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Early Life Influences on Acute Stress Reactivity in Young Adulthood

A dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy in Psychology

by

Alexandra H. Dupont

2014
ABSTRACT OF THE DISSERTATION

Early Life Influences on Acute Stress Reactivity in Young Adulthood

by

Alexandra H. Dupont

Doctor of Philosophy in Psychology

University of California, Los Angeles, 2014

Professor Julienne E. Bower, Chair

Stress in early life, such as experiencing physical or sexual abuse, is associated with vulnerability to chronic illnesses in adulthood including depression, lung disease, cancer, heart disease, diabetes, and premature mortality. Less severe early experiences have also been linked to poor health in adulthood. Repetti, Taylor, and Seeman (2002) identified a specific cluster of family characteristics that leave children at risk for worse health in adulthood. High levels of conflict and aggression, and relationships that are cold, unsupportive, and neglectful characterize these “risky families”. How a risky family environment influences long-term health remains largely unknown. Hypothesized pathways include: (1) disruptions of the physiological stress response systems, including a hyper-reactive cardiovascular system, and (2) disruptions in psychosocial functioning, including increased threat appraisal, hostility, rejection sensitivity, and avoidant coping. The current study tests these proposed pathways by examining whether healthy young adults ($N=95$) that report growing up in a risky family have altered physiological, psychological, and behavioral responses to acute psychological stress. Participants completed two social stress tasks related to psychological domains thought to be altered in the context of
early adversity, social conflict and negative social evaluation. Participants’ emotional, behavioral, cardiovascular, autonomic nervous system, and salivary cortisol responses to these tasks were measured. Results showed that young adults from risky families demonstrated increased automatic processing of threatening stimuli, heightened anxiety, and a heightened initial systolic blood pressure response to social conflict compared to controls. We found no evidence for increased hostile attitudes or behaviors, sensitivity to rejection from a peer, or disengagement coping in individuals from risky families. In exploratory analyses that tested the impact of specific subtypes of risky family environments, we found that experiencing abuse in childhood was associated with greater sympathetic nervous system reactivity to social conflict and growing up in a chaotic home environment was associated with a dampened cortisol response to the laboratory session. Together, these results challenge and extend the risky family model, providing new directions for future research.
The dissertation of Alexandra H. Dupont is approved.

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Introduction

Stress in childhood is associated with vulnerability to psychological and physical illness in adulthood, including lung disease, heart disease, diabetes, cancer, depression, and premature mortality (e.g., Anda et al., 2009; Danese, Pariante, Caspi, Taylor, & Poulton, 2007; Felitti et al., 1998; Jacobs & Bovasso, 2000; Koupil et al., 2009; Norman et al., 2012; Rich-Edwards et al., 2010; Wegman & Stetler, 2009). Most of the research in this area has focused on the long-term impact of severe forms of early adversity, such as physical or sexual abuse, and physical neglect.

Less severe and more common forms of early adversity such as disrupted parent-child relationships have also been associated with worse mental and physical health in adulthood (e.g., Russek & Schwartzer, 1997). Repetti, Taylor, and Seeman (2002) identified a cluster of family characteristics that are associated with behavioral problems in childhood, and worse health throughout life. Specifically, families that are characterized by high levels of conflict and aggression, relationships that are cold, unsupportive, and neglectful, and chaotic daily lives, are termed “risky families” because they leave children at risk for worse health. Children that grow up in risky families have higher rates of mental health problems throughout their lives, and accumulating evidence suggests that they also have worse physical health in adulthood (Carroll et al., 2013; Luecken & Lemery, 2004; Repetti, Robles, & Reynolds, 2011; Repetti et al., 2002; Taylor, Lehman, Kiefe, & Seeman, 2006; Taylor, Lerner, Sage, Lehman, & Seeman, 2004).

The mechanisms through which growing up in a risky family may influence physical health decades later are largely unknown. One hypothesis is that stress in childhood dysregulates the physiologic response to acute stress. In response to psychological or physical stress, the autonomic nervous system (ANS) and hypothalamic pituitary adrenal (HPA) axis respond, preparing the body to meet environmental demands (Weiner, 1992). Responses that are over
active, under active, fail to habituate, or fail to recover efficiently are considered maladaptive responses that over time may contribute to disease development and progression (McEwen, 1998).

Previous studies have examined whether experiencing early adversity alters acute stress reactivity in adulthood, but several large gaps in the literature remain. First, studies have largely focused on stress reactivity in clinical samples of adults who in addition to the presence of psychopathology, report a history of severe childhood maltreatment like physical or sexual abuse (e.g., Bremner et al., 2003; Heim, 2000; Heim et al., 2002; Newport, Heim, Bonsall, Miller, & Nemeroff, 2004; Pace & Mletzko, 2006). Results from these studies consistently show that severe childhood maltreatment alters stress reactivity patterns in adulthood. However, these alterations may be primarily driven by the presence of psychopathology and not the experience of early life stress in that psychopathology has been shown to alter stress reactivity (e.g., Ehlert, Gaab, & Heinrichs, 2001; Gold, Goodwin, & Chrousos, 1988).

Previous studies of individuals who experienced severe maltreatment also do not inform our understanding of the impact of milder forms of early adversity, such as growing up in a risky family environment. The studies that have tested the influence of a risky family environment on stress reactivity in adulthood are limited in that they focus primarily on the HPA axis and cardiovascular response to stress. Results show a dampened cortisol response in those from risky families, but mixed and often null results for cardiovascular reactivity (e.g., Carpenter et al., 2007; Larkin, Frazer, & Semenchuk, 1996). No studies have delineated the ANS influences on stress reactivity, which may be particularly important given the role of the ANS in regulating the inflammatory cytokine network (Irwin & Cole, 2011; Thayer & Sternberg, 2006).

Not all studies we review selected subjects based on the definition of a “risky family” outlined by Repetti et al. (2002), but all used instruments that were conceptually similar. Thus, our use of the term risky family when describing study samples does not imply the use of the Risky Family Questionnaire.
Inflammation is of particular importance in this context given evidence that risky family environments are associated with heightened circulating inflammatory markers in adulthood (Carroll et al., 2013; Crosswell, Bower, & Ganz, 2014; Danese et al., 2007; Matthews, Chang, Thurston, & Bromberger, 2014; Taylor, Lehman, et al., 2006), and chronic inflammation is associated with increased risk of chronic disease and mortality (Choy & Panayi, 2001; Coussens & Werb, 2002; Dowlati et al., 2010; Kaptoge et al., 2010).

A final gap in the current literature is the lack of examination of psychological factors that may be driving alterations in physiological stress reactivity. Children currently living in risky families demonstrate distinct psychological and behavioral differences from those living in warm and loving homes. These differences include increased threat appraisal, difficulty regulating emotions, and ineffective social behaviors (Repetti et al., 2002), all of which are associated with stress physiology (Woody & Szechtman, 2011). Researchers hypothesize that these psychological differences influence stress reactivity profiles (Chen & Miller, 2012; Luecken & Lemery, 2004; Luecken, Roubinov, & Tanaka, 2013; Repetti et al., 2011, 2002), but few studies have examined whether these psychological and behavioral tendencies continue into adulthood, and whether they are associated with acute stress reactivity.

The current study examines whether young adults who report growing up in a risky family have altered physiological, psychological, and behavioral responses to acute psychological stress. We selected social stress tasks that tap into psychological domains known to be altered in the context of early adversity. Specifically, we employ a social conflict role-play task and a social evaluation task to examine whether young adults from risky families demonstrate increased threat appraisal, hostility towards others, sensitivity to rejection from a peer, and attempts to disengage from social stress in comparison to those from non-risky
families. In the following sections we provide a rationale for the study by reviewing previous literature linking early adversity to alterations in physiological stress reactivity patterns and psychological processes in adulthood.

**Early Adversity and Physiological Stress Reactivity**

The majority of studies testing the hypothesis that early adversity is associated with dysregulation of the acute stress response in adulthood have been conducted in clinical samples of adults that experienced severe maltreatment in childhood. In general, these studies have shown that severe maltreatment alters the HPA axis response to acute psychological stress and pharmacological challenges. For example, adults who experienced physical or sexual abuse in childhood and were diagnosed with a psychiatric illness (i.e., depression) have dampened cortisol responses to acute psychological and pharmacologic stress compared to healthy controls (e.g., Heim, 2000; Heim et al., 2002; Newport et al., 2004).

There has been less attention to the impact of family environments that are “risky” but not characterized by severe physical or sexual abuse on stress reactivity profiles in adulthood. The majority of studies that have examined the influence of growing up in a risky family on acute stress reactivity have examined cortisol, blood pressure, and heart rate responses to psychological challenge. The impact of a risky family environment on cortisol reactivity is generally consistent, with adults from risky families showing a dampened cortisol response to acute stress compared to controls (Engert, Buss, et al., 2010; Engert, Efanov, et al., 2010; Goldman-Mellor, Hamer, & Steptoe, 2012; Luecken, Kraft, & Hagan, 2009; Taylor et al., 2004).

The relationship between growing up in a risky family environment and cardiovascular reactivity in adulthood is less clear. The cardiovascular system has received considerable attention in the study of acute stress reactivity because repeated and heightened blood pressure...
responses to stress are associated with the development of hypertension and cardiovascular disease progression (Georgiades, Lemne, de Faire, Lindvall, & Fredrikson, 1997; Lynch, Everson, Kaplan, Salonen, & Salonen, 1998). We identified 10 studies that examined the impact of growing up in a risky family on cardiovascular reactivity to psychological stress. Three of these studies reported heightened blood pressure and/or heart rate reactivity in individuals from risky families (Larkin et al., 1996; Larkin, Frazer, & Wheat, 2011; Taylor et al., 2004), five studies reported no association, (Carpenter et al., 2007; Carpenter et al., 2011; Elzinga et al., 2008; Engert et al., 2010a; Pruessner, Champagne, Meaney, & Dagher, 2004), and two studies reported lower cardiovascular reactivity in individuals from risky families (Luecken et al., 2005; Luecken & Roubinov, 2012). There were no obvious differences in methodology; all studies used college-age adults, comparable tools for early life stress assessment (e.g., Moos Family Environment Scale; Parent Bonding Instrument, Child Trauma Questionnaire), and similar stress protocols (i.e., the Trier Social Stress Test, Noisy Neighbor task, or a similar paradigm).

Another stress response system that has received little attention in this literature is the ANS. The ANS supports anabolic and catabolic functions across numerous organ systems. The ANS is divided into two subsystems: the sympathetic and parasympathetic nervous systems. Both branches innervate a number of organs throughout the body. In response to stress, activation of the sympathetic branch leads to increased cardiovascular activation, pupil dilation, and secretion of norepinephrine and epinephrine into the blood stream. The parasympathetic system acts as the counter regulatory “brake” to the sympathetic system.

Living in a risky family environment during childhood may alter the development of the sympathetic system. The amygdala, a brain region that is often active in studies involving threat and fear (Phelps, 2006; Whalen, 2007), is altered in children who have experienced severely
adverse early rearing conditions. Specifically, institutionally reared children show larger amygdala volume and functional hyperactivity years after being removed from the adverse conditions (Tottenham et al., 2010, 2011). Activation of the amygdala likely leads to increases in sympathetic activity via its connections with other brainstem regions such as the locus coeruleus, which is a key region for norepinephrine production (Muscatell & Eisenberger, 2012). Thus, heightened sensitivity of the amygdala or increased perceptions of threat in the environment may lead to increased sympathetic activation in individuals from risky families.

Initial evidence suggests that early adversity may be associated with alterations of both the parasympathetic and sympathetic nervous systems, though very little research has examined this. In one study conducted with children, lower quality of relationships with current caregivers, and to a lesser extent specific experiences of neglect, were associated with heightened sympathetic activation in response to the Strange Situation paradigm (Oosterman, De Schipper, Fisher, Dozier, & Schuengel, 2010). Another study found that severe maltreatment was associated with lower resting parasympathetic activity in young children (Miskovic, Schmidt, Georgiades, Boyle, & MacMillan, 2009). In two studies of adults, a history of sexual abuse, physical abuse, or neglect, was associated with lower parasympathetic activity at rest and in response to exercise (Dale et al., 2009; Shenk, Noll, Putnam, & Trickett, 2010). To our knowledge, no study has examined the influence of growing up in a risky family environment on parasympathetic and sympathetic responses to psychological stress in adulthood.

**Risky Families and Psychological Responses to Stress**

There is currently little understanding of what psychological processes drive changes in physiological stress response patterns in adults from risky families. One hypothesis is that individuals from risky families have difficulty navigating social interactions. Growing up in a
risky family may lead to cognitive, affective, and behavioral tendencies that magnify psychological and physiological responses to daily social encounters (Repetti, et al., 2002). In social interactions, individuals from risky families may demonstrate increased interpretation of encounters as threatening, heightened hostile emotions and aggression, increased rejection sensitivity, and disengagement from stressful situations (Cicchetti & Toth, 2005; Loman & Gunnar, 2010; Repetti et al., 2002).

Growing up in an unpredictable and stressful environment may lead to increased threat appraisal (Chen, Langer, Raphaelson, & Matthews, 2004; Luecken, 2006). Early experiences of fear may sensitize developing corticolimbic pathways to react more readily to threatening situations (Coccaro, Sripada, Yanowitch, & Phan, 2011; Heim & Nemeroff, 2001; Loman & Gunnar, 2010; Obradović, 2012). Evidence in severely maltreated children supports the hypothesis that maltreatment leads to automatic processing of stimuli as increasingly threatening. For example, maltreated children tend to classify facial expressions as negative, identify threatening faces with less sensory information, and show selective attention to threatening faces and then avoidance of those faces (Pollak & Kistler, 2002; Pollak & Tolley-Schell, 2003; Tottenham et al., 2011). To our knowledge, only one study has tested whether increased automatic attention to or avoidance of threatening faces is present in adults from risky families. Taylor, Eisenberger, Saxbe, Lehman, and Leiberman (2006) found that in an undergraduate sample, growing up in a risky family was not associated with reaction time to labeling images of fearful or angry facial expressions. Instead, neural activation patterns suggested that for individuals from risky families, the right ventrolateral prefrontal cortex was not able to regulate the amygdala’s response to threatening faces as effectively as controls. This suggests that growing up in a risky family may be associated with differences in neurobiological social
information processing in adulthood, warranting further research on automatic processing of threat appraisal in adults from risky families.

An attentional bias toward threatening stimuli is thought to be associated with the development and maintenance of anxiety (Mogg, Bradley, & Williams, 1995; Thayer & Lane, 2000). In children, increased threat sensitivity is related to greater anxiety in response to a variety of stress tasks and greater risk of anxiety disorder and internalizing symptoms in later childhood (for a review see Miller, 2014). The relationship between threat sensitivity and anxiety is likely bi-directional. O’Donovan and colleagues (2013) propose a neurobiological framework in which sensitivity to threat in anxious people leads to prolonged and repeated activation of stress response systems. This pathway may extend to those with a history of early life stress, as trait levels of anxiety are significantly higher in adults from risky families (Carpenter, Shattuck, Tyrka, Geracioti, & Price, 2011; Engert, Efano, et al., 2010; Luecken & Roubinov, 2012).

Interpreting more threat and experiencing more anxiety in social situations may also lead to more hostile attitudes and behaviors towards others. Hostility often manifests as aggressive behaviors and feelings of anger (Smith, 1994). In social interactions, children who have experienced severe maltreatment are more aggressive, mean, and disruptive than controls (Andreas & Watson, 2009; Cicchetti & Toth, 2005; Feldman et al., 1995; Salzinger, Feldman, Hammer, & Rosario, 1993). These behavioral tendencies are also present in children who have experienced less severe forms of early adversity. For example, children and adolescents who are the recipients of more anger, aggression, and hostility from family members, show more aggression and anger as reported by teachers and observed in lab studies (Carson & Parke, 1996; Matthews, Woodall, Kenyon, & Jacob, 1996; Stormshak, Bellanti, & Beirman, 1996).
Preliminary evidence suggests these behavioral tendencies continue into adulthood. Several studies have found that adults who grew up in risky family environments behave more aggressively and experience heightened negative emotions in response to acute stress (Larkin et al., 1996; Larkin et al., 2011; Luecken & Roubinov, 2012). The possibility that the heightened hostile emotions and behaviors in response to psychological stress in individuals from risky families may lead to heightened physiological reactivity has rarely been tested. One study has demonstrated that early adversity in the form of low socio-economic status predicted heightened cardiovascular stress reactivity in a sample of adolescents, and this relationship was partially mediated by increased appraisal of neutral situations as threatening (Chen et al., 2004).

An additional alteration in social processes present in adults from risky families may be increased rejection sensitivity. Rejection sensitivity is an excessive awareness and concern about the behaviors and statements of others, a fear of criticism by others, and sensitivity to social feedback (Boyce & Parker, 1989). Children whose caregivers are unresponsive, neglectful, or use excessively harsh punishment are more likely to develop perceptions of themselves as unworthy, have less positive self-concepts, and be more sensitive to rejection in future interpersonal interactions (Bolger, Patterson, & Kupersmidt, 1998; Downey & Feldman, 1996; Kim & Cicchetti, 2006). Fewer studies have examined this relationship in adults, but preliminary evidence suggests that a risky family environment is associated with negative self-concept and increased sensitivity to social evaluation and rejection in adulthood. One study found that retrospective reports of low maternal care in childhood was associated with low self-esteem (Pruessner, Champagne, Meaney, & Dagher, 2004). Additionally, adults who experienced sexual abuse or witnessed physical aggression between family members during childhood self-report higher rejection sensitivity than controls (Feldman & Downey, 1994;
Luterek, Harb, Heimberg, & Marx, 2004). Thus, initial studies suggest that early adversity is associated with lower self-concept and higher self-reported rejection sensitivity, though no studies have explored the association between growing up in a risky family and changes in self-concept and related emotions in response to acute negative social evaluation.

