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How Your Spouse May Save You: An Analysis of Early Environment, Physiological Stress Responses, and Spousal Support

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How Your Spouse May Save You: An Analysis of Early Environment, Physiological Stress Responses, and Spousal Support

A Thesis Presented

by

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ABSTRACT

HOW YOUR SPOUSE MAY SAVE YOU: AN ANALYSIS OF EARLY ENVIRONMENT, PHYSIOLOGICAL STRESS RESPONSES, AND SPOUSAL SUPPORT

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Growing up in an adverse early environment is related to a number of negative health outcomes later in life, and dysregulation of the HPA axis may serve as the means by which this process occurs (Repetti et al., 2002). Indeed, early environment has been linked to altered physiological responses to general stressors in adulthood, but it remains unclear whether physiological responses to marital stress are also affected. Thus, the present work addresses two central questions in 129 newlywed couples: (1) How does growing up in an adverse early environment relate to physiological stress responses (assessed by cortisol) to a relationship conflict? (2) Does having a supportive spouse moderate this relation? The results provide some support for the link between early environment and cortisol reactivity among husbands, and marginal support for the moderating role of spousal support.

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CHAPTER 1

EARLY ENVIRONMENT AND PHYSIOLOGICAL RESPONSES TO MARITAL CONFLICT

1.1 Introduction

The nature of one's early experiences is critical to development in both humans and animals. In animal research, the importance of the early environment has been explored by examining the consequences of variations in maternal care. Champagne and Meaney (2006) found that stressed mother rats (dams) exhibited decreased pup licking and grooming, which in turn resulted in female offspring that displayed the same decreased pup licking and grooming as well as male offspring that exhibited increased fearfulness. In addition to differences in offspring behavior, maternal care has been associated with physiological and epigenetic outcomes. Low levels of pup grooming and arched-back nursing were related to effects on the neural substrates of maternal behavior and differences in DNA methylation and gene expression in offspring (Champagne & Meaney, 2006; Weaver et al., 2004).

Human research has also found that growing up in an environment lacking nurturance is associated with many negative physical and psychological health outcomes. Children who grow up in a risky family environment characterized by conflict, a lack of support, and neglect are more likely to have a number of health problems later in life, such as anxiety, depression, cardiovascular disease, cancer, and obesity (Repetti, Taylor, & Seeman, 2002; Montgomery, Bartley, & Wilkinson, 1997; Lissau & Sorensen, 1994). According to the Risky Families Model (Repetti et al., 2002), a harsh early environment leads to disruptions in physiological stress response systems that, over time, can affect health. In particular, the hypothalamic-pituitary-adrenal (HPA) axis (which releases the hormone cortisol) can become dysregulated through repeated activation, thereby increasing health risks. In particular, individuals who experience a more disorganized or conflictual early environment are more likely to have elevated physiological responses to general stressors (e.g., counting backwards from 9,095 by sevens; Taylor, Lerner, Sage, Lehman, & Seeman, 2004). However, it remains unclear whether a detrimental early environment has consequences for stress experienced in a relational context.

A separate line of work shows a clear link between marital functioning and better health outcomes (Kiecolt-Glaser & Newton, 2001). For example, newlywed wives who were more satisfied with support from their spouse showed smaller cortisol responses during a conflict discussion (Heffner et al., 2004). Thus, the literature on marriage suggests that a supportive spousal relationship may ameliorate the disruptions in physiological stress responses associated with growing up in a risky family, but this idea is as yet untested. The present work integrates these two lines of work by examining (a) how growing up in an adverse early environment relates to physiological stress responses in the context of marriage and (b) the role of the marital relationship in exacerbating or reducing the negative physiological effects of growing up in a risky family environment.

1.2 Early Family Environment and Health

There is a great deal of evidence linking an adverse early family environment to negative health outcomes (Repetti et al., 2002). Growing up in an environment characterized by conflict, neglect, and/or a lack of support (i.e., a risky family environment) has been associated with a number of poor mental health outcomes in childhood and adolescence. Children exposed to conflict and aggression within the family are more likely to exhibit aggression, behavior problems, conduct disorder, anxiety, and depression (Emery, 1982; Grych & Fincham, 1990; Repetti et al., 2002).

