings, and as such there are unique challenges to collecting hormone data. In an effort to gather accurate awakening cortisol data, the researchers did not specify a time for saliva collection. Though the collection time was consistent for most of the samples, some samples were collected on weekends, when children may be permitted to sleep later. Samples with drastically different collection times were removed in order to obtain the most accurate values, though this process may not have been sufficient. Additionally, because of the typical pattern of cortisol change during sleep, participants who have little consistency in bedtime may have shown greater cortisol variability, even if samples were collected at the same time each morning. Due to the nature of collection, some of the samples may not have been collected or stored according to the researcher's instructions. Although samples were eliminated from analysis if problems were identified, unidentified problems likely contribute to error variance. Also, previous studies of the cortisol/DHEAS level have obtained each hormone value from the same source, typically either saliva or blood. While this study used different samples for cortisol and DHEAS levels, saliva and urine, respectively, previous studies have indicated that DHEAS levels in overnight urine samples are comparable to those in saliva samples. Although most previous studies on the cortisol/DHEAS ratio have focused on high-risk or clinical samples, the current study, using a community sample, found effects consistent with prior studies.

Another concern is that the alpha level for CBCL social problems at Time 2 was much lower than at Time 1; the reason for this difference is unknown, but the findings at both time points were similar. Additionally, both social problems and aggression were measured via maternal report on subscales of the CBCL; this may have caused the relationship to be inflated. Inclusion of the child report of rejection offsets concerns about use of the same reporter for predictor and outcome to some extent.

Because these data are from a community sample in an urban area, findings may not be applicable to a general young adolescent population. There is also the possibility of history affecting the internal validity in this study. The girls' and boys' studies were initiated four years apart, so any substantial events that occurred between the collection of the girls' and the boys' data may have affected the variables analyzed in this study. Although many studies have demonstrated gender differences during adolescence in key variables used in this study (see Zahn-Waxler, Shirtcliff, & Marceau, 2008, for review), no gender differences were found in the current sample. This may be due to the early stage of adolescence in which this study took place for most participants. Gender differences in aggression and depressive symptoms are typically not as apparent until middle or later adolescence, and the current sample included individuals in late childhood and early adolescence.

Despite these limitations, studying the effects of environmental and hormonal factors on the interaction between social stressors and aggression and depressive symptoms may help us to better understand why most adolescents experience similar difficulties in social interactions while only a few develop lasting psychosocial difficulties. The results from this study suggest that intervention programs in home or school

environments designed to help children and their parents communicate effectively or to teach children the lasting effects of teasing and bullying may help to reduce risk for psychopathology. Moderators such as the cortisol/DHEAS ratio may provide a means by which to predict whether an adolescent, upon experiencing significant peer rejection, develops an internalizing or externalizing disorder. The cortisol/DHEAS ratio may be an indicator of a biological vulnerability which emerges during early adolescence due to the increasing complexity and significance of peer relationships or due to additional biological or psychosocial changes taking place during this time. Additional research is needed to determine the developmental significance of the cortisol/DHEAS ratio and the strength of the interaction effect with peer problems across different ages.

APPENDIX A
CBCL SOCIAL PROBLEMS SUBSCALE

1. Acts too young for his/her age
11. Clings to adults or too dependent
25. Doesn’t get along with other kids
38. Gets teased a lot
48. Not liked by other kids
55. Overweight
62. Poorly coordinated or clumsy
64. Prefers being with younger kids

APPENDIX B
CHILDREN'S DEPRESSION INVENTORY

1. I am sad once in a while.
   I am sad many times.
   I am sad all the time.
2. Nothing will ever work out for me.
   I am not sure if things will work out for me.
   Things will work out for me O.K.
3. I do most things O.K.
   I do many things wrong.
   I do everything wrong.
4. I have fun in many things.
   I have fun in some things.
   Nothing is fun at all.
5. I am bad all the time.
   I am bad many times.
   I am bad once in a while.
6. I think about bad things happening to me once in a while.
   I worry that bad things will happen to me.
   I am sure that terrible things will happen to me.
7. I hate myself.
   I do not like myself.
   I like myself.
8. All bad things are my fault.
   Many bad things are my fault.
   Bad things are not usually my fault.
9. I feel like crying everyday.
   I feel like crying many days.
   I feel like crying once in a while.
10. Things bother me all the time.
    Things bother me many times.
    Things bother me once in a while.
11. I like being with people.
    I do not like being with people many times.
    I do not like being with people at all.
12. I cannot make up my mind about things.
    It is hard to make up my mind about things.
    I make up my mind about things easily.
13. I look O.K.
    There are some bad things about my looks.
    I look ugly.
14. I have to push myself all the time to do my schoolwork.
    I have to push myself many times to do my schoolwork.
    Doing schoolwork is not a big problem.
15. I have trouble sleeping every night.
    I have trouble sleeping many nights.