Finally, in response to stressful social situations, adults from risky families may also attempt to disengage from the stressor in order to modulate their heightened arousal or to minimize the risk of rejection from others (Elzinga et al., 2008; Luecken et al., 2009; Luterek et al., 2004). Young adults who described their childhood homes as high in conflict reported using avoidance strategies (e.g., attempting to escape) to deal with difficult situations (Luecken et al., 2005; Valentiner, Holahan, & Moos, 1994). Two studies of adults have demonstrated that individuals from risky families use more negative nonverbal behaviors similar to disengagement techniques (e.g., not tracking the confederate, turning away) during acute psychological stress (Larkin et al., 1996; Larkin et al., 2011). However, experimental studies of stress reactivity in individuals from risky families have generally not assessed behavioral disengagement or avoidant coping.

In sum, there is strong evidence that severe maltreatment leads to alterations in psychological and behavioral patterns in children that are relevant for interacting in social situations. There is accumulating evidence that these patterns are also apparent in children who experience more common and less severe forms of early adversity, such as growing up in a risky family. However, it remains unknown whether these patterns continue once the child has left the risky home environment and entered adulthood.

**Influence of Type of Early Exposure on Acute Stress Reactivity**
Different types of early environments may influence the development of stress response systems. For example, Boyce and Ellis (2005) propose that children who grow up in threatening environments, such as witnessing a lot of conflict and violence, develop high biological sensitivity as a protective strategy that helps maintain the vigilance necessary to survive. On the other hand, early environments characterized by a lack of nurturing and attention are proposed to lead to lower biological sensitivity. Thus, theoretically, exposures to different forms of early adversity, like abuse and neglect, should lead to these differing levels of sensitivity of the stress response system throughout life. Very little work has examined whether distinct types of exposures lead to distinct stress response profiles.

In developmental psychology, a significant body of research has shown that distinct types of experiences can lead to distinct behavioral outcomes. For example, a recent systematic review and meta-analysis by Norman et al. (2012) found that emotional abuse, which involves threats of violence or other verbal aggression, belittling, blaming and ridiculing from caregivers, predicts adverse outcomes after accounting for all other forms of abuse. The consequences of neglect have also been found to be distinct from and in some cases more detrimental than other forms of maltreatment (Hildyard & Wolfe, 2002; Trickett & McBride-Chang, 1995). For example, the Minnesota Mother-Child Project followed 200 low income families longitudinally, and found that emotionally neglected children had the most dramatic decline in developmental achievements from 9 months to 24 months in comparison to infants who were experiencing other forms of maltreatment including physical or verbal abuse (Egeland, Sroufe, & Erickson, 1983).

In addition to overt abuse and neglect, aspects of the family climate also influence child development (Bronfenbrenner & Evans, 2000; Bronfenbrenner, 1979). Home environments characterized by unpredictability and lack of routines or structure have been shown to negatively
influence children’s cognitive and emotional development (G. W. Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005; G. Evans & Wachs, 2010). This is consistent with Bronfenbrenner’s bioecological model of human development, which posits that predictable social environments promote competent development, while disruptions to continuity and predictability disrupt healthy development (Bronfenbrenner, 1979). A key differentiation between these different types of exposures is that a chaotic environment captures negative experiences going on around the person, while abuse captures negative behaviors directed at the person, and neglect captures positive behaviors withheld from the person. Of course they often co-occur and may be inter-related.

**Aim of Current Study**

The goal of the current study was to test whether young adults from risky families differ in psychological, behavioral, and physiological responses to acute psychological stress compared to controls. We examined responses to two experimental tasks that tap dimensions of social encounters that are particularly relevant for individuals from risky families, social conflict and social evaluation. We also examined whether growing up in a risky family environment was associated with automatic processing of threatening emotional stimuli using a computerized attention task (the Dot-Probe task; Mogg & Bradley, 1999).

The social conflict stressor, called the Noisy Neighbor task, was chosen to reflect a naturalistic and relatively common experience for undergraduates that has been shown to elicit anger and cardiovascular arousal (Semenchuk & Larkin, 1993). Participants attempt to convince an uncooperative confederate to turn down his music so they can continue studying for their exam. Stronger blood pressure and heart rate responses to the task have been found in
individuals from risky families in three previous studies (Larkin et al., 1996; Larkin et al., 2011; Lueckcn et al., 2009).

In the Social Evaluation task, the participant watches the confederate select a series of negative adjectives he or she believes are being selected to describe the participant (Eisenberger, Inagaki, Muscatell, Byrne Haltom, & Leary, 2011). This task was of interest because of previous evidence that early adversity is associated with increased sensitivity to social rejection and because social evaluation elicits a strong physiologic stress response (Dickerson, Gruenewald, & Kemeny, 2004).

In exploratory analyses, we tested whether exposure to specific types of risky family environments have distinct effects on emotional, cognitive, behavioral, and physiological stress responses. We examined subtypes of early adversity (i.e., abuse, neglect, and chaotic environment) given previous evidence of the strong and potentially independent effects of these experiences on health outcomes (Evans & Wachs, 2010; Higgins & McCabe, 2000; Norman et al., 2012; Trickett & McBride-Chang, 1995).

**Hypotheses**

1. Young adults from risky families will demonstrate heightened sensitivity and reactivity to threat. In particular, they will demonstrate increased vigilance to threatening social stimuli, as indicated by avoidance of angry and fearful faces in the Dot-Probe computer task and increased threat-related emotions (i.e., anxiety) in response to the Noisy Neighbor task relative to the control group.

2. Young adults from risky families will demonstrate increased hostility in response to social conflict, as indicated by increased hostile appraisals of the confederate, higher levels of
self-reported anger, and greater use of hostile/aggressive verbal statements in response to the Noisy Neighbor task compared to the control group.

3. Young adults from risky families will demonstrate increased rejection sensitivity in response to negative social evaluation, as indicated by a greater decrease in self-esteem and increase in shame in response to the Social Evaluation task compared to the control group.

4. Young adults from risky families will demonstrate a greater tendency to disengage from social conflict, as indicated by earlier attempts to disengage from the Noisy Neighbor task compared to the control group.

5. Young adults from risky families will demonstrate heightened cardiovascular and autonomic responses to both social conflict and social evaluation, as indicated by greater heart rate and blood pressure reactivity, greater activation of the sympathetic nervous system (greater decline in PEP and increase in LF/HF ratio), and greater withdrawal of the parasympathetic nervous system (greater decline in heart rate variability measures RMSSD and HF-HRV) compared to the control group.

6. Young adults from risky families will demonstrate a dampened cortisol response to the laboratory session compared to the control group.

7. Increased levels of our four psychological and behavioral constructs of interest (threat appraisal, hostility, rejection sensitivity, and disengagement) will be associated with heightened cardiovascular, ANS, and cortisol responses to the stress tasks for the sample as a whole.

**Methods**

**Participants**

Participants were recruited from the UCLA Psychology Department undergraduate subject pool. All undergraduates enrolled in the subject pool were given access to the study
calendar and able to enroll for a study time slot. The study was titled Social Encounters &
Health Study so as not to alert the participants to our interest in early life stress.

To ensure that we had enough participants from risky families to test our hypotheses, we
also specifically marketed our study to students who reported high levels on the Risky Family
Questionnaire (Taylor et al., 2004) that was completed by all subject pool participants on an
initial screening survey. Students who met our *a priori* criteria for being placed into the Risky
Family group (described on pages 20-21) were emailed directly, introducing the study and
encouraging them to enroll for a study time slot. Participants who were contacted directly were
not informed of the reason they were contacted.

After signing up for a time slot, the students were screened over the phone. Given our
focus on milder forms of early adversity, we excluded individuals with a history of physical or
sexual abuse. In addition, to account for potential confounding effects of psychopathology and
medical conditions on physiological stress reactivity, we excluded individuals who had a
previous diagnosis of a psychiatric illness, had been treated for a mental illness by a medical
professional, had been hospitalized for a psychiatric or drug-related reason, or had a major
medical or health problem that required continuous supervision and treatment from a doctor; or,
potentially had current depression as assessed with the Patient Health Questionnaire-9 (Kroenke,
Spitzer, & Williams, 2001). Finally, we excluded individuals with body mass index over 30,
given known effects of BMI on physiological stress reactivity. All participants that were not
eligible were provided with the contact information for the UCLA Counseling Services. The
screening script is available in Appendix A.

In total, 133 participants signed up for the study; 120 signed up directly from the subject
pool and 13 signed up after email solicitation. Nine participants were found to be ineligible (*n*=1
for BMI over 30; \( n = 8 \) for past or present psychopathology, major medical illness, or history of physical or sexual abuse; \( n = 0 \) for current depression), and 29 cancelled their appointments. The final sample size was 95 participants.

**Procedures**

**Overview of study design.** Once eligibility was confirmed, participants were scheduled for a 3-hour session in the Health Psychology laboratory. Because certain behaviors can influence the collection of physiologic data, participants were given specific instructions prior to coming to the lab. Participants were told to refrain from the following activities before the experiment: consuming alcohol within 24 hours, consuming dairy products within three hours, eating and drinking within an hour, brushing teeth within 45 minutes, and wearing clothing that would prevent attaching electrodes to their arms and lower back.

During the session participants completed three primary tasks: the Dot-Probe computer task, the Noisy Neighbor social conflict stress task, and the Social Evaluation stress task. A visual representation of the study timeline is presented in Figure 1. Psychological, behavioral, and physiological responses to the tasks were assessed. Participants also completed a series of online questionnaires after participating in the laboratory session to gather data on demographics, family characteristics, childhood experiences, and psychosocial characteristics.

**Laboratory session set-up.** Upon arrival at the Health Psychology laboratory, participants were asked to wait in the hallway outside the study rooms. A confederate approached the participant and introduced himself as another study participant. Two study Research Assistants then entered the hallway and briefly described the study, explaining that it was a study of social interactions that would involve an interactive task with the other participant and individual computer tasks. The participant and confederate were led in to separate rooms
where the participant gave informed consent. All study procedures were approved by the UCLA IRB. Research Assistants were blind to the participant’s Risky Family group status.

**Dot-Probe task.** The first task the participant completed was the Dot-Probe task, which is a computerized task designed to assess attentional bias either towards or away from threatening social stimuli (Mogg & Bradley, 1999). Participants were seated in front of a computer. Figure 2 shows an example of what the participant saw during the task. Each Dot-Probe task trial began with a small cross presented in the middle of the screen for 500 milliseconds (ms), which was followed by two faces presented on opposite sides of the screen for 500 ms. One of the faces was replaced by the dot-probe (two asterisks) which was presented for 1100 ms on the left or right side of the screen. Subjects pressed one of two keys as quickly as possible to indicate the location of the dot-probe (right versus left), and reaction time was captured. This task is based on the premise that individuals respond faster to a stimulus that is presented in an attended rather than unattended area of a visual display. Eighty trials were evenly divided between the following five facial expression combinations: angry/neutral, fear/neutral, disgust/neutral, happy/neutral, sad/neutral. Images were chosen from the NimStim Set of Facial Expressions (Tottenham et al., 2009). DirectRT v2010.3 (Empirisoft Corporation, New York) software was used. Previous research has shown that in children, a history of maltreatment is associated with automatic avoidance of threatening faces in the Dot-Probe paradigm (Pine et al., 2005). Avoidance of a threatening face is indicated by a quicker reaction time when the dot-probe replaces the neutral face compared to when it replaces the threatening face because this indicates the individual is looking at the neutral face.

**Noisy Neighbor task.** Next, participants were told they would be participating in a role-play activity with the other participant (actually the confederate). The confederate was always
male given previous evidence that male confederates elicit a greater cardiovascular response to this task than female confederates regardless of the participant’s gender (Larkin et al., 2011). The participant was told that while both participants would be videotaped during the interaction, they had been selected as the one whose physiological data would be collected, and were subsequently hooked up to the electrocardiogram (ECG), impedance cardiography (ICG), and blood pressure cuff equipment (see Figure 3 for study setup).

After the physiological equipment was in place, the participant sat quietly for 10 minutes to record baseline physiological data and complete baseline emotion questionnaires. The confederate was then brought to the participant’s room and the Research Assistant described the Noisy Neighbor task to the participant and confederate. They were instructed to role-play a scenario in which they were neighbors in a dorm, and the confederate was playing his music so loud that the participant was unable to study for an exam scheduled for the next morning. When the Research Assistant signaled them to begin, the participant was told to request their “neighbor” turn down his music so they could study for an exam. Unbeknownst to the participant, the confederate was instructed to deny this request and refuse to reach a compromise. The confederate began with a neutral facial expression and responded to the participant from a series of scripted responses indicating refusal to cooperate (e.g., “I don’t think it’s too loud”). As the role-play continued, the confederate became more assertive in his refusal (e.g., “Stop nagging me. You sound like my mother”). If the participant asked the Research Assistant what they should do, the Research Assistant had a scripted prompt to encourage the participant to continue (i.e., “All our other participants have been able to come to an agreement. You need to make a more persuasive argument”). The Research Assistant ended the role-play after 6 minutes.
At the end of the role-play, the confederate left the room and the participant sat quietly while data were collected for a 10-minute recovery period. During the recovery period, the participant completed measures of current mood, impressions of the task, and impressions of the confederate. This task is a challenging but relatively common interpersonal situation appropriate for a college sample. Several studies have shown that it elicits cardiovascular arousal, increases cortisol, provokes angry emotional and behavioral responses, and that these patterns differ based on childhood experiences (Larkin et al., 1996, 2011; Larkin, Semenchuk, Frazer, Suchday, & Taylor, 1998; Luecken et al., 2009; Luecken & Roubinov, 2012).

**Social Evaluation task.** After the Noisy Neighbor task recovery period, participants were seated in front of a computer screen that displayed an image of numerous adjectives (see Figure 4). They were told that in the other room the confederate would select adjectives that he felt best described the type of person the participant was, and that as he did so, they would see each adjective chosen since the computers were connected. In reality, the participant was viewing a pre-recorded 2-minute video during which the same adjectives were selected to describe each participant. Thirty-five adjectives appeared on the screen. From these words, the subject saw the confederate “select” 17 negative words (e.g., uptight, annoying, hostile, selfish, boring), two positive words (i.e., sensible, sincere), and four neutral words (i.e., alert, normal, competitive, practical). This task was developed by Eisenberger et al. (2011) on the basis of a behavioral paradigm used by Leary, Haupt, Strausser, and Chokel (1998). It was chosen to evoke feelings of being negatively socially evaluated. A study of undergraduates found that a similar task increased feelings of evaluation, perceptions of social rejection and shame, and increased circulating levels of the pro-inflammatory cytokine interleukin (IL)-6 (Muscatell et al., 2014). This task was used to test our hypothesis about increased rejection sensitivity in the
Risky Family group as rejection sensitivity includes reactivity to social feedback, concern about the behavior and statements of others, and fear of perceived or actual criticism from others (Boyce & Parker, 1989). The Principal Investigator (PI) debriefed the participants at the end of the laboratory session.

**Measures**

**Online questionnaires.** Participants completed a series of online questionnaires within 48 hours of participating in the lab session to assess demographics, childhood experiences, and psychosocial characteristics. In addition to the Risky Family Questionnaire, we used other measures of childhood experiences to ensure that the individuals from risky families and non-risky families did indeed have different childhood exposures. To capture trait levels of the psychological and behavioral states we probed in the stress tasks, we assessed trait hostility, rejection sensitivity, anxiety, and disengagement coping. To further characterize the sample, we included measures of social relationships and current mood.

**Demographics.** The online questionnaire captured demographics data including age, gender, ethnicity, year in school, grade point average, and generational status.

**Risky Family Assessment.** We used the Risky Family Questionnaire, which is a 13-item survey that captures the extent to which the participant lived in a home characterized by high conflict, low parental warmth, and a chaotic or unpredictable daily life from ages 5 – 15 (Taylor et al., 2004). Participants indicated how true each statement was for them on a scale from not at all (1) to very often (5). For the current study, $\alpha=.86$. See Appendix B for the full questionnaire. Participants who selected a rating of 3, 4 or 5 to at least one of six PI-selected items fell into the Risky Family group. These six items were: violence in the home, chaotic/disorganized home, swear/ insult/ threatened, pushed/ grabbed/ shoved, felt loved and cared for (reverse scored), and
neglected/ left to fend for self. We selected these items in particular because we thought these experiences would be the most likely to influence long-term psychological functioning. All other respondents fell into the control group. This grouping strategy was planned prior to beginning the study.

*Childhood experiences.* To confirm that our two groups were exposed to different childhood environments, we included additional measures that captured different childhood exposures. These measures included family socio-economic status, chaos in the home environment, number of traumatic experiences witnessed or experienced personally, and history of abuse and neglect.

Family socio-economic status was assessed by asking about parental education, and three financial resource questions: was the family ever on welfare or food stamps, did the family own their home before age 5, and the number of years the family was under financial strain before age 18. To capture the extent to which the subject’s childhood environment was chaotic and disorganized we used the Chaos, Order, and Hubbub Scale (Matheny, Wachs, Ludwig, & Phillips, 1995). Additional indicators of chaos during childhood were number of times the primary breadwinner lost his or her job, number of disruptive moves to a new home, years living in overcrowded living conditions, number of divorces or separations between parents, years in a single parent household, presence of a parent with a mental illness, presence of a family member who had committed a crime, and whether their mother had been treated violently. The Life Events Checklist was used to capture the number of traumatic experiences the participant witnessed or experienced personally in childhood (Johnson & McCutcheon, 1980). The Child Trauma Questionnaire emotional abuse, emotional neglect, and physical neglect subscales were used to capture severe maltreatment (Bernstein et al., 1994).
Psychosocial characteristics. In addition to looking at emotional and behavioral responses to the experimental stressors, we also assessed trait levels of hostility, rejection sensitivity, anxiety, and disengagement coping. Hostility was captured with the Cook-Medley Hostility Questionnaire-Short Form (Cook & Medley, 1954; Steinberg & Jorgensen, 1996). Sensitivity to rejection was captured with the Rejection Sensitivity Questionnaire (Downey & Feldman, 1996). Trait anxiety was assessed with the State-Trait Anxiety Inventory trait subscale (Spielberger, 1983). The Brief COPE behavioral disengagement subscale was used to capture the tendency to cope with stress by giving up or withdrawing efforts from the goal with which the stressor is interfering (Carver, Scheier, & Weintraub, 1989).