In addition, children who grow up in a risky family environment are more likely to have physical health problems later in life (Repetti et al., 2002). A conflictual family environment has been associated with an increased risk of illness (e.g., aches and pains, high blood pressure), lower height attainment, and more physical symptoms in adulthood (Lundberg, 1993; Montgomery, Bartley, & Wilkinson, 1997; Walker et al., 1999). Indeed, exposure to overt conflict and aggression in the home has been linked to a variety of negative health outcomes, but growing up in an environment characterized by cold, unsupportive, and neglectful care seems to be equally detrimental to one's health (Repetti et al., 2002). Children who grew up in unsupportive, neglectful homes were more likely to be diagnosed with obesity, cardiovascular disease, alcoholism, and cancer later in life (Lissau & Sorensen, 1994; Russek & Schwartz, 1997). Taken together, the extant work provides compelling evidence of the negative health outcomes associated with a risky family environment characterized by conflict, neglect, and/or a lack of support. Furthermore, Lehman, Taylor, Kiefe, and Seeman (2005) found that childhood socio-economic status (SES) was associated with a risky family environment, which in turn was associated with metabolic functioning. In fact, childhood SES was directly related to metabolic functioning, suggesting that it may be an important factor to examine along with the childhood family environment.

1.3 The Role of the HPA Axis in the Link Between Early Environment and Health

Work with both humans and animals has demonstrated a strong link between early environment and adult physical and mental health, and emerging evidence suggests that altered hypothalamic pituitary adrenal (HPA) functioning may play a role in the transmission of stressful childhood experiences to health outcomes later in life. When confronted with stress, the HPA system works to redirect energy and resources away from processes that facilitate long-term survival, such as digestion and growth, and toward those that prepare the body for confronting the stressor at hand and promote short-term survival (Gunnar & Cheatham, 2003). However, the allocation of resources away from future-oriented functions may be detrimental if this occurs too often or for too long, and indeed, differential patterns of HPA activity have been associated with depression and posttraumatic stress disorder (PTSD) (Gunnar & Cheatham, 2003). Furthermore, there is evidence that, at least among rodents, the manner by which the HPA system responds to stress is shaped by early experience, specifically by altering basal and stress reaction cortisol levels (Gunnar & Cheatham, 2003). One study of rats and their pups demonstrated a link between early experiences (i.e., early maternal care) and the expression of genes related to HPA responses to stress (Weaver et al., 2004). Specifically, Weaver and colleagues (2004) found that variations in dams' maternal behavior during the first week of life influenced their pups' DNA methylation, such that pups raised by a less nurturing, low licking and grooming mother (whether biological or foster) exhibited altered hippocampal glucocorticoid receptor (GR) expression and thus HPA function than those raised by more nurturing, high licking and grooming mothers. In addition to demonstrating a link between early environment and HPA function, these findings support the idea that alterations in HPA functioning are a mechanism by which early experience exerts long-term effects. Thus, the HPA system may play an important role in transmitting the effects of the early environment and act as a channel through which the childhood family environment may be associated with negative health outcomes later on.

At present, the relation between a risky family background and HPA reactivity to stress has been examined primarily by exposing participants to laboratory stressors, such as the Trier Social Stress Task (Kirschbaum, Pirke, & Hellhammer,1993; Taylor et al., 2004), and the role of early family environment on responses to relational stressors in adulthood is unknown. However, a great deal of evidence has demonstrated a connection between marital functioning and both physical and mental health (Kiecolt-Glaser & Newton, 2001; U.S. Department of Health and Human Services, 2007). Given the role of early experience in adult stress responses and the link between marriage and health, the present work examines whether growing up in a risky family environment is associated with HPA responses to marital stressors.

1.4 The Potential Moderating Role of Spousal Support

Despite the numerous physical and psychological health problems associated with growing up in an adverse early environment, the impact of early experience may be reversible. Recent work suggests that interventions in adulthood may be able reverse or dampen the negative physiological effects of growing up in a risky family environment. A pharmacological intervention administered to adult rats reversed a disadvantageous alteration in DNA methylation (which subsequently affected gene expression related to

HPA functioning) that was the result of being raised by a less nurturing, low licking/grooming mother, and this intervention eliminated the difference between these animals and those raised by a more nurturing mother (Weaver et al., 2004). While a comparable pharmacological intervention for humans is beyond the scope of this work, it is notable that the epigenetic effects of poor early maternal care were reversible. In another example of an intervention affecting HPA functioning, work with toddlers found that an attachment-based behavioral intervention with parents was capable of lowering basal cortisol levels in children among those with a particular dopamine receptor D4 polymorphism (Bakermans-Kranenburg, Van Ijzendoorn, Mesman, Alink, & Juffer, 2008).