I sleep pretty well.

16. I am tired once in a while.
    I am tired many days.
    I am tired all the time.
17. Most days I do not feel like eating
    Many days I do not feel like eating.
    I eat pretty well.
18. I do not worry about aches and pains.
    I worry about aches and pains many times.
    I worry about aches and pains all the time.
19. I do not feel alone.
    I feel alone many times.
    I feel alone all the time.
20. I never have fun at school.
    I have fun at school only once in a while.
    I have fun in school many times.
21. I have plenty of friends.
    I have some friends, but I wish I had more.
    I do not have any friends.
22. My school work is alright.
    My school work is not as good as before.
    I do very badly in subjects I used to be good in.
23. I can never be as good as other kids.
    I can be as good as other kids if I want to.
    I am just as good as other kids.
24. Nobody loves me.
    I am not sure if anybody loves me.
    I am sure that somebody loves me.
25. I usually do what I am told.
    I do not do what I am told most times.
    I never do what I am told.
26. I get along with people.
    I get into fights many times.
    I get into fights all the time.

APPENDIX C
CBCL AGGRESSIVE BEHAVIORS SUBSCALE

3. Argues a lot
7. Bragging, boasting
16. Cruelty, bullying, or meanness to others
19. Demands a lot of attention
20. Destroys his/her own things
21. Destroys things belonging to his/her family or others
22. Disobedient at home
23. Disobedient at school
27. Easily jealous
37. Gets in many fights
57. Physically attacks people
68. Screams a lot
74. Showing off or clowning
86. Stubborn, sullen, or irritable
87. Sudden changes in mood or feelings
93. Talks too much
94. Teases a lot
95. Temper tantrums or hot temper
97. Threatens people
104. Unusually loud

APPENDIX D
BREAKDOWN OF CHAOS VARIABLES

Table D-1. Time 1 Chaos frequencies

		Frequency	Percent	Valid Percent
Valid	.00	82	37.4	43.9
	1.00	57	26.0	30.5
	2.00	39	17.8	20.9
	3.00	7	3.2	3.7
	4.00	2	.9	1.1
	Total	187	85.4	100.0
Missing	System	32	14.6	
Total		219	100.0	

Table D-2. Time 1 “Eat with mother or father” frequencies

		Frequency	Percent	Valid Percent
Valid	Yes	164	74.9	84.5
	No	30	13.7	15.5
	Total	194	88.6	100.0
Missing	System	25	11.4	
Total		219	100.0	

Table D-3. Time 1 “Regular weekday bedtime” frequencies

		Frequency	Percent	Valid Percent
Valid	Yes	143	65.3	76.1
	No	45	20.5	23.9
	Total	188	85.8	100.0
Missing	System	31	14.2	
Total		219	100.0	

Table D-4. Time 1 number of places cared for by a non-parent

		Frequency	Percent	Valid Percent
Valid	.00	49	22.4	26.5
	1.00	94	42.9	50.8
	2.00	35	16.0	18.9
	3.00	6	2.7	3.2
	4.00	1	.5	.5
	Missing	34	15.5	
	Total	219	100.0	100.0

Table D-5. Time 1 number of non-parent caregivers

		Frequency	Percent	Valid Percent
Valid	.00	62	28.3	33.5
	1.00	73	33.3	39.5
	2.00	36	16.4	19.5
	3.00	9	4.1	4.9
	4.00	3	1.4	1.6
	5.00	2	.9	1.1
	Missing	34	15.5	
	Total	219	100.0	100.0