In addition to examining how individuals from risky families interact in social interactions within a laboratory setting, we were also interested in capturing level of general social support and feelings of loneliness following evidence that children living in risky families have difficulties forming friendships (Repetti et al., 2002). We used the Interpersonal Support Evaluation List as a general measure of social support and the UCLA Loneliness Scale-Revised to capture feelings of loneliness (Sheldon Cohen, Mermelstein, Kamarck, & Hoberman, 1985; Russell, Peplau, & Cutrona, 1980). Current levels of depressive symptoms and stress are also often heightened in individuals who experienced early adversity, and thus we assessed these with the Center for Epidemiologic Studies – Depression Scale (CESD; Radloff, 1977) and Perceived Stress Scale (PSS; S Cohen, Kamarck, & Mermelstein, 1983).

Psychological measures. All survey questionnaires given during the lab session are included in Appendix C.
Impressions of stress tasks.  Immediately after the Noisy Neighbor and Social Evaluation tasks, participants rated how difficult and stressful the tasks were on a scale of not at all (1) to extremely (7).

Emotional response to stress tasks.  Anxiety and anger before and after the Noisy Neighbor task were captured with the anxiety and anger/hostility subscales of the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971). The anxiety subscale included the following 6 items: tense, on edge, uneasy, restless, nervous, and anxious. The anger/hostility subscale included the following 7 items: angry, peeved, grouchy, annoyed, resentful, bitter, and furious. Participants rated how much they felt each item at the current moment on a scale ranging from not at all (0) to extremely (4). Ratings on each item were summed to create the subscales scores.

Appraisal of the confederate.  After the Noisy Neighbor task, the participant rated the confederate on the following adjectives: hostile, angry, mean, judgmental, self-serving, considerate, understanding, reasonable, and trustworthy, on a scale of not at all (0) to extremely (4). The five negative adjectives were averaged.

Self-esteem & self-conscious emotions.  As both a manipulation check for the Social Evaluation task, and as indicators of sensitivity to negative social evaluation, self-esteem and self-conscious emotions were captured pre and post-task. Self-esteem was captured with the State Self Esteem Scale (SSES; Heatherton & Polivy, 1991). The SSES is a 20-item self-report measure of state changes in self-esteem. We included two out of three subscales (14 items total) that captured current self-esteem related to performance on tasks (e.g., “I feel like I’m not doing well”) and social impressions (e.g., “I feel inferior to others at this moment”). The appearance self-esteem subscale was not included because the task was not thought to evoke changes in this
dimension. Participants rated how much each statement was accurate about how they feel at the current moment from not at all (1) to extremely (5).

Self-conscious emotions were measured using the 10-item State Shame and Guilt Scale (SSGS; Marschall, Sanftner, & Tangney, 1994). Our analyses focused on the shame subscale. Participants responded to items such as “I want to sink into the floor and disappear” on a scale from not feeling this way at all (1) to feeling this way very strongly (5).

**Behavioral measures.**

**Dot-Probe responses.** The primary outcome from the Dot-Probe task was attentional bias toward or away from emotional faces. Attentional bias was assessed by comparing reaction times when the dot-probe was presented on the same side of the screen as the emotional face to when the dot-probe was presented on the same side of the screen as the neutral face. Avoidance of a particular face (e.g., the angry face) should result in a quicker reaction time when the dot-probe is presented on the same side of the screen as the neutral face compared to the reaction time when it is on the same side of the screen as the emotional face. This is because the participant is attending to the area of space away from the emotional stimuli (the neutral stimuli). The presence of an attentional bias toward or away from a particular type of emotional face is tested by comparing the reaction time scores against zero.

**Video coding of the Noisy Neighbor task.** The Noisy Neighbor task was videotaped in order to capture verbal and non-verbal behaviors. Verbal statements during the Noisy Neighbor task were coded based on a video-coding scheme developed specifically for this task by Linda Luecken’s lab. Coders were trained to identify the presence or absence of the following statements within each 30-second time segment of the 6-minute task: problem solving, cognitive focused coping, emotion focused coping, disengagement coping, passive or helpless response,
positive statements, and hostile/aggressive response (see Appendix D for examples of each type of statement). We were primarily interested in the use of hostile or aggressive statements during the task given our hypothesis that the Risky Family group would demonstrate more hostility toward the confederate. Types of hostile or aggressive responses included: patronize/sarcasm/mock, blame/insult, demand/insist, threat of revenge, and threat of violence. To correct for normality, the number of hostile or aggressive statements used was square root transformed prior to analyses.

We were also interested in how quickly participants attempted to disengage from the task based on our hypothesis that in order to regulate a heightened emotional and physiological arousal to the stressful interaction, participants in the Risky Family group would attempt to disengage from the role-play. Thus, we recorded the amount of time in seconds from the start of the role-play to when the participant turned to the Research Assistant attempting to disengage from it (e.g., “This guy won’t compromise. What do I do?”). If a participant continued the interaction without attempting to stop, this value was recorded as 360 seconds (the full length of the 6 minutes). To correct for normality, this variable was square root transformed prior to analyses.

We attempted to code for several nonverbal behaviors (i.e., eye rolling, nodding, stepping away from the confederate) given previous evidence that men from families identified as “extreme” on the Circumplex Model of Marital and Family Systems showed more negative nonverbal behaviors in response to social conflict than those from “balanced” families (Larkin et al., 1996; Larkin et al., 2011; Olson, Russell, & Sprenkle, 1983). However, the video quality did not allow for accurate coding of these behaviors.
Scores were averaged across the two coders and averages were used in all analyses. For all categories used in analyses, inter-rater reliability was high, with inter-class correlations ranging from 0.89 to 0.94. Complete details about the procedures followed for verbal and non-verbal coding are provided in Appendix D.

**Physiological measures.** Physiological response to the stress tasks was captured with blood pressure and heart rate monitoring, ECG, and ICG. Responses to the tasks were broken into three intervals – baseline, during task, and recovery from task. For the Noisy Neighbor task, the baseline period was 10 minutes, the task itself was six minutes, and the recovery period was 10 minutes. For the Social Evaluation task each period was five minutes in length. Figure 1 displays the timing of the laboratory session.

During the baseline and recovery periods, participants were asked to rest comfortably in their chair with both legs on the floor and arms in their laps or on the arm rests as the data were being collected. They were not given reading materials or other distractions, and were asked to minimize moving and speaking. Participants were standing and allowed to move around during the Noisy Neighbor task. If an electrode fell off during the scenario, a Research Assistant would gently replace the electrode without stopping the task. During the Social Evaluation task participants sat comfortably in the chair watching the computer screen.

**Blood pressure and heart rate.** Cardiovascular response data were captured with heart rate and blood pressure monitoring at set time points throughout the two stress tasks via an automated blood pressure cuff (Dinamap Pro100V2; GE Medical Systems). Heart rate is the number of heartbeats per minute and is recorded in beats per minute (BPM). Blood pressure is the amount of force of blood against the blood vessel walls and is measured in millimeters of mercury (mmHg); maximum pressure is recorded as systolic (SBP) and minimum pressure as
diastolic (DBP). Readings were taken at minutes 3 and 6 during the Noisy Neighbor task baseline, minutes 2 and 4 during the task itself, and minutes 2, 5, and 8 during the recovery period. Readings were taken at minute 3 of the Social Evaluation task baseline, minute 3 during the task itself, and minutes 2 and 4 during the recovery period. These times are displayed visually in Figure 1. For ease of interpretation and to match the ECG and ICG results, the blood pressure and heart rate readings were averaged across each time interval in Tables 8 and 9. In actual analyses however, all seven individual readings were used in order to increase power and for a closer inspection of the temporal aspect of the response patterns.

**Autonomic nervous system measures.** ANS data were captured with ECG and ICG throughout the two stress tasks. A trained Research Assistant placed three general purpose electrodes (Biopac Systems, Inc., USA) on the participants’ left and right inner forearms, and on the collar bone to form a modified lead II electrode placement. Four bioimpedance strip transducers (Biopac Systems, Inc., USA) were placed on the back of the neck and lower back. The electrodes attached to the processor (MP150; Biopac Systems, Inc., USA), which then connected to a local computer via ethernet. Data were captured continuously throughout the Noisy Neighbor and Social Evaluation stress tasks. A trained Research Assistant watched the live data on the computer screen and used flags within the software to indicate the start and stop of time intervals throughout the tasks.

Processing of the data took place off-line using AcqKnowledge 4.2 (Biopac Systems Inc., USA) and Kubios software programs (University of Kuopio, Finland). Data files were sliced based on the flags to form different segments of data for each time interval (e.g., Noisy Neighbor baseline). We averaged across each segment of data to create one value for each outcome per interval. First however, we averaged the outcomes across 2-3 minute segments of time within
each interval. Breaking down each time interval into 2-3 minute segments allowed for the examination of outliers. The AcqKnowledge software has built in filters that can be applied to identify and remove extreme outliers. Research Assistants conducting the data processing were trained to look across the 2-3 minute segments of data and decide whether or not to apply an outlier filter based on whether there were any pieces of the segment that appeared irregular. Using this procedure also allowed Research Assistants to exclude any segments of the data that were captured incorrectly due to collection errors such as when an electrode fell off or the participant was moving excessively. The outcomes values of each of the 2-3 minute segments were averaged to create one final value per interval. The final dataset included values for all ANS outcomes for the baseline, during task, and recovery intervals for both the Noisy Neighbor and Social Evaluation tasks.

Heart rate variability. We used HRV as our index of parasympathetic nervous system activity. The sympathetic and parasympathetic branches of the ANS dually influence HRV, though data processing techniques allow for pure measures of parasympathetic influence through both time and frequency domain analysis of the heartbeat. Through time domain analysis, the intervals of subsequent normal R-R waves (each heartbeat) are measured over a period of time. The root mean square of the successive differences in R-R intervals (RMSSD) is calculated and reported in milliseconds (ms). RMSSD was our primary HRV outcome of interest. Low RMSSD at rest is a proposed index of poor autonomic regulation (Appelhans & Luecken, 2006). A decrease in RMSSD in response to stress has been used as an index of a shift in ANS activity towards increased sympathetic activity and reduced parasympathetic activity (Berntson et al., 1997; Task Force of the European Society of Cardiology and the North American Society of Pacing Electrophysiology, 1996). To correct for normality, RMSSD was log transformed prior
Frequency domain analysis of the R-R wave pattern can also be used to estimate the effect of the sympathetic and parasympathetic influences on the R-R intervals. Some heart rate oscillations are faster than others and thus frequency deconstruction enables the transformation of R-R intervals into high (0.15 – 0.40 Hz) and low frequency bands (0.04-0.15 Hz). High frequency HRV (HF-HRV) is a specific marker of parasympathetic activity. In our sample, baseline levels of RMSSD and HR-HRV were highly correlated, \( r = .92 \). Some authors argue that the ratio of low to high frequency power (LF/HF power ratio) can be used as a measure of sympathetic nervous system activity, with higher scores indicating sympathetic dominance (Malliani, Pagani, & Lombardi, 1994). However, the validity of this measure is debated since sympathetic and parasympathetic activity can vary independently making a ratio a biased measure (Berntson, Cacioppo, & Quigley, 1993). Thus, HF-HRV and LF/HF ratio are secondary ANS outcomes. To correct for normality, HF-HRV and LF/HF ratio were log transformed prior to analysis.

**Pre-ejection period.** We used PEP as our primary index of sympathetic nervous system activity. PEP measures myocardial contractility time, meaning the average amount of time from the beginning of electrical stimulation of the ventricles to the opening of the aortic valve. PEP is derived by calculating the time in ms from beginning of the heartbeat to the onset of left ventricular ejection, which is when blood is pumped out of the heart. A shorter PEP means the heart is pumping harder indicating increased sympathetic activity. PEP values greater than 150 ms were considered outliers and replaced as missing in the data file. To correct for normality, PEP values were square root transformed prior to analyses.
**Salivary cortisol.** We also examined the salivary cortisol response to the laboratory session. Previous studies have shown that cortisol increases in response to psychological stress, and particularly in response to social evaluation (Dickerson, Mycek, & Zaldivar, 2008). One previous study has shown a cortisol response to the Noisy Neighbor task (Luecken et al., 2009). Because cortisol was a secondary outcome, the study was not designed to look at cortisol response to each task separately. Instead, we examined the cortisol response to the laboratory session as a whole. We anticipated the combination of the Noisy Neighbor and Social Evaluation tasks to be potent enough psychological stressors to evoke a cortisol response.

Participants provided four saliva samples using cotton swabs or “salivettes” (Sarstedt, Inc., USA) for determination of salivary cortisol changes throughout the course of the lab session. Saliva was collected before the Noisy Neighbor task began (baseline), and 25, 45, and 70 minutes post-baseline (which places the final saliva sample at 40 minutes after the Social Evaluation task) to capture peak cortisol response and recovery (Dickerson & Kemeny, 2004; Dickerson et al., 2008; Luecken et al., 2009). Subjects placed the salivette in their mouth for two minutes and let the saliva soak the cotton swab.

Samples were stored immediately after collection at –80 °F until they were shipped via express mail and assayed at the University of Trier Biochemistry Lab (Trier, Germany). After thawing, salivettes were centrifuged at 2,000 rpm for 6 minutes, which resulted in a clear supernatant of low viscosity. Salivary concentrations were measured using the dissociation-enhanced lanthanide fluorescent immunoassay (DELFIA). The intra- and inter-assay coefficients of variation were between 4.0% and 9.0%.

Cortisol values are reported in ug/dl and were log transformed prior to analysis to correct for deviations from normality. Values were considered outliers if they were greater than two
standard deviations above the mean for that time point following suggested guidelines (Adam & Kumari, 2009). There were no outliers in our dataset.

**Statistical Analysis**

**Power analysis.** Sample size estimates were guided by previous research. Studies assessing the effect of childhood experiences on reactivity to the Noisy Neighbor task have found significant group differences (risky family versus control) with sample sizes ranging from 38 – 75 participants (Larkin et al., 1996; Larkin et al., 2011; Luecken et al., 2009; Luecken & Roubinov, 2012). Based on the effect size estimates from this research (Cohen’s \( d \) ranged from 0.34 - .67 for group differences in reactivity) a sample of 80 subjects should provide \( \geq 80\% \) power to detect a medium sized effect of early adversity on stress reactivity, when specifying an alpha of 0.05. Our final sample included 95 participants. Analyses involving repeated measures benefited from repeated sampling across the stress tasks, increasing power to detect effects on these particular measures.

**Group comparisons.** The Risky Family group was compared to the control group on demographics, family characteristics, childhood experiences, and psychosocial characteristics using chi-square and \( t \)-tests.

**Dot-Probe data.** Following standard procedures, the primary analyses compared attentional bias scores for each group against zero to examine whether or not an attentional bias was indeed present using one-sample \( t \)-tests. Attentional bias scores were calculated by subtracting reaction times in milliseconds (ms) when the dot-probe was presented on the same side of the screen as the emotional face from reaction times when the dot-probe was presented on the same side of the screen as the neutral face (Arndt & Fujiwara, 2012). Negative attentional bias scores indicate that the participant had a slower response to dot-probes when they were
presented on the same side of the screen as the emotional face compared to when it was presented on the same side of the screen as the neutral face. Thus, for fearful and angry face trials, negative attentional bias scores reflect avoidance of threatening faces because it indicates that the participant was looking at the opposite side of the screen. Conversely, positive attentional bias scores reflect faster responses to threatening faces. Trial errors occurred when the participant hit the incorrect key on the keyboard; these were dropped from the data file. Reaction times less than 200 ms and greater than 2000 ms were considered outliers and dropped from the data file as well (0.7% of the data; Arndt & Fujiwara, 2012).

**Responses to stress tasks.** Psychological and behavioral responses to the two stress tasks were tested using repeated measures ANOVA, which is appropriate for analyzing data with two time points nested within individuals and no missing data. In these analyses we tested for the effect of group, time, and group by time interactions. Two sample group means t-tests were used to compare group differences for outcomes that were only measured at one time point.

Physiological responses to the stress tasks were tested using multi-level modeling, which is appropriate for analyzing data with more than two time points nested within individuals. Multi-level modeling allows for the inclusion of all available data, even when data is missing (e.g., if one blood pressure reading was not collected). Risky Family group was the between-person dimension, with the control group coded as ‘0’ and the Risky Family group coded as ‘1’. Separate analyses were conducted for each outcome. Each model tested for the effects of group, time, and the overall group by time interaction, which assesses differences between groups in the overall pattern of change over time. Then, in follow-up contrasts, we tested for group differences in mean change from baseline to during the task (reactivity) and group differences at
individual time points. An independent errors variance component structure was used in each model.

We also tested for associations between psychological and behavioral responses to the Noisy Neighbor task and physiological reactivity. We used four of our primary behavioral variables of interest to predict physiological reactivity: change in anger from pre to post-task (post minus pre-task value), change in anxiety from pre to post-task (post minus pre-task value), number of hostile/aggressive statements made, and number of seconds until the participant attempted to disengage from the stressor. We used these variables to predict HR, SBP, DBP, PEP and RMSSD values during the stress task, and peak cortisol (25 minutes after stressor onset). We performed regression analyses to test these associations, controlling for baseline levels of the outcome. All analyses were conducted using STATA 12 (StataCorp LP, USA).