Given that HPA functioning may be altered through directed interventions, it may be that positive relational experiences in adulthood can also counter the negative physiological effects of growing up in an adverse early environment. As marriage is arguably the most important interpersonal relationship in adulthood, having a supportive spouse may serve as a buffer against the negative HPA effects of having a risky family background. Indeed, marriage has been reliably associated with health outcomes; spousal interactions have been related to alterations in autonomic, endocrine, and immune function (Kiecolt-Glaser & Newton, 2001). For example, newlywed wives who were more satisfied with support from their spouse showed smaller cortisol responses during a conflict discussion than less satisfied wives (Heffner, Kiecolt-Glaser, Loving, Glaser, & Malarkey, 2004). Thus, a supportive spousal relationship may ameliorate the disruptions in physiological stress responses associated with growing up in a risky family.

Extant work on the physical health outcomes of social support distinguishes between *perceived* and *received* support (Uchino, 2009; Wills & Shinar, 2000). Perceived support describes potential access to social support and has been consistently linked to positive health outcomes (Uchino, 2009). Received support refers to the reported receipt of support, particularly during a specific time frame, and its link to health outcomes is more tenuous. As a result, the present work explores whether spousal support indeed serves as a moderator of the link between a risky family background and HPA responses to a marital stressor by examining both overall perceived marital support and spousal support received in response to the stressor.

1.5 Gender and HPA Function

Given this work's focus on HPA responses to stress in the context of the marital relationship, it is important to consider the possibility that men and women respond differently to such stressors. The extant work on gender differences in HPA stress reactivity is inconclusive, but overall it suggests there are gender differences in HPA reactivity, and the nature of such differences depends on the type of stressor (Kudielka & Kirschbaum, 2005).

According to Kudielka and Kirschbaum (2005), most studies of psychological stressors indicate that men show greater HPA responses to stress than women, if they find gender differences at all. However, this discrepancy may be in part because men and women respond differently to the same stressors. Uhart and colleagues (2006) examined gender differences in HPA responses to a psychological stressor (the Trier social stress test, or TSST) and a pharmacological stressor (naloxone challenge). Men exhibited a greater cortisol response to the TSST than women, while women had a greater response to the naloxone challenge than men, demonstrating that gender differences in HPA response patterns were dependent on the type of stressor. To more precisely understand how HPA reactivity differs between men and women, Stroud, Salovey, and Epel (2002) investigated two types of psychological stressor: social rejection and achievement stress. Again, men and women differed in their physiological responsiveness depending on the type of stressor. Men showed greater increases in cortisol in response to achievement stress than women, while women exhibited greater cortisol responses to social rejection than men. Thus, men may show greater cortisol responses to psychological stressors in general, but women may be more physiologically reactive to negative interpersonal events than men.

Similarly, cortisol patterns for both men and women have been found to vary as a function of individual difference variables (i.e., adult attachment avoidance and anxiety) in the context of an interpersonal conflict negotiation task. For instance, attachment anxiety predicted men's cortisol patterns (Brooks, Robles, & Dunkel Schetter, 2011; Powers, Pietromonaco, Gunlicks, & Sayer, 2006), whereas attachment avoidance predicted women's cortisol patterns (Powers et al., 2006).

Men and women also differ in the trajectory of their physiological stress response (i.e., cortisol levels before, during, and after a stressor). For instance, Kirschbaum and colleagues (1992) found that anticipating an upcoming stressful task was related to heightened cortisol levels in men but not among women. Laurent and Powers (2006) also found gender differences in the trajectory of cortisol response. In a sample of young adult couples asked to engage in a conflict discussion, the authors examined the role of social dependency and relationship attributions in couple members' physiological responses to relationship conflict. Gender differences emerged in the importance of social dependency and relationship attributions in predicting individuals' HPA responses to conflict, but the nature of these differences depended on which part of the cortisol trajectory was examined. Among men, social dependency was related to higher cortisol levels during the conflict but was unrelated to the rate of change or the overall curvature of the cortisol trajectory. Among women, social dependency did not predict any aspect of the cortisol trajectory; however, relationship attributions predicted the rate of change in cortisol during the discussion. The authors conclude that men were more physiologically responsive to social dependency while women were more sensitive to relationship attributions, but the degree to which this was true depended on the aspect of the cortisol trajectory examined.

Indeed, men and women exhibit different HPA responses to stress depending on the type of stressor, individual difference variables, and the aspect of the cortisol trajectory examined. With regard to gender differences in the present work, it is difficult to predict any specific outcomes. However, I expect men and women may vary in their cortisol reactivity, so I examine this possibility in the context of each hypothesis.

1.6 The Present Study

The present work explores two central research questions. First, to what extent does growing up in an adverse early environment predict physiological responses to marital conflict? Second, might the relation between an adverse early environment and physiological responses to marital conflict depend on the spouse's supportiveness?