Table D-6. Time 2 Chaos frequencies

		Frequency	Percent	Valid Percent
Valid	.00	77	35.2	39.3
	1.00	69	31.5	35.2
	2.00	42	19.2	21.4
	3.00	7	3.2	3.6
	4.00	1	.5	.5
	Total	196	89.5	100.0
Missing	System	23	10.5	
Total		219	100.0	

Table D-7. Time 2 “Eat with mother or father” frequencies

		Frequency	Percent	Valid Percent
Valid	Yes	161	73.5	81.7
	No	36	16.4	18.3
	Total	197	90.0	100.0
Missing	System	22	10.0	
Total		219	100.0	

Table D-8. Time 2 “Regular weekday bedtime” frequencies

		Frequency	Percent	Valid Percent
Valid	Yes	150	68.5	74.6
	No	51	23.3	25.4
	Total	201	91.8	100.0
Missing	System	18	8.2	
Total		219	100.0	

Table D-9. Time 2 number of places cared for by a non-parent

		Frequency	Percent	Valid Percent
Valid	.00	36	16.4	19.1
	1.00	113	51.6	60.1
	2.00	36	16.4	19.1
	3.00	2	.9	1.1
	4.00	1	.5	.5
	Missing	31	14.2	
	Total	219	100.0	100.0

Table D-10. Time 2 number of non-parent caregivers

		Frequency	Percent	Valid Percent
Valid	.00	58	26.5	30.9
	1.00	76	34.7	40.4
	2.00	37	16.9	19.7
	3.00	13	5.9	6.9
	4.00	3	1.4	1.6
	5.00	1	.5	.5
	Missing	31	14.2	
	Total	219	100.0	100.0

APPENDIX E
ADDITIONAL STATISTICS

Table E-1. Demographic frequencies

		Frequency	Percent
Sex	Male	103	47.0
	Female	116	53.0
	Total	219	100.0
Ethnicity	White	74	33.8
	Black: African-American	49	22.4
	Black: Caribbean/Island origin	7	3.2
	Black: non-specified/other	22	10.0
	Asian or Pacific Islander	6	2.7
	Hispanic: Puerto Rican	20	9.1
	Hispanic: Dominican	2	.9
	Hispanic: non-specified/other	9	4.1
	other/non-specified	7	3.2
	Multiracial	23	10.5
	Total	219	

Table E-2. SES, age, and puberty descriptives

	N	Minimum	Maximum	Mean	Std. Deviation
SES	217	9.00	66.00	37.58	13.22
T1 Age	195	8.81	13.86	10.86	.77
Boys	103	9.17	13,86	11.13	.77
Girls	92	8.81	12.16	10.56	.64
T2 Age	202	10.16	14.09	12.04	.77
Boys	91	10.98	14.09	12.28	.69
Girls	111	10.16	13.74	11.84	.78
T1 Tanner Score	190	1.00	5.00	2.12	.95
Boys	100	1.00	5.00	1.93	.86
Girls	90	1.00	4.50	2.33	1.00
T2 Tanner Score	198	1.00	5.00	2.82	1.00
Boys	87	1.00	5.00	2,72	.91
Girls	111	1.00	5.00	2.91	1.07

Table E-3. Means and standard deviations for Time 1 primary variables

Variable	n	Min	Max	M	SD
T1 Aggression	190	.00	26.00	6.65	5.70
T1 Aggression Girls	89	.00	26.00	6.58	5.68
T1 Aggression Boys	101	.00	26.32	6.09	5.43
T1 CDI (Adjusted)[a]	182	.00	39.00	7.02	6.33
T1 CDI Girls (Adj)	88	.00	32.00	6.98	6.68
T1 CDI Boys (Adj)	94	.00	39.00	7.06	6.02
T1 Ridicule	190	.00	7.00	1.16	1.36
T1 CBCL Social Problems	190	.00	15.00	1.83	2.29
T1 Cortisol/DHEAS[b]	163	.47	.61	.50	.02
T1 Parenting[c]	188	2.00	6.00	4.06	1.06
T1 Chaos[d]	187	.00	4.00	.88	.94

[a] CDI scores adjusted to reflect removal of suicidality item
[b] lower values indicate lower cortisol and higher DHEAS values
[c] higher values indicate more negative parenting characteristics
[d] higher values indicate higher levels of chaos