Results

Participant Characteristics

Participant (n=95) demographics are displayed in Table 1. Participants were age 18 – 33 (\( \bar{x} = 20.1, SD = 2.1 \)), 64% (n=61) female, from a range of ethnic backgrounds (34% Asian-American; 27% white, non-Hispanic or Latino; 20% other or mixed race; 17% white, Hispanic or Latino; 2% black or African American), and over half were second generation American (57%).\(^2\) We compared the Risky Family and control groups on these demographic characteristics and found no significant group differences.

Table 2 displays the average score on each item of the Risky Family Questionnaire. The mean Risky Family total score for the sample as a whole was \( \bar{x} = 26.44, SD = 9.06, \text{range}=14-55 \), Forty-two (44%) participants fell into the Risky Family group. Within this group, 13 (30%)

\(^2\) Second generation American is defined as being born in the US and one or both parents born in another country.
selected a three or above on only one item, seven (17%) on two items, 10 (24%) on three items, and 12 (29%) on four or more items. The mean score for the Risky Family group was $x = 34.02$, $SD = 8.10$, which was significantly higher than the control group $x = 20.43$, $SD = 3.69$, $t(93) = -10.87$, $p < .001$. These scores are comparable to samples of community adults and other samples of UCLA undergraduates (Carroll et al., 2013; Crosswell et al., 2014; Raposa & Hammen, 2014).

To get a richer picture of the childhood experiences of the two groups, we compared them on additional indices of childhood exposures, as displayed in Table 3. The two groups differed on the majority of these measures, with the Risky Family group experiencing greater adverse childhood conditions, including lower family socio-economic status, more chaos in the home environment, and higher levels of emotional abuse and physical and emotional neglect.

Additionally, we compared the two groups on personality and mood measures of particular relevance to our hypotheses, as displayed in Table 4. Our results confirm what has been found in previous research on children living in risky families (Repetti et al., 2002). The Risky Family group reported higher hostility, rejection sensitivity, and lower levels of social support, as well as higher levels of trait anxiety, depressive symptoms, and perceived stress. The two groups did not differ on the tendency to cope through behavioral disengagement or loneliness.

**Dot-Probe Task Results**

The Dot-Probe task was used to test the hypothesis that the Risky Family group would demonstrate heightened threat sensitivity as measured by automatic avoidance of angry and fearful faces. Reaction times to angry and fearful faces were used to calculate attentional bias scores that represent avoidance of or vigilance to threatening stimuli. Attentional bias scores for
the total sample and each of the two groups are shown in Table 5. These scores are comparable to those from other studies of healthy adults (Frewen, Dozois, Joanisse, & Neufeld, 2008).

As is standard for Dot-Probe analyses, we compared each group’s mean attentional bias score against zero to test whether there was indeed an attentional bias towards or away from specific emotional faces. The Risky Family group demonstrated a significant negative attentional bias (avoidance) when viewing angry faces, $t(40)=-2.362, p=.023$, consistent with hypotheses. In contrast, the control group did not display an attentional bias when viewing angry faces that was statistically significant from zero, $t(50)=-1.272, p=.209$. Neither group showed an attentional bias towards or away from fearful faces.

As secondary outcomes, we examined attentional bias to disgust, happy, and sad faces. Both groups had marginally significant negative attentional bias scores when viewing disgust faces, indicating that they were avoiding these faces, $t(40)=-1.859, p=.071$ for the Risky Family group and $t(40)=-1.959, p=.056$ for the control group. The Risky Family group also demonstrated avoidance of happy faces, as they had a significant negative attentional bias when viewing happy faces, $t(40)=-2.289, p=.027$; the control group did not demonstrate this bias, $t(50)=.796, p=.43$. Neither group showed an attentional bias when viewing sad faces.

**Psychological and Behavioral Response to the Noisy Neighbor Task**

The Noisy Neighbor task allowed us to capture emotional, cognitive, and behavioral responses to social conflict. We hypothesized that the Risky Family group would report greater increases in anxiety and anger, appraise the confederate as more hostile, display more hostile behaviors towards the confederate, and attempt to disengage from the task earlier than the control group.
**Appraisal of the task.** First, we tested whether the task was perceived as stressful and difficult by participants. On a scale from not at all (1) to extremely (7), the sample overall found the Noisy Neighbor task moderately stressful ($\bar{x}= 4.16$, $SD=1.39$) and difficult ($\bar{x}=4.23$, $SD=1.64$). There were no group differences in these ratings, nor on other task appraisal items: how engaged they were, how well they felt they did, and how in control, evaluated, or how judged they felt during the task (all $p$’s > .111).

**Emotional response.** We hypothesized that the Risky Family group would report greater anxiety and anger in response to the Noisy Neighbor task than controls. See Table 6 for mean values on the POMS anxiety and anger/hostility subscales.

There was a significant effect of time for anxiety, with both groups demonstrating an increase in anxiety from pre to post-task, $F(1,93)=42.21$, $p<.001$ (see Figure 5). The group effect was also significant, $F(1,93)=4.92$, $p=.029$. The Risky Family group reported significantly higher anxiety pre-task, $t(93)=-2.516$, $p=.014$, and marginally higher anxiety post-task, $t(93)=-1.716$, $p=.089$. The group by time interaction effect was not significant, indicating that the two groups did not differ in the amount of change in anxiety in response to the task.

There was a significant effect of time for anger with both groups demonstrating an increase in anger from pre to post-task, $F(1,93)=67.05$, $p<.001$ (see Figure 5). The group effect and group by time interaction were not significant ($p=.084$ for the group effect and $p=.30$ for the group by time interaction), indicating that the two groups did not differ in their reported anger.

**Appraisal of the confederate.** Participants appraised the confederate on a series of negative adjectives after completing the Noisy Neighbor task. We hypothesized that the Risky Family group would perceive the confederate as more hostile than the control group, but found no evidence to support this. Overall, the sample rated the confederate as moderately hostile.
(\(\bar{x}=3.91\)), angry (\(\bar{x}=3.34\)), mean (\(\bar{x}=3.77\)), judgmental (\(\bar{x}=4.78\)), and self-serving (\(\bar{x}=5.20\)) on a scale of *not at all* (1) to *extremely* (7). There were no group differences on any of the individual item ratings or for the mean score (all \(p\)’s > .234).

**Verbal and non-verbal responses.** Next, we tested group differences in verbal and non-verbal behavior in response to the Noisy Neighbor task. We hypothesized that the Risky Family group would make more hostile or aggressive statements to the confederate compared to the control group. Across the sample, participants said on average three statements that were coded as hostile or aggressive (\(\bar{x}=3.2, SD=2.4, \text{range}=0\text{-}10\)). Contrary to our hypothesis, there were no group differences in the number of these statements used by the participant, \(\bar{x}=3.4, SD=.4\) for the RF group, \(\bar{x}=3.1, SD=.3\) for the control group, \(t(91)=-0.19, p=.849\).

We also hypothesized that the Risky Family group would attempt to disengage from the role-play scenario sooner than the control group in order to regulate their emotional arousal. We coded the amount of time (in seconds) before each participant turned to the Research Assistant to ask for help or imply that they wanted to end the role-play. Across the sample, it took participants on average 231.45 seconds before attempting to disengage (\(SD=113.32, \text{range}=20\text{-}360\)). There were no group differences in the amount of time before disengaging from the task, \(\bar{x}=226.91, SD=17.97\) for the RF group, \(\bar{x}=234.96, SD=15.51\) for the control group, \(t(93)=.36, p=.719\).

**Cardiovascular and Autonomic Response to the Noisy Neighbor Task**

We then examined the physiological arousal provoked by the Noisy Neighbor task. We hypothesized that the Risky Family group would show heightened cardiovascular arousal (greater SBP, DBP, and HR reactivity), increased sympathetic activation (greater PEP decrease
and LF/HF ratio increase), and increased parasympathetic withdrawal (greater RMSSD and HF-HRV decrease). These response patterns are shown in Figures 6 and 7.

Across the sample as a whole, there was a significant main effect of time for all outcomes (all $p$’s < .001). In response to the task, heart rate and blood pressure increased, and then decreased during the recovery period. RMSSD and HF-HRV decreased during the task, indicating parasympathetic withdrawal, and then returned to baseline during the recovery period. This is the expected response when inducing anger or anxiety (Kreibig, 2010). LF/HF ratio increased and PEP decreased during the task, indicating sympathetic activation, then increased during the recovery period. Group means for all outcomes are shown in Table 7. There were no significant main effects of group or group by time interactions in any of the models, indicating that the overall patterns of activation did not differ between the Risky Family and control groups.

We ran planned follow-up contrasts to test for group differences in reactivity to the task (changes from baseline to during task). There was a significant group difference in SBP reactivity; the Risky Family group had a greater increase in SBP from the second baseline reading (6 minutes into baseline) to the first reading during the task (2 minutes into the task), $\chi^2 (1, N=95)=7.60, p=.006$. However, by the next blood pressure reading at 4 minutes into the task, the two groups had nearly identical SBP readings, indicating that the Risky Family group’s SBP did not remain higher than the control groups. There was also a marginally significant group difference in PEP reactivity; the Risky Family group had a greater decrease in PEP (indicating more sympathetic activation) from baseline to during the stress task, $\chi^2 (1, N=95)=2.92, p=.088$. There were no group differences in DBP, HR, or HRV responses from the task. Of note, there were no baseline group differences in any of these measures.

**Psychological Response to the Social Evaluation Task**
The Social Evaluation task allowed us to capture emotional responses to negative social evaluation in the Risky Family group versus controls. We hypothesized that the Risky Family group would report greater decreases in self-esteem and increases in shame in response to the task.

**Appraisal of the task.** First, we tested whether participants perceived the task as stressful and difficult. The sample overall found the Social Evaluation task mildly stressful ($\bar{x}=2.77$, $SD=1.69$) and difficult ($\bar{x}=2.09$, $SD=1.56$) on a scale from *not at all* (1) to *extremely* (7). The Risky Family group reported that the task was more difficult than the control group, $t(89)=-2.32$, $p=.022$.

**Emotional response.** We hypothesized that the Risky Family group would be more sensitive to the task and thus report experiencing greater decreases in self-esteem and increases in shame. See Table 6 for mean values on the SSES and SSGS shame subscale before and after the task. There was no main effect of time for the SSES, $F(1,93)=.17$, $p=.681$, group, $F(1,93)=1.16$, $p=.284$, or group by time interaction, $F(1,93)=1.51$, $p=.223$. There was a marginally significant effect of time for the SSGS shame subscale, $F(1,93)=3.16$, $p=.079$, no effect of group, $F(1,93)=2.43$, $p=.123$, and no group by time interaction, $F(1,93)=.59$, $p=.444$. The lack of significant effects of time indicates that the task did not elicit the intended changes in self-esteem or shame.

**Cardiovascular and Autonomic Response to the Social Evaluation Task**

Next, we tested the physiological arousal provoked by the Social Evaluation task. We hypothesized that the Risky Family group would show a greater cardiovascular and autonomic response to this social evaluative stressor compared to the control group as indicated by larger heart rate, blood pressure, HRV, and PEP reactivity.
Across the sample as a whole, there was a significant main effect of time for all outcomes (all $p$’s < .05). In response to the task, heart rate and blood pressure increased, indicating cardiovascular arousal (Figure 8). RMSSD and HF-HRV decreased, indicating vagal withdrawal, and LF/HF ratio increased, indicating sympathetic activation (Figure 9). PEP values remained the same at baseline and during the task but then decreased during the recovery period. Group means for all outcomes are shown in Table 8. Of note, the physiological response to the task was significantly lower than that evoked by the Noisy Neighbor task on all outcomes, as tested by comparing all outcomes during the stressor itself across the two tasks. Because the Social Evaluation task was a passive task in which participants did not move or speak, it is to be expected that the magnitude of physiological arousal would be lower than more active tasks like the Noisy Neighbor.

We then tested whether these patterns of physiological activation differed by group. There were no significant group by time interactions for any outcome, indicating that the overall patterns of activation did not differ across groups. Additionally, follow-up contrasts to test for group differences in reactivity specifically revealed no significant group differences. Overall, the Social Evaluation task did elicit a physiological stress response, though it was a considerably weaker response than that created by the Noisy Neighbor task, and the response did not differ between the two groups on any outcome.

**Cortisol Response to the Laboratory Session**

We then examined how the cortisol response to the lab session differed by Risky Family group. Based on previous research, we hypothesized that the Risky Family group would exhibit an attenuated cortisol response to the laboratory session compared to the control group (Engert,
Buss, et al., 2010; Engert, Efanov, et al., 2010; Goldman-Mellor et al., 2012; Luecken et al., 2009; Taylor et al., 2004).

There was a significant main effect of time, $\chi^2 (3, N=95)=99.46, p <.001$, with cortisol showing a substantial increase from baseline to 25 minutes post-stressor onset and decreasing over the rest of the lab session as displayed in Figure 10. The cortisol increase was similar to that reported in a previous study using the Noisy Neighbor task (Luecken, Kraft, & Hagan, 2009). There was no significant group effect, $\chi^2 (1, N=95)=.04, p=.839$, or group by time interaction, $\chi^2 (3, N=95)=.24, p=.972$, meaning that the Risky Family and control groups did not differ in their pattern of cortisol response. Follow-up contrasts revealed no group differences in reactivity or at any individual time points. Including potential biobehavioral confounds (i.e., BMI, gender, and hours of sleep the night before) did not influence the results.

**Association Between Psychological and Physiological Responses**

Next, we examined whether the psychological states and behavioral responses of interest predicted physiological reactivity to the Noisy Neighbor task across the sample as a whole. Results showed that increases in anger during the Noisy Neighbor task were positively associated with peak cortisol level, controlling for baseline cortisol, $b=.025, t(92)=2.09, p=.039$. There was also a marginally significant positive association between increases in anxiety during the Noisy Neighbor task and peak cortisol, $b=.032, t(92)=1.87, p=.065$. Increased number of hostile/aggressive statements used during the Noisy Neighbor task was associated with a larger decrease in PEP reactivity, $b=-.147, t(77)=-1.77, p=.081$, indicating greater sympathetic arousal. Increased number of hostile/aggressive statements was also associated with smaller DBP reactivity to the task, $b=-2.43, t(89)=-2.36, p=.020$. There were no other significant associations between psychological or behavioral responses to the task and physiological reactivity.
We then examined whether any of these psychological or behavioral variables were associated with the heightened SBP and PEP reactivity present in the Risky Family group. We used each psychological and behavioral variable to predict peak SBP and PEP in the Risky Family group only, controlling for baseline level of the outcome. There were no significant associations.

**Follow-up Analyses**

In follow-up analyses, we examined whether scoring the Risky Family Questionnaire in two alternative ways influenced the results. First, we ran all the analyses using the Risky Family total score as a continuous variable. The total score was created by summing all items after reverse coding three items (items 1, 3, and 6; see Appendix B for individual items). Treating the Risky Family Questionnaire as a continuous variable may more accurately reflect the nature of the childhood environment compared to a dichotomous approach and may enable us to see dose-response patterns that would otherwise be hidden by group analyses. We also divided the sample into two groups based on stricter criteria for the Risky Family group inclusion to separate out individuals who were exposed to a more “extreme” form of a risky family environment. Individuals fell into the Risky Family “extreme” group if they selected a 4 or 5 on at least one of the *a priori* chosen questionnaire items described above (*n* for RF “extreme” group=26, control group *n*=69). Using these alternative scoring strategies produced nearly identical results to what was found in the primary analyses.

**Exploratory Analyses**

In exploratory analyses, we tested whether particular aspects of a risky family environment were particularly potent in eliciting a psychological and physiological stress response. Specifically, we tested the effects of abuse, neglect, and living in a chaotic home environment,
based on previous evidence by our group and others that these experiences can have independent effects on long-term health outcomes (Crosswell et al., 2014; Manly & Kim, 2001; Petrenko et al., 2012). We focused our analyses on responses to the Noisy Neighbor task, given the results from the primary analyses showing that this task elicited a strong emotional and physiologic response.

Three subscales were created by averaging the selected items to create subscale summary scores (Crosswell et al., 2014; specific items for each subscale are identified in Table 2). Then, based on these scores, we placed individuals into high and low exposure groups. Participants who had a summary score of 3 or above were placed in the “high” exposure group and those with a score below 3 were placed in the “low” exposure group. Seventeen participants (18%) fell into the high exposure abuse group, 12 (13%) fell into the high exposure neglect group, and 16 (17%) fell into the high exposure chaos group.

**Abuse subscale analyses.** We first tested whether the high and low abuse groups differed in stress response profiles compared to controls. In line with the primary analyses, results showed that the high abuse group had a significantly greater increase in SBP reactivity to the Noisy Neighbor task, $\chi^2(1, N=95)=7.05, p=.008$, and a greater decrease in PEP, $\chi^2(1, N=95)=5.96, p=.015$. The group by time interaction for PEP was also significant, $\chi^2(3, N=95)=7.92, p=.048$ though the group effect was not. The group effects and group by time interactions were not significant for SBP, or for anxiety, anger, HR, DBP, and RMSSD.

For cortisol response to the laboratory session, there was no significant group effect, but there was a significant group by time interaction, $\chi^2(1, N=95)=11.45, p=.01$. The high abuse group had a greater increase in cortisol from baseline to post-stress tasks, $\chi^2(1, N=95)=6.06, p=.014$. Of note, in the primary analyses there was no effect of Risky Family group on cortisol.
Neglect subscale analyses. We tested whether the high and low neglect groups differed in stress response profiles compared to controls. There were no significant group effects or group by time interactions for any outcome.

Chaotic environment subscale analyses. We tested whether the high and low chaos groups differed in stress response profiles compared to controls. There were no significant group effects or group by time interactions for anxiety, anger, cardiovascular outcomes, or ANS outcomes. For cortisol response however, there was a significant effect of group, $\chi^2(1, N=95)=7.37, p=.007$. As displayed in Figure 11, the high chaos group had a dampened cortisol response. At each time point, the high chaos group had significantly lower cortisol than the control group (all $p$’s < .05). There was no significant group by time interaction, $\chi^2(1, N=95)=4.19, p=.241$.