Specifically, I hypothesize that growing up in an adverse early environment will be associated with stronger physiological stress responses (as indexed by cortisol) to a conflict discussion with one's spouse. That is, individuals who experienced a risky family environment or low childhood SES should show greater cortisol reactivity to a spousal conflict as well as slower recovery following the conflict.

Additionally, both received and perceived spousal support may moderate the effects of early environment on physiological stress responses to the marital conflict. I predict that individuals from a more adverse family environment who report receiving more spousal support in the context of the conflict interaction will show less pronounced physiological reactivity and quicker recovery than those with less supportive spouses. It is also possible that more general perceptions of access to spousal support will moderate the link between early environment and physiological reactivity and recovery. Given that I used an existing dataset, relationship satisfaction serves as a proxy for perceived spousal support. Although relationship satisfaction is not identical to perceived support from a spouse, the two are highly associated (Clark & Lemay, 2010). Thus, I also predict that individuals from a riskier family background who report higher relationship satisfaction will show less pronounced physiological reactivity and quicker recovery than those who are less satisfied.

The present work examined these questions in a sample of newlywed couples. Couples provided information about their childhood family environment, completed a measure of marital satisfaction, and discussed an area of conflict in their relationship. After the conflict discussion, spouses rated both themselves and their partners on how supportive they were during the discussion. Additionally, each couple member provided salivary cortisol samples to reflect their physiological stress levels before, during, and after the conflict interaction. As previously discussed, growing up in an adverse early environment is associated with a number of negative psychological outcomes later in life (e.g., depression, anxiety). As a result, there may be some shared variance between a risky family background and trait neuroticism. However, I expected that each of the hypothesized effects for risky family background would remain statistically significant once neuroticism was statistically controlled.

CHAPTER 2

METHOD

2.1 Participants

One hundred twenty-nine newlywed couples (n = 258 individuals) participated in this study. Couples were recruited from town records of marriage licenses in Western Massachusetts. All couples were in their first marriage, married for less than 6-7 months, and had no children. Participants ranged in age from 19 to 46. The average age of husbands was 29.4 (SD = 5.3), and the average age of wives was 27.9 (SD = 4.8). Of the husbands, 122 were white (94.6%), 2 were Hispanic (1.6%), 3 identified themselves as multiethnic (2.3%), and 2 did not provide information about their race/ethnicity (1.6%). Of the wives, 117 were white (90.7%), 3 were Asian (2.3%), 5 were Hispanic (3.9%), and 4 did not provide this information (3.1%). Couples were paid $100 for completing the study ($50 each).

2.2 Procedure

Upon providing consent, couple members were asked to individually answer a set of questions about themselves and their relationship. Couple members then provided the first saliva sample (lab baseline). Next, the couple members were asked to separately list three areas of unresolved conflict in their relationship. One of these topics was selected for the conflict discussion. Couple members then separately answered a second set of questions. Upon completion of this set, the researcher gave the couple a more detailed description of the upcoming conflict discussion and asked whether they had questions about the discussion, after which couple members worked separately on a third set of questionnaires. Fifteen minutes after receiving the detailed instructions about the upcoming discussion, the couple provided a second saliva sample (anticipatory) and was then directed to a different room for the conflict discussion. For this task, the couple was assigned one of the unresolved issues in their relationship that they had identified earlier in the study. They were given 15 minutes to discuss their topic and try to resolve the conflict. Following the conflict discussion, couple members provided saliva samples at intervals 10, 30, and 60 minutes following the end of the interaction. Meanwhile, they separately completed additional questionnaires. To obtain a baseline sample of cortisol outside of the lab, couple members also provided a home saliva sample in the week following their lab session. The sample was provided on a day similar to the day they visited the lab (e.g., if they worked the day of their lab visit, they provided the sample on another day on which they worked) and at the same time of day that they provided the lab baseline sample. Despite measuring cortisol on a different day than the session, conceptually the home sample should provide a general indicator of individuals' cortisol levels outside of the lab. For analytic purposes, the home sample was entered into the trajectory of cortisol responses as if it had occurred 30 minutes prior to the first lab sample. This allowed examination of changes in the trajectory across the following time points: home sample, lab baseline, anticipation of conflict, 10 minutes post-conflict, 30 minutes post-conflict, and 60 minutes pos-conflict. It takes approximately 15 minutes for cortisol in the bloodstream to appear in saliva, so each sample reflects the individual's cortisol response 15 minutes prior to the sample. See Table 1 for an overview of each saliva sample and the timing.