Table E-4. Means and standard deviations for Time 2 primary variables

Variable	n	Min	Max	M	SD
T2 Aggression	195	.00	29.00	5.96	5.32
T2 Aggression Girls	108	.00	29.00	5.85	5.25
T2 Aggression Boys	87	.00	26.32	6.09	5.43
T2 CDI (Adjusted)[a]	184	.00	26.00	6.04	5.71
T2 CDI Girls (Adj)	103	.00	25.00	6.08	5.90
T2 CDI Boys (Adj)	81	.00	26.00	6.52	5.48
T2 Ridicule	191	.00	6.00	1.16	1.30
T2 CBCL Social Problems	195	.00	9.00	1.61	1.83
T2 Cortisol/DHEAS[b]	173	.45	.80	.50	.03
T2 Parenting[c]	182	2.00	6.00	3.88	.97
T2 Chaos[d]	196	.00	4.00	.91	.89

[a] CDI scores adjusted to reflect removal of suicidality item
[b] lower values indicate lower cortisol and higher DHEAS values
[c] higher values indicate more negative parenting characteristics
[d] higher values indicate higher levels of chaos

Table E-5. Cross-Sectional Correlations of Time 1 Variables

Variable	1	2	3	4	5	6	7
T1 Aggression	-						
T1 CDI	.227**	-					
T1 Ridicule	.073	.266***	-				
T1 CBCL Social Problems	.512***	.239**	.110	-			
T1 Cortisol/DHEAS	.102	-.088	-.017	.116	-		
T1 Parenting	-.027	.094	.062	-.012	.094	-	
T1 Chaos	.076	.008	.019	.069	-.039	-.167*	-

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

Table E-6. Cross-Sectional Correlations of Time 2 Variables

Variable	1	2	3	4	5	6	7
T2 Aggression	-						
T2 CDI	.211**	-					
T2 Ridicule	.033	.182*	-				
T2 CBCL Social Problems	.523***	.241**	.108	-			
T2 Cortisol/DHEAS	-.003	.035	-.127	.016	-		
T2 Parenting	-.094	-.025	.148†	-.008	.038	-	
T2 Chaos	.277***	.161*	.127†	.093	.100	-.146†	-

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

Table E-7. Longitudinal Correlations of Time 1 Predictors and Time 2 Outcome Variables

Variable	1	2	3	4	5	6	7
T2 Aggression	-						
T2 CDI	.211**	-					
T1 Ridicule	.065	.264**	-				
T1 CBCL Social Problems	.480***	.260**	.110	-			
T1 Cortisol/DHEAS	.079	-.236**	-.017	.116	-		
T1 Parenting	.018	.177*	.062	-.012	.094	-	
T1 Chaos	.129†	.075	.019	.069	-.039	-.167*	-

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

Table E-8. Frequency of maternal warmth at Time 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	32	14.6	17.0	17.0
	2.00	43	19.6	22.9	39.9
	3.00	65	29.7	34.6	74.5
	4.00	42	19.2	22.3	96.8
	5.00	6	2.7	3.2	100.0
	Total	188	85.8	100.0	
Missing	System	31	14.2		
Total		219	100.0		

Table E-9. Frequency of maternal hostility at Time 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	150	68.5	79.8	79.8
	2.00	20	9.1	10.6	90.4
	3.00	13	5.9	6.9	97.3
	4.00	2	.9	1.1	98.4
	5.00	3	1.4	1.6	100.0
	Total	188	85.8	100.0	
Missing	System	31	14.2		
Total		219	100.0		

Table E-10. Frequency of maternal warmth at Time 2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	35	16.0	19.2	19.2
	2.00	58	26.5	31.9	51.1
	3.00	59	26.9	32.4	83.5
	4.00	23	10.5	12.6	96.2
	5.00	7	3.2	3.8	100.0
	Total	182	83.1	100.0	
Missing	System	37	16.9		
Total		219	100.0		

Table E-11. Frequency of maternal hostility at Time 2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	136	62.1	74.7	74.7
	2.00	29	13.2	15.9	90.7
	3.00	11	5.0	6.0	96.7
	4.00	6	2.7	3.3	100.0
	Total	182	83.1	100.0	
Missing	System	37	16.9		
Total		219	100.0		

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BIOGRAPHICAL SKETCH

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