Discussion

The purpose of the current study was to examine how growing up in a risky family environment influences psychological, behavioral, and physiological responses to social stress in adulthood. Early adverse experiences have been associated with both difficulty navigating social situations and alterations in physiological responses to acute psychological stress (Luecken & Lemery, 2004; Repetti, Robles, & Reynolds, 2011; Repetti, Taylor, & Seeman, 2002). Alterations in stress reactivity may be one mechanism linking early adversity to worse health in adulthood. However, previous research has not established whether milder forms of early adversity change reactivity patterns, whether the sympathetic and parasympathetic branches of the ANS are impacted, whether different types of risky family environments differentially influence the acute stress response, and what psychological mediators may drive these physiologic changes. This study sought to address these important questions in a sample of
healthy young adults. In Appendix E, we present a brief overview of the study hypotheses and general results.

**Hypothesis 1: Risky Families and Threat Sensitivity**

**Automatic threat processing.** Evidence from studies of children suggest that growing up in an environment characterized by constant threat of danger (i.e., physical abuse) or extreme neglect is associated with increased threat sensitivity, generally indexed by an automatic tendency to view stimuli as threatening (Pollak & Kistler, 2002; Pollak & Tolley-Schell, 2003; Tottenham et al., 2011). We hypothesized that this bias would extend into adulthood and to individuals who experienced a more mild form of early life stress, with the Risky Family group demonstrating heightened automatic threat processing.

Results showed that in response to the Dot-Probe task, the Risky Family group demonstrated automatic avoidance of angry faces whereas the control group had no such bias. This indicates that the Risky Family group was more sensitive to the threatening stimuli, recognizing it sooner, and looking away faster than the control group. Brain regions associated with recognizing threat may be hypersensitive after growing up in an environment laden with constant threats. The results coincide with evidence in children that early experiences of fear may sensitize corticolimbic pathways to be more vigilant to threatening situations (Coccaro et al., 2011; Heim & Nemeroff, 2001; Loman & Gunnar, 2010; Obradović, 2012). To our knowledge, only one other study has examined automatic processing of threatening stimuli in adults from risky families. An examination of neural activation patterns in young adults from risky families showed that the right ventrolateral prefrontal cortex was not able to regulate the amygdala’s response to threatening faces as effectively as controls (Taylor, Eisenberger, et al., 2006).
Contrary to results for angry faces, we did not see an attentional bias to fearful faces in the Risky Family group. This may be because being attentive to angry faces is more beneficial to survival than paying attention to others’ fear since observing an angry face may mean you could be a target of the anger. In addition, our exploratory analyses found that the Risky Family group tended to avoid happy faces while the control group did not. The Risky Family group may be quick to turn away from positive information, since it would not help them avoid threat, in an effort to attend to other areas of the environment where threats may still be. Overall, these results suggest that a risky family environment may be associated with changes in neurobiological processes involved in automatic social information processing, and that these changes continue into young adulthood.

**Threat-related emotional responses.** As another index of threat sensitivity, we examined self-reported anxiety before and after the social conflict stress task. Consistent with hypotheses, the Risky Family group reported more anxiety before and marginally more after the Noisy Neighbor task. These results are in line with two previous studies that found that growing up in a risky family environment was associated with greater anxiety in response to acute stress (Larkin et al., 1996; Luecken et al., 2005), though not all studies have found this (Larkin et al., 2011). The higher levels of anxiety present in the Risky Family group before the Noisy Neighbor task suggests that these individuals were coming in to the laboratory session with greater anxiety. Trait levels of anxiety were also significantly higher in the Risky Family group, which is consistent with past research (Carpenter et al., 2011; Engert, Efano, et al., 2010; Luecken & Roubinov, 2012).

**Hypothesis 2: Risky Families and Hostility**
Interpreting more threat in the environment is hypothesized to lead individuals from risky families to behave with more hostility towards those around them (Repetti et al., 2002). In the current study, we hypothesized that the Risky Family group would appraise the confederate as more hostile, report more anger, and use more hostile/aggressive verbal statements during the Noisy Neighbor task.

We found no evidence for increased hostility in the Risky Family group. The Risky Family group did not rate the confederate more negatively than the control group; both groups found the confederate equally hostile, angry, mean, judgmental, and self-serving. The Risky Family group did not report greater levels of anger in response to the task than controls; both groups reported comparable elevations in anger. Finally, the Risky Family group did not use more aggressive or hostile verbal statements during the task.

These results are inconsistent with previous studies examining anger and hostile behaviors in response to social stress. Carpenter et al. (2011) found that women who experienced physical abuse in childhood became angrier in response to the Trier Social Stress Test than controls. Larkin et al. (2011) found that men from risky families responded with greater anger to the Noisy Neighbor task than controls, though women did not. Both men and women used more negative verbal behaviors (e.g., complain, disagree, put down) in response to the Noisy Neighbor task in this study (Larkin et al., 2011), and in previous work by this group (Larkin et al., 2009). Finally, in a study that used a similar behavioral coding scheme as used in our study, young adults from risky families used more hostile/aggressive behaviors towards the confederate during the Noisy Neighbor task (Lueckent & Roubinov, 2012). Of note, the average number of hostile/aggressive behaviors used by the overall sample in that study (mean = 5.9) was substantially higher than in ours (mean = 3.2), likely due to differences in coding methodology.
How can we interpret these results? The conflict task used in our study was identical to that used in several of the trials that yielded positive results as our study procedures were developed based on Larkin’s protocol. In addition, the task was successful in eliciting feelings of anger and appraisals of the confederate as hostile and mean. Further, all of these trials besides the one with sexually abused women (Carpenter et al., 2011) were conducted with similar populations, namely undergraduates at public universities. However, in contrast to earlier trials, we excluded individuals with psychopathology and who reported physical or sexual abuse. Thus, it is possible that individuals from families with milder levels of conflict, neglect, and chaos are not at risk for high levels of anger and hostility in response to social conflict. Instead, this group may demonstrate more threat vigilance and anxiety. Although we see group differences in trait hostility, hostility may manifest in ways other than aggressive response to social conflict, such as increased skepticism of others. This could then lead to increased anxiety in social situations, increased threat vigilance, and difficulty forming meaningful relationships, all of which there was evidence in the current study.

**Hypothesis 3: Risky Families and Rejection Sensitivity**

Early adversity, such as witnessing violence and experiencing emotional maltreatment is associated with increased rejection from peers and increased sensitivity to that rejection in children (Bolger & Patterson, 2001; Bolger et al., 1998; Feldman & Downey, 1994). We hypothesized that the Risky Family group would demonstrate a greater decrease in self-esteem and greater increase in shame in response to being negatively socially evaluated by a peer. We did not find evidence to support this hypothesis, as both groups reported comparable decreases in self-esteem and increases in shame in response to the Social Evaluation task.
The lack of group differences may be because the Social Evaluation task was not potent enough to elicit a significant change in either of these emotional states in the current study. In the original version of this task, the participant is interviewed by the experimenter, and asked to describe personal characteristics by answering questions such as “What is your best quality?” and “What are you most afraid of?” (Eisenberger et al., 2011). This interview is video recorded and the participant is told that the other participant (actually a confederate) will watch the video and rate his or her impressions of the participant. Thus, when participants watch the negative adjectives being chosen on the computer screen, they believe the confederate is responding directly to the participants’ own personal characteristics. In this scenario, participants likely feel that they are being evaluated for who they are as a person. In our study however, participants often reported that they felt the confederate was evaluating them on how they acted during the task, not on their personal characteristics. In many of the debriefing sessions, participants communicated that they were unaffected by the negative ratings because they had been acting in the role-play scenario. A stronger manipulation may have caused a stronger increase in self-conscious emotions and possibly revealed differences in the Risky Family versus control groups. Participants in the Risky Family group self-reported higher levels of trait rejection sensitivity, suggesting that there are differences in this psychological construct that were not probed by the Social Evaluation Task.

Alternatively, it is possible that growing up in a risky family has minimal influence on one’s response to negative social evaluation from a peer they just met. Instead, individuals from risky families may be more sensitive to rejection from authority figures, family members, close friends, and romantic partners. Boyce and Mason (1996) suggest that faulty early attachments may lead individuals to become sensitized when engaging in important relationships, fearing
potential disruptions in those relationships; this sensitization may not occur in casual relationships or daily interactions with peers, as was modeled in the current study.

**Hypothesis 4: Risky Families and Disengagement Coping**

In an effort to dampen arousal to stressful situations or to avoid interpersonal rejection, individuals from risky families may cope with social discomfort by disengaging from the situation. Initial evidence suggests that individuals from risky families self-report using more avoidant strategies to cope with stress (Lueckcn et al., 2005; Valentiner et al., 1994). Thus, we tested whether individuals from risky families would try to disengage from the social conflict task by measuring the number of seconds before participants turned to the research assistant in an attempt to disengage from the uncomfortable situation.

We found no evidence that individuals from risky families tried to disengage from the Noisy Neighbor task more rapidly than controls. In addition, they did not self-report higher levels of behavioral disengagement in response to general stressors on a trait version of the COPE scale. In two previous studies, individuals from risky families did demonstrate higher levels of avoidant behaviors in the Noisy Neighbor task compared to controls, such as physically turning away from the confederate (Larkin et al., 1996; 2011). Unfortunately, we were not able to reliably code turning away in our study, which may be a more sensitive and subtle indicator of disengagement. It should also be noted that these studies also found elevated anger and hostility among individuals from risky families (Larkin et al., 1996; 2011), which may have prompted differences in behavioral responses. Thus, the lack of differences we observed may follow from the lack of risky family effects on anger and hostility in our sample.

**Hypothesis 5: Risky Families and Heightened Cardiovascular and ANS Response to Stress**
We hypothesized that the Risky Family group would show greater cardiovascular and ANS reactivity to the stress tasks compared to controls. We found partial support for this hypothesis. The Risky Family group showed greater SBP reactivity to the task compared to the controls. The increase from the baseline SBP reading to the first reading during the task (2 mins into the task) was greater for the Risky Family group than the control group. By the next reading (4 mins into the task), the Risky Family group SBP came back down to the same level as the control group. The Risky Family group also showed marginally greater sympathetic nervous system activation (indexed by a greater decrease in PEP) in response to the task. In exploratory analyses, a greater decrease in PEP in response to the Noisy Neighbor task was also found in individuals who reported experiencing mild emotional or physical abuse. These results are consistent with previous studies showing exaggerated cardiovascular response to social conflict among young adults who grew up in stressful family environments (Larkin et al., 1996; 2011), but are the first to demonstrate an effect of risky families on sympathetic nervous system reactivity.

Contrary to hypotheses, we found no effect of risky families on HRV, either at baseline or in response to the task. To our knowledge, this is the first study to test whether growing up in a risky family is associated with parasympathetic response to acute stress. Three previous studies have shown an association between early adversity and lower parasympathetic activity at rest or in response to exercise, however these studies focused on individuals who experienced severe maltreatment or trauma in childhood (Dale et al., 2009; Miskovic et al., 2009; Shenk et al., 2010). It is possible that less severe forms of early adversity may not lead to differences in parasympathetic activity, but may instead have potent effects on the sympathetic nervous system.

**Hypothesis 6: Risky Families and Dampened Cortisol Response to Stress**
We hypothesized that the Risky Family group would have a dampened cortisol response to the laboratory session compared to controls. We saw no group differences despite a robust cortisol response across the sample as a whole. Instead, exploratory analyses showed that experiencing a specific type of risky family, growing up in chaotic home environment, was associated with a dampened cortisol response to stress.

Chaos is an understudied social determinant of health. A chaotic home environment has been conceptualized as one that is characterized by crowding, noise, disruptive moves of people into and out of the home or between different homes, and an unpredictable and disorganized daily life (Evans, Eckenrode, & Marcynyszyn, 2010). Chaotic home environments have been shown to negatively influence children’s cognitive and emotional development (Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005; Evans & Wachs, 2010). Recent evidence has also shown that children living in chaotic environments have worse parent-rated health and increased sleep problems (Kamp Dush, Shmeer, & Taylor, 2013; Brown & Low, 2008).

Our study is the first to demonstrate an association between a chaotic childhood home environment and dampened cortisol response to acute psychological stress in adulthood. The results suggest that a chaotic environment may influence the developing HPA axis, with long-term ramifications. According to the allostatic load model, a period of physiological recovery after acute stress is necessary to restore the body to homeostatic balance (McEwen & Stellar, 1993; McEwen, 1998). Living in a chaotic environment may mean that children are in a constant state of chronic or repeated stress, without adequate time to recovery from the heightened emotional and physiological arousal (Miller, Chen, & Zhou, 2007; Perry & Pollard, 1998; Repetti et al., 2002). In response to this consistently high cortisol production, the system may then re-calibrate, developing an ability to down-regulate in the face of conflict to avoid the
physical toll of repeatedly mounting a cortisol response. This idea of “re-calibration” in childhood based on environmental cues in order to protect the organism is hypothesized in the adaptive calibration model developed by Del Giudice and colleagues (Del Giudice, Ellis, & Shirtcliff, 2011; Del Giudice, Hinnant, Ellis, & El-Sheikh, 2012). Initial evidence in children suggests that indeed, the ability to regulate one’s emotional and physiological arousal both in the moment and over time in response to environmental cues moderates the association between an adverse early environment and later psychological problems (El-Sheikh & Whitson, 2006; Obradović, Bush, Stamperdahl, Adler, & Boyce, 2010).

**Hypothesis 7: Links Between Psychological and Physiological Stress Responses**

Although theoretical models suggest that psychological processes may drive alterations in physiological stress reactivity in individuals from risky families (Luecken, 2006; Repetti et al., 2002), few studies have specifically examined links between these responses. We tested whether threat appraisal, hostility, rejection sensitivity, and disengagement were associated with heightened cardiovascular, ANS, and cortisol responses to the stress tasks. In general, we found little evidence that the psychological constructs we examined were indeed drivers of the physiological responses to our tasks, as we had hypothesized.

Results did show that increases in anger and greater use of hostile or aggressive statements during the social conflict task were associated with several indicators of elevated physiological responses. Specifically, increases in anger were positively associated with cortisol reactivity and number of hostile or aggressive statements used was positively associated with PEP reactivity across the sample as a whole. This supports previous evidence that hostility is an important driver of worse health in adulthood, and cardiovascular disease in particular (Miller, Smith, Turner, Guijarro, & Hallet, 1996). However, because we did not see increases in hostile
attitudes and behaviors in our Risky Family group, these results do not provide much insight into our understanding of risky families.

There were no other associations between psychological and behavioral responses to the task and physiological reactivity. This disconnect between psychological and physiological responses to acute stress is not unprecedented. In a meta-analysis of nine studies, Feldman and colleagues (1999) found that although increases in negative emotions were associated with increases in cardiovascular reactivity to acute psychological stress paradigms, negative emotions only accounted for two percent to 12% of the variance in cardiovascular reactivity. There could be several reasons for the lack of association between psychological and physiological responses in our study. First, we may not have captured the key psychological factors that influenced physiological reactivity. For example, we were unable to capture initial appraisals of the Noisy Neighbor task. Based on our finding that the Risky Family group demonstrated heightened sensitivity to threat, and previous evidence that early adversity is associated with increased threat appraisal in ambiguous situations in particular (Chen et al., 2004), capturing the amount of perceived threat during the ambiguous part of the Noisy Neighbor task may be important. Specifically, the Risky Family group may have appraised the Noisy Neighbor task as more threatening immediately because of the ambiguity of the situation, leading to the increased SBP and PEP reactivity we saw in the Risky Family group. However, because we could not capture this initial appraisal of the Noisy Neighbor task, we may have missed the key psychological difference driving the increased reactivity.

Another possible explanation for the lack of association is that individual differences in physiological reactivity are driven not by the differences in psychological or behavioral responses of participants, but differences in the sensitivity and functioning of the physiological
systems. Initial evidence suggests that early adversity is associated with functional differences in the HPA axis and immune system. Each component of the HPA axis cascade can be probed to test for functional differences using pharmacologic challenges such as the CRH injection test and the dexamethasone suppression test. Several studies in adults who experienced early life stress have found altered cortisol responses to a pharmacologic challenge compared to controls (Carpenter et al., 2009; DeSantis et al., 2011; Tyrka et al., 2009, 2012). This provides initial evidence that early adversity may alter the functioning of the HPA axis response to stress independent of psychological factors. Of note, two of these studies found that results were moderated by genetic polymorphisms (Tyrka et al., 2009, 2012), suggesting genetic analysis may be an important factor in uncovering how and when childhood stress is associated with altered HPA axis functioning.

The immune system may also be programmed differently in individuals who experienced early adversity. Miller, Chen, and Parker’s biological embedding model (2011) suggests that when stress occurs during sensitive periods of development, it calibrates how the immune system will function throughout the life course. In particular, stress during development may prime macrophages to over-respond to stressors in adulthood. Thus, independent of psychological responses, early adversity may be associated with a greater inflammatory response to acute stress. Although we did not include measures of serum inflammatory cytokines in the current study, this model highlights another mechanism by which early adverse experiences may influence physiological stress reactivity other than through alterations in psychological response.

**Conclusion**

Overall, results suggest that young adults from risky families are highly attuned to their environment, automatically processing potentially threatening information and reporting high
levels of anxiety in novel situations. These results are in line with a key tenet of the original risky families model which argues that growing up in a risky family leads to heightened sensitivity to threat and anxiety (Repetti et al., 2002). The study also supports the model’s hypothesis that young adults from risky families have exaggerated initial physiological responses to acute psychological stress, though we found no evidence for continued elevations in arousal after the initial reaction. This initial heightened reactivity may be driven by the ambiguity present at the beginning of the role-play task when the participant is unsure whether the confederate is intentionally frustrating them or not. The Risky Family group may have interpreted the situation with greater threat appraisal initially compared to the control group. Additionally, participants from risky families did get angry in response to the social conflict task, but they did not appraise the confederate as more hostile or behave with any more hostility than the control group. Thus, our data do not support the risky family model proposal that young adults from risky families will behave with more hostility during negative social encounters than those from non-risky families (Repetti et al., 2002).

These results suggest a change in the conceptualization of the daily experiences of adults from risky families. Growing up in a risky family environment may not be associated with a tendency to be more angry and hostile towards others, but instead a daily experience characterized by heightened attention to threat and anxiety. Increased anxiety, and anxiety disorders in particular, are associated with a greater risk of chronic illness (Fiedorowicz, He, & Merikangas, 2011; Phillips et al., 2009).

One mechanism by which increased anxiety may lead to worse physical health is through increased inflammation (Hou & Baldwin, 2012; O’Donovan et al., 2013; Raison, Capuron, & Miller, 2006; Salim, Chugh, & Asghar, 2012). Heightened inflammation is associated with an
increased risk of a number of chronic diseases and mortality (Choy & Panayi, 2001; Coussens & Werb, 2002; Dowlati et al., 2010; Kaptoge et al., 2010). The hyper-vigilance present in threat sensitive and anxious individuals may lead to heightened inflammation because of exaggerated or repeated activation of the sympathetic nervous system (O’Donovan et al., 2013). In general, sympathetic activation leads to the release of pro-inflammatory cytokines (Irwin & Cole, 2011), which may contribute over time to heightened chronic inflammation.

This pathway, of anxiety to sympathetic activation to increased inflammation, may be at work in individuals exposed to early adversity (Heim & Nemeroff, 2001). Compelling evidence suggests that early adversity, including growing up in a risky family, is positively associated with chronic inflammation in healthy adults (Danese et al., 2009, 2007; Fagundes, Glaser, & Kiecolt-Glaser, 2013; Kiecolt-Glaser et al., 2011; Matthews et al., 2014; Taylor, Lehman, et al., 2006). Results from our study provide initial evidence for several other pieces of the pathway. In addition to higher trait anxiety, the Risky Family group showed increased threat sensitivity, greater state anxiety upon coming into the laboratory, and marginally greater increases in state anxiety in response to stress. In addition, the Risky Family group responded to psychological stress with a marginally greater sympathetic response. Increased threat sensitivity in individuals from risky families may lead to daily lives characterized by more anxiety, higher sympathetic activation in the face of stress, and greater stress levels in response to ambiguous social encounters, leading to heightened inflammation over time.

Results from our study also expand the risky family model, suggesting that different types of risky family exposures may have differential long-term impacts on physiological systems. Different physiological response patterns are required to cope adaptively with different threats (Weiner, 1992). When children grow up in environments that require different response
patterns (e.g., having violence directed at you versus being left to fend for yourself), these patterns may become engrained and continue into adulthood. We examined the influence of three different types of childhood experiences – abuse, neglect, and living in a chaotic environment. Results from the current study support initial evidence that different childhood exposures may have different long-term biological and psychological ramifications (Crosswell et al., 2014; Essex et al., 2011; Higgins & McCabe, 2000; Pears, Kim, & Fisher, 2008; van Veen et al., 2013).

We found that experiencing abuse in childhood was associated with greater sympathetic reactivity to social conflict, and growing up in a chaotic home environment was associated with a dampened cortisol response across the lab session. These results may be of particular importance given the association between the ANS, HPA axis, and inflammatory cytokine network. As described earlier, activation of the sympathetic nervous system triggers the release of pro-inflammatory cytokines (Irwin & Cole, 2011). Individuals who experienced emotional and/or physical abuse may be more prone to repeated and heightened inflammatory responses due to heightened sympathetic activation, leading to chronic inflammation. In contrast, the secretion of cortisol curbs pro-inflammatory cytokine production in response to stress (Sapolsky, Romero, & Munck, 2000). Our finding that a chaotic childhood environment was associated with a dampened cortisol response to acute stress may indicate that individuals exposed to more chaos would have a heightened or sustained inflammatory response to the challenge, which over time may contribute to heightened inflammation. Our study provides initial evidence that disaggregating different types of risky family environments may provide insight into the specific pathways by which a stressful early environment leads to worse health.
Major strengths of the study include the use of tasks that tap into two aspects of social stress relevant to the risky family model, comprehensive assessment of emotional and behavioral responses to the tasks, including behavioral coding of hostility and disengagement, sophisticated assessment of the ANS, and exploration of risky family subtypes. There are also several limitations of the study. First, the sample was comprised of students at a large public university. It is possible that participants in our Risky Family group actually represent a group of “resilient” young adults in that they overcame difficult family circumstances and made it into an elite college. This may be particularly relevant for our lack of group differences to the social evaluation manipulation. Making it into an elite college after having grown up in a risky family, without the emotional, social, and often financial support provided to those from warm and loving homes, our Risky Family group may consist of individuals who developed a stronger sense of self that is not unduly perturbed by rejection from a peer. However, the significantly higher levels of depressive symptoms, anxiety, and stress in the Risky Family group indicate that this group is not as psychologically well adjusted as controls.

Another potential criticism of our study is that in an effort to parse out the impact of a risky family environment independent of severe maltreatment and psychopathology, we may have selected out the individuals that were the most impacted by their early stress exposure. However, only eight students were found to be ineligible during the screening process due to past or present psychopathology or history of severe maltreatment. In addition, our sample’s Risky Family scores were similar to those in previous studies of community adults that did not screen out for severe abuse or psychopathology (Carroll et al., 2013; Crosswell et al., 2014).

Another study limitation is the reliance on retrospective reporting of childhood experiences. Although retrospective reporting of past experiences has been criticized, the
consensus in the literature is that retrospective recall is a valid and reliable way to capture experiences that occurred decades earlier (Brewin, Andrews, & Gotlib, 1993; Robins et al., 1985). Our sample is also relatively young, having moved away from home within the previous few years, which may assist in accurate recall of the childhood home environment.

A final study limitation is that our implementation of the Social Evaluation task did not evoke as strong of an emotional response as we would have liked. Previous work has demonstrated an increase in feelings of social evaluation, perceptions of rejection, and shame in response to this task (Muscatell et al., 2014), but our sample did not show a strong emotional response to it. Increasing the perception of negative evaluation during the task would likely provide more variability in the change in self-conscious emotions, potentially allowing us to see group differences.

This study allowed us to examine stress responses in a controlled laboratory setting. It may also be informative to examine responses to stress in the daily lives of individuals from risky families. Employing daily diary techniques would allow researchers to track the association between daily stress, coping strategies, and health behaviors in individuals from risky families. One reason we may not have seen group differences in disengagement coping in response to the social conflict stress task is because avoidant coping strategies are not employed immediately but instead come online later in the day. For example, one form of avoidant coping is using substances to cope with stress. Indeed, young adults from risky families report great alcohol and substance use (Barnes et al., 2000; Shedler & Block, 1990; Trickett-McBride, 1995; Scaramella et al., 1998). Other negative health behaviors that may be used to deal with stress such as sedentary behavior, and too little or too much sleep, have also been associated with growing up in a risky family environment (Brown & Low, 2008; Greenfield, Lee, Friedman, &
Thus, individuals from risky families may indeed be using avoidant strategies to cope with daily stressors, but our measure did not capture them. Daily diary studies would allow for the examination of these coping strategies in a real world setting and over longer periods of time, which we may miss in lab studies.

In addition, using different stress tasks may allow for further understanding of the psychological differences between adults from risky families and controls. For example, it is possible that we did not see group differences in sensitivity to rejection because of the dynamics of the task itself. Employing different stress tasks like rejection from an important person in their life (i.e., roommate, significant other, professor) may be more potent for young adults from risky families. Because attachment relationships are often disrupted in children from risky families, as adults, these individuals may be more sensitive to potential loss of important relationships. Additionally, we were unable to capture initial appraisals of the social conflict task in our study. Greater initial threat appraisal may have driven the larger increase in cardiovascular and sympathetic nervous system reactivity in the Risky Family group. Tasks that require less involvement from the participant may enable participants to provide repeated appraisals throughout the task. For example, having participants watch two individuals get into an argument may be both stress provoking and may allow researchers to collect participants’ appraisal of the situation at multiple time points during the interaction.

The role of chronic inflammation in the relationship between early adversity and later health has recently received considerable attention (Fagundes et al., 2013; Miller et al., 2011). In addition to the hypothesized pathway of increased anxiety to greater sympathetic activation to chronic inflammation described earlier, heightened inflammatory response due to increased
Macrophage sensitivity to stress is another proposed mechanism linking early adversity to increases in chronic inflammation over time (Miller et al., 2011). Preliminary evidence suggests that adults who experienced maltreatment in childhood mount a greater inflammatory response to acute stress and to daily stressors than those who report no maltreatment (Carpenter et al., 2010; Gouin, Glaser, Malarkey, Beversdorf, & Kiecolt-Glaser, 2012; Pace & Mletzko, 2006). Future studies should test the mechanisms by which early adversity, and milder forms of early adversity in particular, lead to heightened chronic inflammation.

Finally, qualitative work is also needed in this area. In-depth interviews with young adults from risky families could help illuminate the ways in which growing up in a risky family influences the psychological and social lives of young adults. Conducting these assessments in an undergraduate sample may be especially beneficial as it could provide insight into what factors enabled individuals to overcome the difficult childhood circumstances and make it into college. Examining the most detrimental aspects of risky family environments and identifying aspects that act as stress buffers will inform the development of prevention efforts with high-risk children and intervention efforts with individuals from risky families as they transition into adulthood.
Figures

Figure 1. Timeline of laboratory session.
Figure 2. Screenshot of one trial of the Dot-Probe task. Participants first see a plus sign (+), then two faces, then the dot-probe (**), after which they hit the key that corresponds with which side of the screen the dot-probe appeared.
Figure 3. Image of Noisy Neighbor task set up. The confederate and participant stood facing each other. The participant is connected to the blood pressure cuff, electrocardiography (ECG), and impedance cardiography (ICG) machines, which are connected to the computer monitor behind her.
Figure 4. Screenshot of participants’ view during the Social Evaluation task. Adjectives light up individually as the participant believes the confederate is in another room “selecting” each adjective as a description of the participant.
Figure 5. Emotional responses to the Noisy Neighbor task by group. Error bars are 95% confidence intervals around the mean.
Figure 6. Cardiovascular response to the Noisy Neighbor task by group. Systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) readings at baseline, during the task, and during the recovery period for Risky Family and control groups.
Figure 7. Autonomic nervous system (ANS) response to the Noisy Neighbor task by group.

RMSSD, HF-HRV, LF/HF ratio, and PEP averages for the baseline, during task, and recovery periods for Risky Family and control groups.
Figure 8. Cardiovascular response to the Social Evaluation task by group. Systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) readings as baseline, during the task, and during the recovery periods for Risky Family and control groups.
Figure 9. Autonomic nervous system (ANS) response to the Social Evaluation task by group.

RMSSD, HF-HRV, LF/HF ratio, and PEP averages for the baseline, during stress task, and recovery period for Risky Family and control groups.
Figure 10. Cortisol response to the laboratory session for Risky Family and control groups.
Figure 11. Cortisol response to the laboratory session by chaotic environment group.
### Table 1

**Characteristics of Total Sample and by Risky Family (RF) Group**

<table>
<thead>
<tr>
<th></th>
<th>Total (N=95)</th>
<th>RF group (n=42)</th>
<th>Control (n=53)</th>
<th>p value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, M (SD)</td>
<td>20.1 (2.1)</td>
<td>20.1 (2.5)</td>
<td>20.0 (1.8)</td>
<td>0.861</td>
</tr>
<tr>
<td>Women, n (%)</td>
<td>61 (64)</td>
<td>27 (64)</td>
<td>34 (64)</td>
<td>0.99</td>
</tr>
<tr>
<td>Ethnicity, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.413</td>
</tr>
<tr>
<td>White, non-Hispanic or Latino</td>
<td>25 (27)</td>
<td>8 (20)</td>
<td>17 (32)</td>
<td></td>
</tr>
<tr>
<td>White, Hispanic or Latino</td>
<td>16 (17)</td>
<td>8 (20)</td>
<td>8 (15)</td>
<td></td>
</tr>
<tr>
<td>Asian American</td>
<td>32 (34)</td>
<td>15 (36)</td>
<td>17 (32)</td>
<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>2 (2)</td>
<td>0 (0)</td>
<td>2 (4)</td>
<td></td>
</tr>
<tr>
<td>Other or mixed race</td>
<td>19 (20)</td>
<td>10 (24)</td>
<td>9 (17)</td>
<td></td>
</tr>
<tr>
<td>Year in school, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.951</td>
</tr>
<tr>
<td>First</td>
<td>24 (26)</td>
<td>12 (29)</td>
<td>12 (23)</td>
<td></td>
</tr>
<tr>
<td>Second</td>
<td>28 (29)</td>
<td>13 (31)</td>
<td>15 (29)</td>
<td></td>
</tr>
<tr>
<td>Third</td>
<td>22 (23)</td>
<td>9 (21)</td>
<td>13 (25)</td>
<td></td>
</tr>
<tr>
<td>Fourth or fifth</td>
<td>20 (21)</td>
<td>8 (19)</td>
<td>12 (23)</td>
<td></td>
</tr>
<tr>
<td>GPA, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.463</td>
</tr>
<tr>
<td>Under 2.9</td>
<td>20 (21)</td>
<td>8 (19)</td>
<td>12 (23)</td>
<td></td>
</tr>
<tr>
<td>3.0-3.3</td>
<td>27 (29)</td>
<td>15 (37)</td>
<td>12 (23)</td>
<td></td>
</tr>
<tr>
<td>3.4-3.8</td>
<td>37 (39)</td>
<td>15 (37)</td>
<td>22 (41)</td>
<td></td>
</tr>
<tr>
<td>3.9 and above</td>
<td>10 (11)</td>
<td>3 (7)</td>
<td>7 (13)</td>
<td></td>
</tr>
<tr>
<td>Generational status, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.294</td>
</tr>
<tr>
<td>1st generation American</td>
<td>19 (20)</td>
<td>7 (17)</td>
<td>12 (23)</td>
<td></td>
</tr>
<tr>
<td>2nd generation American</td>
<td>54 (57)</td>
<td>29 (69)</td>
<td>25 (48)</td>
<td></td>
</tr>
<tr>
<td>3rd generation or higher</td>
<td>21 (22)</td>
<td>6 (14)</td>
<td>15 (29)</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> For comparisons between groups; tested with t-tests or chi square.
Table 2

*Individual Item Scores for Risky Family Questionnaire*

<table>
<thead>
<tr>
<th>Item</th>
<th>Item score for full sample Mean (SD)</th>
<th>Selected 3 or greater n (%)</th>
<th>Item score for RF group Mean (SD)</th>
<th>Item score for control group Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feel loved and cared for (rev; N)</td>
<td>1.63 (.98)</td>
<td>17 (18)</td>
<td>2.22 (1.19)</td>
<td>1.17 (.38)</td>
</tr>
<tr>
<td>Neglected/ left to fend for self (N)</td>
<td>1.61 (.98)</td>
<td>16 (17)</td>
<td>2.26 (1.33)</td>
<td>1.09 (.30)</td>
</tr>
<tr>
<td>Swear/ insult/ threaten (A)</td>
<td>1.98 (1.09)</td>
<td>26 (27)</td>
<td>2.79 (1.12)</td>
<td>1.34 (.48)</td>
</tr>
<tr>
<td>Push/grab/ shove (A)</td>
<td>1.65 (.87)</td>
<td>15 (16)</td>
<td>2.10 (1.05)</td>
<td>1.30 (.46)</td>
</tr>
<tr>
<td>Violence in home (C)</td>
<td>1.69 (1.07)</td>
<td>15 (16)</td>
<td>2.39 (1.26)</td>
<td>1.15 (.36)</td>
</tr>
<tr>
<td>Chaotic/ disorganized (C)</td>
<td>1.84 (1.16)</td>
<td>22 (23)</td>
<td>2.67 (1.28)</td>
<td>1.19 (.39)</td>
</tr>
<tr>
<td>Alcoholic present in the home (C)</td>
<td>1.55 (1.13)</td>
<td>15 (16)</td>
<td>2.00 (1.50)</td>
<td>1.19 (.48)</td>
</tr>
<tr>
<td>Arguing between parents (C)</td>
<td>2.80 (1.23)</td>
<td>52 (55)</td>
<td>3.52 (1.19)</td>
<td>2.21 (.91)</td>
</tr>
<tr>
<td>Express physical affection (rev; N)</td>
<td>2.02 (1.20)</td>
<td>29 (30)</td>
<td>2.64 (1.30)</td>
<td>1.51 (.81)</td>
</tr>
<tr>
<td>Well-organized (rev)</td>
<td>2.04 (1.17)</td>
<td>29 (30)</td>
<td>2.86 (1.20)</td>
<td>1.40 (.60)</td>
</tr>
<tr>
<td>Arguing between you and parent</td>
<td>2.59 (1.06)</td>
<td>44 (46)</td>
<td>3.17 (1.19)</td>
<td>2.13 (.65)</td>
</tr>
<tr>
<td>Arguing between parent and siblings</td>
<td>2.59 (1.10)</td>
<td>49 (52)</td>
<td>2.86 (1.26)</td>
<td>2.38 (.90)</td>
</tr>
<tr>
<td>Arguing between siblings and you</td>
<td>2.56 (1.16)</td>
<td>45 (47)</td>
<td>2.67 (1.24)</td>
<td>2.47 (1.08)</td>
</tr>
</tbody>
</table>

*Note:* Individuals who endorsed a 3, 4, or 5 on any of the bolded items were selected into the Risky Family group. N = neglect subscale items, α=.77; A = abuse subscale items, r=.53; C = chaos subscale items, α=.83.
### Table 3

**Group Differences in Childhood Experiences**

<table>
<thead>
<tr>
<th></th>
<th>RF group</th>
<th>Control group</th>
<th>p value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risky Family total score, mean (SD)</td>
<td>34.02 (8.10)</td>
<td>20.43 (3.69)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Mother's education level, n (%)</td>
<td></td>
<td></td>
<td>.293</td>
</tr>
<tr>
<td>Some or no high school</td>
<td>7 (17)</td>
<td>6 (11)</td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>8 (20)</td>
<td>4 (8)</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>9 (22)</td>
<td>10 (19)</td>
<td></td>
</tr>
<tr>
<td>College graduate or higher</td>
<td>17 (41)</td>
<td>32 (62)</td>
<td></td>
</tr>
<tr>
<td>Father's education level, n (%)</td>
<td></td>
<td></td>
<td>.013</td>
</tr>
<tr>
<td>Some or no high school</td>
<td>11 (26)</td>
<td>5 (10)</td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>5 (12)</td>
<td>5 (10)</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>9 (21)</td>
<td>4 (7)</td>
<td></td>
</tr>
<tr>
<td>College graduate or higher</td>
<td>17 (41)</td>
<td>38 (73)</td>
<td></td>
</tr>
<tr>
<td>Years of financial strain, mean (SD)</td>
<td>3.99 (.35)</td>
<td>.78 (.92)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>On welfare or food stamps, n (%)</td>
<td>10 (24)</td>
<td>6 (12)</td>
<td>.116</td>
</tr>
<tr>
<td>Owned home before age 5, n (%)</td>
<td>22 (52)</td>
<td>29 (56)</td>
<td>.55</td>
</tr>
<tr>
<td>Chaos, Order, and Hubbub Scale, mean (SD)</td>
<td>23.74 (6.66)</td>
<td>16.02 (5.97)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Structural chaos, mean or yes/no, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of times breadwinner lost job</td>
<td>1.57</td>
<td>.45</td>
<td>.002</td>
</tr>
<tr>
<td>Number of disruptive moves to new home</td>
<td>1.7</td>
<td>.73</td>
<td>.009</td>
</tr>
<tr>
<td>Years in over crowded living conditions</td>
<td>1.85</td>
<td>1.16</td>
<td>.368</td>
</tr>
<tr>
<td>Number of divorces between parents</td>
<td>.625</td>
<td>.26</td>
<td>.042</td>
</tr>
<tr>
<td>Years in single parent home</td>
<td>2.95</td>
<td>1.64</td>
<td>.188</td>
</tr>
<tr>
<td>Mother treated violently (scale 1-5)</td>
<td>.786</td>
<td>.075</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Parental mental illness</td>
<td>22 (52)</td>
<td>9 (17)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Family member commit crime or in prison</td>
<td>8 (19)</td>
<td>2 (4)</td>
<td>.016</td>
</tr>
<tr>
<td>Life Events Checklist&lt;sup&gt;b&lt;/sup&gt;, mean (SD)</td>
<td>2.57 (.27)</td>
<td>2.02 (.25)</td>
<td>.138</td>
</tr>
<tr>
<td>Child Trauma Questionnaire, mean (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional abuse subscale</td>
<td>10.69 (5.05)</td>
<td>6.68 (2.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Emotional neglect subscale</td>
<td>7.4 (2.62)</td>
<td>5.6 (1.45)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Physical neglect subscale</td>
<td>6.74 (2.04)</td>
<td>5.38 (.74)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

<sup>a</sup> For comparisons between groups.  

<sup>b</sup> Count of number of life events personally experienced or witnessed.
Table 4

*Group Differences in Psychosocial Characteristics*

<table>
<thead>
<tr>
<th></th>
<th>RF group</th>
<th>Control group</th>
<th>p value(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostility (Cook-Medley Hostility Scale)</td>
<td>13.36 (5.32)</td>
<td>11.17 (5.33)</td>
<td>.050</td>
</tr>
<tr>
<td>Rejection sensitivity (Rejection Sensitivity Questionnaire)</td>
<td>9.94 (2.94)</td>
<td>8.78 (2.88)</td>
<td>.052</td>
</tr>
<tr>
<td>Anxiety (State Trait Anxiety Inventory trait subscale)</td>
<td>42.71 (1.40)</td>
<td>37.45 (8.11)</td>
<td>.004</td>
</tr>
<tr>
<td>Behavioral disengagement (Brief COPE subscale)</td>
<td>1.46 (.67)</td>
<td>1.47 (.64)</td>
<td>.956</td>
</tr>
<tr>
<td>Social support (Interpersonal Support Evaluation List)</td>
<td>33.81 (6.66)</td>
<td>37.96 (6.35)</td>
<td>.002</td>
</tr>
<tr>
<td>Social isolation (UCLA Loneliness Scale)</td>
<td>53.33 (5.70)</td>
<td>52.58 (4.42)</td>
<td>.473</td>
</tr>
<tr>
<td>Depressive symptoms (CESD)</td>
<td>14.43 (8.46)</td>
<td>9.83 (8.12)</td>
<td>.009</td>
</tr>
<tr>
<td>Perceived stress (PSS)</td>
<td>21.07 (5.11)</td>
<td>18.81 (5.61)</td>
<td>.047</td>
</tr>
</tbody>
</table>

\(^a\)For comparisons between groups.
**Table 5**

*Dot-Probe Task Attentional Bias Scores by Group*

<table>
<thead>
<tr>
<th></th>
<th>RF group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Angry</td>
<td>-13.13 (35.60)*</td>
<td>-6.37 (35.78)</td>
</tr>
<tr>
<td>Fear</td>
<td>-1.46 (39.39)</td>
<td>-1.61 (31.90)</td>
</tr>
<tr>
<td>Disgust</td>
<td>-10.85 (39.55)+</td>
<td>-10.46 (36.03)+</td>
</tr>
<tr>
<td>Happy</td>
<td>-10.15 (28.38)*</td>
<td>4.06 (36.40)</td>
</tr>
<tr>
<td>Sad</td>
<td>-3.78 (24.96)</td>
<td>5.13 (28.50)</td>
</tr>
</tbody>
</table>

*Note:* Negative scores reflect slower responses to trials when the dot-probe replaces emotional versus neutral faces, indicating avoidance of emotional faces. Mean attentional bias scores presented in ms. *p < .05 for comparison of attentional bias scores against zero.*
### Emotional Responses to the Stress Tasks by Group

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Post-task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>RF group</td>
<td>Control group</td>
</tr>
<tr>
<td></td>
<td>RF group</td>
<td>Control group</td>
</tr>
<tr>
<td>Anxiety response to the NN task</td>
<td>4.69 (3.83)</td>
<td>2.98 (2.79)</td>
</tr>
<tr>
<td>Anger/hostility response to the NN task</td>
<td>1.21 (2.29)</td>
<td>.75 (1.69)</td>
</tr>
<tr>
<td>Shame response to the SE task</td>
<td>1.52 (.61)</td>
<td>1.37 (.49)</td>
</tr>
<tr>
<td>Self-esteem response to the SE task</td>
<td>3.69 (.79)</td>
<td>3.91 (.66)</td>
</tr>
</tbody>
</table>

Note: NN = Noisy Neighbor; SE = Social Evaluation.
Table 7

Autonomic and Cardiovascular Responses to the Noisy Neighbor Task by Group

<table>
<thead>
<tr>
<th>Outcome</th>
<th>RF group Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>RF group Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>RF group Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>RF group Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>Group difference p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR</td>
<td>68.02 (9.22)</td>
<td>71.39 (12.26)</td>
<td>86.33 (14.61)</td>
<td>90.39 (16.17)</td>
<td>70.81 (10.12)</td>
<td>73.81 (12.35)</td>
<td>68.89 (10.12)</td>
<td>72.51 (10.81)</td>
<td>.602 (.532 .996)</td>
</tr>
<tr>
<td>SBP</td>
<td>106.74 (10.07)</td>
<td>107.64 (10.13)</td>
<td>133.29 (18.57)</td>
<td>130.94 (16.19)</td>
<td>113.59 (10.16)</td>
<td>112.90 (10.94)</td>
<td>109.92 (10.05)</td>
<td>111.03 (11.36)</td>
<td>.006 (.230 .108)</td>
</tr>
<tr>
<td>DBP</td>
<td>63.91 (7.68)</td>
<td>64 (7.77)</td>
<td>82.26 (12.24)</td>
<td>78.45 (9.47)</td>
<td>68.89 (10.12)</td>
<td>68.38 (8.30)</td>
<td>66.44 (8.44)</td>
<td>66.43 (8.47)</td>
<td>.244 (.176 .272)</td>
</tr>
<tr>
<td>RMSSD</td>
<td>51.05 (21.31)</td>
<td>50.32 (29.27)</td>
<td>40.70 (14.55)</td>
<td>41.72 (20.91)</td>
<td>51.92 (18.61)</td>
<td>48.05 (26.68)</td>
<td>54.02 (24.90)</td>
<td>47.04 (21.58)</td>
<td>.573 (.188 .156)</td>
</tr>
<tr>
<td>HF-HRV</td>
<td>1108.07 (885.15)</td>
<td>1220.31 (1360.72)</td>
<td>788.18 (591.25)</td>
<td>831.07 (86.51)</td>
<td>1089.52 (710.31)</td>
<td>1192.93 (1454.03)</td>
<td>1200.86 (1171.30)</td>
<td>1049.99 (934.92)</td>
<td>.797 (.740 .476)</td>
</tr>
<tr>
<td>LF/HF ratio</td>
<td>2.04 (1.5)</td>
<td>2.14 (2.17)</td>
<td>3.65 (2.81)</td>
<td>4.65 (5.46)</td>
<td>2.16 (2.6)</td>
<td>2.23 (1.88)</td>
<td>2.26 (2.17)</td>
<td>2.39 (2.71)</td>
<td>.258 (.260 .599)</td>
</tr>
<tr>
<td>PEP</td>
<td>113.65 (13.56)</td>
<td>109.31 (12.47)</td>
<td>104.61 (17.43)</td>
<td>104.58 (15.47)</td>
<td>109.99 (15.49)</td>
<td>106.12 (14.21)</td>
<td>113.53 (14.58)</td>
<td>111.60 (15.61)</td>
<td>.079 (.138 .301)</td>
</tr>
</tbody>
</table>

Note: Raw values of all outcomes are presented here. Transformed variables were used in all analyses for RMSSD, HF-HRV, LF/HF ratio, and PEP. Blood pressure and heart rate values were averaged across time points in the table for ease of interpretation but in actual analyses, all 7 individual time points were utilized for maximum power. p values are presented for HR, SBP, and DBP, from the models that take advantage of all time points.

a p values reported for HR, SBP, and DBP are for contrasts comparing values at 6 mins into the baseline to 2 mins into the task.
b p values reported for HR, SBP, and DBP are for contrasts comparing values at 4 mins into the task to 2 minutes after the task.
c p values reported for RMSSD, HF-HRV, LF/HF ratio, and PEP are for contrasts comparing during task values to recovery 1 values (0-5 minutes post-task).
### Table 8

**Autonomic and Cardiovascular Responses to the Social Evaluation Task by Group**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>RF group</th>
<th>Control</th>
<th>RF group</th>
<th>Control</th>
<th>RF group</th>
<th>Control</th>
<th>Group difference p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>HR</td>
<td>68.95 (10.30)</td>
<td>72.46 (10.83)</td>
<td>71.17 (9.20)</td>
<td>74.17 (10.87)</td>
<td>71.54 (10.36)</td>
<td>74.61 (10.32)</td>
<td>.723 .519 .648</td>
</tr>
<tr>
<td>SBP</td>
<td>109.81 (10.34)</td>
<td>111.21 (12.07)</td>
<td>113.08 (11.45)</td>
<td>113.33 (11.12)</td>
<td>109.93 (10.43)</td>
<td>111.38 (10.62)</td>
<td>.253 .354 .604</td>
</tr>
<tr>
<td>DBP</td>
<td>66.24 (8.75)</td>
<td>67.02 (9.86)</td>
<td>69.07 (8.59)</td>
<td>68.62 (8.61)</td>
<td>67.74 (8.55)</td>
<td>67.78 (8.03)</td>
<td>.412 .945 .834</td>
</tr>
<tr>
<td>RMSSD</td>
<td>52.37 (21.32)</td>
<td>50.30 (28.82)</td>
<td>50.42 (21.53)</td>
<td>48.76 (27.25)</td>
<td>54.33 (24.85)</td>
<td>57.31 (26.95)</td>
<td>.903 .171 .254</td>
</tr>
<tr>
<td>HF-HRV</td>
<td>1145 (891.51)</td>
<td>1254.45 (1350.81)</td>
<td>1086.82 (851.61)</td>
<td>1198.55 (1554.55)</td>
<td>1302.75 (1179.95)</td>
<td>1496.44 (1482.92)</td>
<td>.992 .702 .905</td>
</tr>
<tr>
<td>LF/HF ratio</td>
<td>2.01 (1.66)</td>
<td>1.98 (1.53)</td>
<td>2.47 (2.53)</td>
<td>2.10 (2.03)</td>
<td>1.70 (1.40)</td>
<td>1.40 (1.31)</td>
<td>.302 .835 .551</td>
</tr>
<tr>
<td>PEP</td>
<td>109.43 (18.03)</td>
<td>109.18 (13.36)</td>
<td>111.59 (16.21)</td>
<td>109.83 (14.15)</td>
<td>103.09 (17.78)</td>
<td>103.22 (13.88)</td>
<td>.317 .210 .415</td>
</tr>
</tbody>
</table>

**Note:** Raw values of all outcomes are presented here. Transformed variables were used in all analyses for RMSSD, HF-HRV, LF/HF ratio, and PEP. Blood pressure and heart rate values were averaged across time points in the table for ease of interpretation but in actual analyses, all 7 individual time points were utilized for maximum power.

* p values reported for HR, SBP, and DBP are for contrasts comparing values at 3 mins into baseline to 3 mins into task.

* *p* values reported for HR, SBP, and DBP are for contrasts comparing values at 3 mins into task to 2 minutes after task.
Appendices

Appendix A. Study screening script.

UNIVERSITY OF CALIFORNIA, LOS ANGELES
SCREENING CONSENT SCRIPT

Social Encounters and Health Study

Thank you for your interest in the Social Encounters and Health Study. I would like to ask you a few questions in order to determine whether you may be eligible for the research study. Before I begin the screening I would like to tell you a little bit about the study. This project examines individual responses to social encounters, and how different aspects of your background influence these responses. The project explores broadly how responses to social encounters influence health. If you are eligible, we can schedule a time for you to participate in the study that will take approximately 3 hours. We will ask you to come into our laboratory and complete a series of tasks, including a computer task and a role-play activity with another person, and provide saliva samples. In addition, you will be asked to complete a series of questionnaires online within 2 weeks after your participation in the laboratory session. For scientific reasons, this form does not include complete information about the study hypotheses and the research questions being tested. You will be fully debriefed following your participation in the research.

Would you like to continue with the screening? The screening will take about 10 minutes. You do not have to answer any questions you do not wish to answer or are uncomfortable answering, and you may stop at any time. Your participation in the screening is voluntary.

Your answers will be confidential. No one will know your answers except for the research team. You will be given a study identification number that will be associated with the answers to these questions instead of your name. An excel file linking your name to your study identification number will be password protected and viewed only when essential by study staff. However, your identity may not be able to be kept confidentiality if you endorse recent thoughts about suicide or self-harm.

If you are not eligible for the study, we will still keep your responses so that for reporting purposes we can track reasons why students were not eligible though we will delete your name and any other identifiable information. If you do qualify for the research study and decide to participate, you will sign an informed consent form when you come into the laboratory. Again, all of your data will be linked only to your study identification number and will be kept in password-protected databases.

Would you like to continue with the screening? [If no, thank the person and hang-up]
[If yes, continue with the screening]

What is your current height and weight?
Height (in inches)____ 2. Weight (in lbs)____

Participants with a BMI > 30 will be excluded because accurate autonomic nervous system data can not be collected.

Severe abuse and psychopathology history screen out questions

I am going to read you a list of statements about life experiences you may have had. After I have read all of the statements, please tell me whether any of the items is true for you. Please do not give me answers
to individual questions, only one answer at the end of all statements; say “yes” if any are true or “no” if none are true.

I believe I was physically or sexually abused. *(Adapted from the CTQ #15 & 27)*

I have been diagnosed with a psychiatric illness such as clinical depression, anxiety, or post-traumatic stress disorder. *(Adapted from the Stress and Adversity Inventory; Slavich, 2012)*

I have been treated for a mental illness by a medical professional. *(Adapted from Jackson et al., 2010)*

I have been hospitalized for a psychiatric or drug-related reason. *(Adapted from the Stress and Adversity Inventory; Slavich, 2012)*

I have a major medical or health problem that requires continuous supervision and treatment from a doctor (e.g., diabetes or high blood pressure).

Were any of the previous statements true for you? YES NO

*If the participant responds YES then they are not eligible. Thank them for answering the screening questions and let them know that they are not eligible for the study.*

*If the participant responds NO to all of the items continue with the screening.*

**PHQ-9 to screen out for current depression** *(Spitzer, Kroenke, & Williams, 1999)*

Over the last two weeks, how often have you been bothered by any of the following problems?

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>(PHQ1) Little interest or pleasure in doing things</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(PHQ2) Feeling down, depressed, or hopeless</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(PHQ3) Trouble falling asleep or staying asleep, or sleeping too much</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(PHQ4) Feeling tired or having little energy</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(PHQ5) Poor appetite or overeating</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(PHQ6) Feeling bad about yourself—or that you are a failure or have let yourself or your family down</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If participants indicate experiencing either of the above two items “nearly every day,” they are not eligible for the study so stop the screening here. Explain to the participant why they are not eligible. Ask the participant if they want the contact information for the UCLA Counseling Services.*

83
(PHQ7) Trouble concentrating on things, such as reading the newspaper or watching television

0 1 2 3

(PHQ8) Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual

0 1 2 3

(PHQ9) Thoughts that you would be better off dead, or of hurting yourself in some way

0 1 2 3

(PHQ10) If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all ___________ Very difficult ___________
Somewhat difficult ___________ Extremely difficult ___________

Ask the participant to please wait a moment. Put the participant on hold and take a moment to add up the participant’s PHQ-9 score.

PHQ-9 total score______(range: 0 – 27)

Individuals who score above 10 or endorse experiencing one of two key items (little interest or pleasure in doing things, and feeling down, depressed, or hopeless) nearly every day in the past two weeks will also be excluded as this likely indicates current depression. If either of these are true for the participant, explain to them why they are not eligible. Ask the participant if they want the contact information for the UCLA Counseling Services.

Thank you for answering the screening questions. [Indicate whether the person is eligible, requires additional screening, or is not eligible and explain why.]

Do you have any questions about the screening or the research? I am going to give you a couple of telephone numbers to call if you have any questions later. Do you have a pen? If you have questions about the research screening, you may call Alexandra Dupont and she will answer your questions. She can be reached at (310) 794-7838.

If you have questions about your rights as a research subject or if you wish to voice any problems or concerns you may have about the study to someone other than the researchers, please call the UCLA Office of the Human Research Protection Program at (310) 825-7122.

If scheduling participant for the study, tell them to --- 1) Do not consume any alcoholic beverages 24 hours before the experiment; 2) Do not consume dairy products during the 3 hours prior to the experiment time; 3) Do not eat or drink anything during the hour prior to the experiment time; 4) Do not brush your teeth 45 minutes prior to the experiment time; 5) Do not wear a dress or long sleeves (we need to attach physio equipment to your arm and lower back)
Appendix B. Risky Family Questionnaire.

These are questions about your childhood and early adolescence (age 5 – 15). Please think over your family life and answer these questions.

1. How often did a parent or other adult in the household make you feel that you were loved, supported, and cared for?

   1  2  3  4  5
   Not at All  Very Often

2. How often did a parent or other adult in the household swear at you, insult you, put you down, or act in a way that made you feel threatened?

   1  2  3  4  5
   Not at All  Very Often

3. How often did a parent or other adult in the household express physical affection for you, such as hugging, or other physical gestures of warmth and affection?

   1  2  3  4  5
   Not at All  Very Often

4. How often did a parent or other adult in the household push, grab, shove, or slap you?

   1  2  3  4  5
   Not at All  Very Often

5. In your childhood, did you live with anyone who was a problem drinker or alcoholic, or who used street drugs?

   1  2  3  4  5
   Not at All  Very Often

6. Would you say that the household you grew up in was well-organized and well-managed?

   1  2  3  4  5
   Not at All  Very Often
7. How often would you say that a parent or other adult in the household behaved violently toward a family member or visitor in your home?

1  2  3  4  5
Not at All Very Often

8. How often would you say there was quarreling, arguing, or shouting between your parents?

1  2  3  4  5
Not at All Very Often

9. How often would you say there was quarreling, arguing, or shouting between a parent and you?

1  2  3  4  5
Not at All Very Often

10. How often would you say there was quarreling, arguing, or shouting between a parent and one of your siblings?

1  2  3  4  5
Not at All Very Often

11. How often would you say there was quarreling, arguing, or shouting between your sibling(s) and you?

1  2  3  4  5
Not at All Very Often

12. Would you say the household you grew up in was chaotic and disorganized?

1  2  3  4  5
Not at All Very Much

13. How often would you say you were neglected while you were growing up, that is, left on your own to fend for yourself?

1  2  3  4  5
Not at All Very Often
Appendix C. Laboratory session questionnaires.

List of questionnaires completed during the laboratory session:
- Health History Questionnaire (beginning of laboratory session)
- Day of Study Health Behaviors Questionnaire (beginning of laboratory session)
- Task Impressions Questionnaire (after both tasks)
- Appraisal of Confederate Questionnaire (after Noisy Neighbor task)
- POMS (before and after the Noisy Neighbor task)
- Brief COPE (after the Noisy Neighbor tasks)
- State Shame and Guilt Scale (before and after the Social Evaluation tasks)
- State Self Esteem Scale (before and after the Social Evaluation tasks)

Health History Questionnaire

1. How tall are you? ________ feet ________ inches
3. If you are female, what was the first day of your last menstrual cycle? If you can’t remember, please just make your best guess:
4. If you are female, are you currently taking birth control pills or any other form of hormonal contraceptives (e.g., depoprovera shots, the patch)? YES NO
5. What medication do you take on a regular or daily basis? If none, leave blank.________________________________________________________________________
6. What medications do you take on an as-needed basis (e.g., inhaler used in the instance of an asthma attack)? If none, leave blank.
7. Did you take any of those as-needed medications within the past 24-hours? YES NO
8. Do you have serious allergies? (circle one) YES NO
9. Do you have asthma? (circle one) YES NO
10. Do you have diabetes? (circle one) YES NO
11. What time do you typically go to bed? ____________
12. What time do you typically wake up in the morning? ____________

Day of Study Health Behaviors Questionnaire

Please read each of the following questions carefully and respond in a manner that best describes you. There are no right or wrong answers, and it is important that you be honest in your responses.

11. How would you describe your health today? 1-excellent 2-very good 3-good 4-fair 5-poor
12. Did you drink any coffee in the past hour? (circle one) YES NO
13. How many cigarettes have you smoked today? ____________
14. Did you engage in physical exercise in which you worked up a sweat within the past three hours? (circle one) YES NO
15. How many hours has it been since you ate something? ____________
16. Did you eat food within the last hour? (circle one) YES NO
17. How many hours did you sleep last night? ____________
### Task Impressions Questionnaire

We’d like to get some information about how you felt during the task. Circle the number that best describes how you feel about the task you just completed.

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Moderately</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The task was stressful.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. The task was difficult.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. I was engaged with the task.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. I did well on the task.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. I was in control during the task.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. I feel evaluated by the other participant.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. I feel judged by the other participant.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### Appraisal of Confederate Questionnaire

We’d like to understand your impression of the other participant. Please answer these questions as truthfully as possible. The other participant will never see your responses. Circle the number that best describes how you feel about the participant RIGHT NOW.

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Moderately</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Likeable</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Hostile</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Angry</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Understanding</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Judgmental</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Self-serving</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Reasonable</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Mean</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Trustworthy</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
## POMS

Circle the answer to the right which best describes how you are feeling RIGHT NOW.

<table>
<thead>
<tr>
<th></th>
<th>Not at All</th>
<th>A little</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tense</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Angry</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Worn out</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Unhappy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Lively</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. Confused</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. Peeved</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. Sad</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>9. Active</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. On edge</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. Grouchy</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>12. Blue</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. Energetic</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. Hopeless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. Uneasy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. Restless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. Unable to concentrate</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18. Fatigued</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>19. Annoyed</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20. Discouraged</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>21. Resentful</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>22. Nervous</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>23. Miserable</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>24. Cheerful</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>25. Bitter</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>26. Exhausted</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>27. Anxious</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
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<tr>
<td>28. Helpless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>29. Weary</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>30. Bewildered</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
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<tr>
<td>31. Furious</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>32. Full of pep</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>33. Worthless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>34. Forgetful</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>35. Vigorous</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>36. Uncertain about things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>37. Bushed</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
**Brief COPE**

In reference to how you handled the previous role-play task, how did you cope with that situation?

1 = I didn’t do this at all.
2 = I did this a little bit.
3 = I did this a medium amount.
4 = I did this a lot.

___  1. I admitted to myself that I couldn’t deal with it, and quit trying.
___  2. I tried to come up with a strategy about what to do.
___  3. I thought hard about what steps to take.
___  4. I allowed myself to express my emotions.
___  5. I tried to see it in a different light, to make it seem more positive.
___  6. I just gave up trying to deal with it.
___  7. I let my feelings come out freely.
___  8. I tried to grow as a person as a result of the experience.

Problem-focused coping = 2, 3
Emotional expression = 4, 7
Positive reinterpretation = 5, 8
Avoidance/ behavioral disengagement = 1, 6
State Self-Esteem Scale

This is a questionnaire designed to measure what you are thinking at this moment. There is, of course, no right answer for any statement. The best answer is what you feel is true of yourself at this moment. Be sure to answer all of the items, even if you are not certain of the best answer. Again, answer these questions as they are true for you RIGHT NOW.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Not at all (1)</th>
<th>A little bit (2)</th>
<th>Somewhat (3)</th>
<th>Very much (4)</th>
<th>Extremely (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I feel confident about my abilities.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>I am worried about whether I am regarded as a success or failure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>I feel frustrated or rattled about my performance.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>I feel that I am having trouble understanding things that I read.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>I feel self-conscious.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>I feel as smart as others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>I feel displeased with myself.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>I am worried about what other people think of me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.</td>
<td>I feel confident that I understand things.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>I feel inferior to others at this moment.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td>I feel concerned about the impression I am making.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12.</td>
<td>I feel that I have less scholastic ability right now than others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13.</td>
<td>I feel like I’m not doing well.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14.</td>
<td>I am worried about looking foolish.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
State Shame and Guilt Scale

The following are some statements that may or may not describe how you feel RIGHT NOW. Please rate each statement using the 5-point scale below.

<table>
<thead>
<tr>
<th></th>
<th>Not feeling this way</th>
<th>Feeling this way somewhat</th>
<th>Feeling this way very strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I want to sink into the floor and disappear.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>I feel remorse, regret.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>I feel small.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>I feel tension about something I have done.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>I feel like I am a bad person.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>I can’t stop thinking about something I’ve done.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>I feel humiliated, disgraced.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>I feel like apologizing, confessing.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>I feel worthless, powerless.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>I feel bad about something I’ve done.</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Appendix D. Noisy Neighbor video coding procedures.

**Procedure for Coding Videos**

Two independent coders, blind to the participants’ Risky Family group assignments, rated each 30-second segment. For any discrepancies in which there was a difference of 3 or more instances of each type of verbal statement, coders met and re-watched the video together, discussing the discrepancy and resolving it by reaching a joint consensus. In cases when a consensus could not be met, the PI was consulted and made the final decision.

We had difficulty coding the nonverbal behaviors we had intended to, and thus these variables were dropped from the study. In addition, the frequencies of several other variables were too few for analysis. The overwhelming majority of participants (93%) said zero positive or passive/helpless comments (86%); these variables were excluded from analysis. The number of hostile/aggressive responses and time until attempting to disengage were positively skewed; these variables were therefore square root transformed to correct for normality. The final video coded variables were: problem solving, cognitive focused coping, emotion focused coping, disengagement coping, hostile/aggressive statements, and total time until participant attempted to disengage from the task.

Scores were averaged across the two coders and averages were used in all analyses. To assess the degree that coders provided agreement in their count of each category we assessed inter-rater reliability using an inter-class correlation (ICC) following a two-way random effects absolute agreement average-measures design (Hallgren, 2012; McGraw & Wong, 1996). ICC values were high for all categories used in analyses, ranging from 0.89 to 0.94. This indicates that coders had a high degree of agreement and that the two independent coders introduced a minimal amount of measurement error.
Coding Scheme for Videos

Verbal behaviors. Adapted from coding scheme provided by Linda Luecken (personal communication, September 20, 2012).

I. Problem Solving – Try to change what you or confederate do about the music situation
   a. Direct Request – Participant tells the confederate to turn down music
   b. Bargaining/Compromise – Participant suggests that both she and the confederate will do something to resolve the situation (turn down music just a little)
   c. Alternative solutions – Participant asks the confederate to do something other than direct request (Use head phones)
   d. Engage confederate in problem solving (Do you have any ideas? Is there anything I can do for you?)

II. Cognitive Focused Coping – Try to change how you or the confederate think about the situation
   a. Explain reasoning – Participant explains why they need the confederate to turn down their music
   b. Moral Appeal – Participant explains moral or social implications in that it’s the right thing to do or that the participant would do it for the confederate (reference to values, rights, social contract, respect, “should”)
   c. Benefit for Confederate – Participant explains how the confederate would benefit from cooperation with the participant’s requests (i.e., health of ears; You won’t get written up by the R.A.; I’ll turn my music down next time)
   d. Understand Confederate’s Perspective – Participant attempts to understand why the confederate does not want to turn down music (asking questions; You need it this loud to study?)
   e. Note Difference in Perspective – Participant refers to the difference in perspective (it might not be too loud for you, but it’s too loud for me; well, that puts us at odds)
   f. Attempt to change Confederate’s Perspective – Participant explains her own perspective to the confederate in an effort to change the confederate’s (put yourself in my shoes)

III. Emotion Focused Coping – Try to change how you or the confederate feel about the situation
   a. Emotional Appeal/Expression – Participant explains emotional experience in an effort to make the confederate understand her perspective (has to have an emotion word, i.e., “This is frustrating;” “I’d like to do well” does not count)
   b. Social Nicety – Participant makes a comment involving a complement or rapport-building efforts
   c. Validation – Participant agrees with something the confederate has said (I understand)
   d. Friendly Appeal – Participant makes a request incorporating social nicety and efforts to build rapport (personal favor; “It’d be really nice/great if you…”)
   e. Use humor to diffuse – Participant uses humor in an effort to reduce tension

IV. Disengagement Coping – No longer participating in the task
   a. Give up/acquiesce – Participant turns to Research Assistant to try and stop
b. Explain – Participant tells confederate what she would do if they were in a real situation
c. Unrelated Topics – Participant talks about things unrelated to the task

V. Hostile/Aggressive Response – under the larger category of Emotion dysregulation.
   a. Patronize, mock, sarcasm, passive-aggressive – Has to be more than just tone. P-A replaces former “manipulate confederate” to indicate purposefully being a “bad participant.”
   b. Blame, criticize, insult – more direct than patronize, mock, sarcasm (calling the confederate “stubborn”; you don’t care that I need to study)
   c. Demand – i.e., “You have to turn it down”)
   d. Threat of revenge
   e. Argue/disagree/disregard – in response to confederate line “no one else has a problem with it,” participant says, “maybe no one else has said anything”)
   f. Threat of violence/ambiguous threat
   g. Use of expletives – ranging from crap to censored words
   h. Threat to authority – e.g., “I’m going to call the cops/resident assistant/landlord”

VI. Passive/Helpless Response
   a. Beg/plead
   b. Apologize
   c. Whine/complain

VII. Positive statements

Nonverbal behaviors. These were chosen from several different sources by the P.I.

I. Frequency of steps backwards (Larkin et al., 1996, 2011). Update 1/10/13- video quality too low to capture this. Was not coded.

II. Frequency of nodding (Mendes & Koslov, 2013). Update 3/14/14 – responses for this were highly skewed, with 71% (n=66) of participants receiving 0’s across the entire task.

III. Frequency of eye rolling (Larkin et al., 1996, 2011). Update 1/10/13- video quality too low to capture this. Was not coded.

IV. Frequency of laughs (Mendes & Koslov, 2013). Update 3/14/14 – coding for this unreliable.

V. Total time until the participant attempted to disengage. Record the time (in seconds) until the participant turns to the Research Assistant attempting to disengage from or end the interaction (e.g., This guy won’t compromise. What do I do?). If they continue the interaction until the research assistant instructs them to stop, record this value as 360 seconds (full length of time of task).
Appendix E. Table of hypotheses and general results.

<table>
<thead>
<tr>
<th>Compared to the control group, young adults from risky families will demonstrate:</th>
<th>Measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Increased threat sensitivity</td>
<td>Avoidance of angry and fearful faces via Dot-Probe attentional bias scores</td>
<td>Partially confirmed; RF group avoided angry but not fearful faces</td>
</tr>
<tr>
<td></td>
<td>Increased levels of anxiety in response to the Noisy Neighbor task</td>
<td>Partially confirmed; RF group had higher anxiety at pre-task and marginally higher at post-task</td>
</tr>
<tr>
<td>2. Increased hostility in response to social conflict</td>
<td>Hostile appraisal of the confederate after the Noisy Neighbor task</td>
<td>Not confirmed</td>
</tr>
<tr>
<td></td>
<td>Increased levels of anger in response to the Noisy Neighbor task</td>
<td>Not confirmed</td>
</tr>
<tr>
<td></td>
<td>Greater number of hostile/ aggressive verbal statements used during the Noisy Neighbor task</td>
<td>Not confirmed</td>
</tr>
<tr>
<td>3. Increased rejection sensitivity in response to social evaluation</td>
<td>Greater decrease in self-esteem and increase in shame in response to the Social Evaluation task</td>
<td>Not confirmed</td>
</tr>
<tr>
<td>4. Increased disengagement from social conflict</td>
<td>Shorter amount of time until disengaged from the Noisy Neighbor task</td>
<td>Not confirmed</td>
</tr>
<tr>
<td>5. Heightened cardiovascular arousal, increased sympathetic activation, and increased parasympathetic withdrawal to acute stress</td>
<td>Greater cardiovascular reactivity (HR, SBP, DBP)</td>
<td>Partially confirmed; RF group had greater SBP reactivity to Noisy Neighbor task</td>
</tr>
<tr>
<td></td>
<td>Greater parasympathetic withdrawal (greater RMSSD and HF-HRV decrease)</td>
<td>Not confirmed</td>
</tr>
<tr>
<td></td>
<td>Greater sympathetic activation (greater PEP decrease and LF/HF ratio increase)</td>
<td>Partially confirmed; RF group had marginally significant greater PEP reactivity to Noisy Neighbor task</td>
</tr>
<tr>
<td>6. Dampened cortisol response to overall laboratory session</td>
<td>Lower overall cortisol response</td>
<td>Partially confirmed; high chaos group had dampened response</td>
</tr>
</tbody>
</table>
References