2.3 Measures

2.3.1 Risky Family Background

The extent to which individuals experienced a risky family environment while growing up was assessed with the Risky Family Questionnaire (Felitti et al., 1998; Taylor et al., 2004). Participants were instructed to think about their family life during childhood and early adolescence (age 5 – 15) in responding to the 13-item questionnaire (e.g., "How often would you say there was quarreling, arguing, or shouting between your parents?"). Items were measured on a 5-point scale (1 = *not at all*, 5 = *very often*); see Appendix A for items. In line with Lehman et al. (2005), each item was converted to a *z* score before a composite score was computed. Higher scores reflect growing up in a riskier family environment. Cronbach's α was .841 for husbands, .877 for wives.

2.3.2 Childhood SES

The extent to which individuals experienced an adverse early environment was also assessed by childhood socio-economic status (SES). Childhood SES was determined by participant reports of their mother's and father's education level. Participants were asked to identify the highest level of education completed by their mother and by their father (or by the person who served as their mother/father) as follows: grade school but no high school, some high school, high school diploma, G.E.D., associate's degree, vocational degree, bachelor's degree, master's degree, Ph.D./J.D./M.D. Following U.S. Census practice, "high school diploma" and "G.E.D." were combined to create a single category (U.S. Census Bureau, 2010), and each category was assigned a number to indicate education level, with higher numbers representing greater educational attainment (1 = *grade school but no high school*, 2 = *some high school*, 3 = *high school diploma or G.E.D.*, 4 = *vocational degree*, 5 = *associate's degree*, 6 = *bachelor's degree*, 7 = *master's degree*, 8 = *Ph.D./J.D./M.D.*). Ratings for mother's and father's education were averaged to create one score reflecting childhood SES. Higher scores represent greater parental education attained.

2.3.3 Salivary Cortisol

As previously described, salivary cortisol served as a measure of physiological stress. The saliva samples were collected using the passive drool method, and participants had four minutes to provide each sample. It takes approximately 15 minutes for cortisol in the bloodstream to appear in saliva, so the time limit allowed more precise estimation of the tasks the participant was completing 15 minutes prior to the sample. Upon completion, each sample was immediately stored in an ultra-low freezer. The samples were sent to Salimetrics for cortisol duplicate assay.

2.3.4 Received Spousal Support

After the conflict interaction, participants completed a five-item measure adapted from Collins and Feeney (2000) assessing perceptions of their partner's behavior during the interaction. Participants used a 5-point scale (1 = *not at all*, 5 = *extremely*) to indicate the extent to which their partner was supportive, responsive, understanding, critical (reverse-scored), and concerned during the interaction. The mean of these five items represented each participant's perception of support received (Cronbach's α = .863 for husbands, .867 for wives).

2.3.5 Perceived Relationship Quality Components (PRQC)

To measure more general positive feelings about the spouse and relationship, relationship satisfaction was assessed with the Perceived Relationship Quality Components Scale (PRQC; Fletcher, Simpson, & Thomas, 2000). The PRQC consists of six factors that represent different domains of perceived relationship quality:. Three items comprise each factor, and participants rated each item about their relationship with their spouse using a 7-point scale (1 = *not at all*, 7 = *extremely*; see Appendix B for items). The mean of all 18 items represents overall perceived relationship quality, such that higher scores indicate higher relationship quality; Cronbach's α was .919 for husbands, .923 for wives. Composite scores for each factor were also computed: satisfaction (husbands' α = .926, wives' α = .954), commitment (husbands' α = .931, wives' α = .938), intimacy (husbands' α = .811, wives' α =.817), trust (husbands' α = .803, wives' α = .842), passion (husbands' α = .892, wives' α = .912), and love (husbands' α = .873, wives' α = .888).

2.3.6 Neuroticism

The personality factor of neuroticism was assessed using the emotional stability scale from the International Personality Item Pool (IPIP; Goldberg, 1999; IPIP, 2012). Participants were instructed to rate how accurately each of 20 items described them using a 5-point scale (1 = *very inaccurate*, 5 = *very accurate*). To compute scores for each personality factor, a number of items were reverse scored, then all 20 items were summed for each factor. Cronbach's α was .925 for husbands, .916 for wives.

2.4 Medication Controls

Medications have the potential to affect salivary cortisol through a number of different pathways (Granger, Hibel, Fortunato, & Kapelewski, 2009). Indeed, both prescription and over-the-counter medications may impact the synthesis and secretion of cortisol, the negative feedback regulation of the HPA axis, and a number of other processes by which cortisol becomes identifiable in saliva. However, the effects of individual medications on salivary cortisol remain unclear. Consequently, in order to assess whether various medications were related to cortisol levels in the present study, participants were asked to "list all of the medications (prescription and nonprescription) and supplements you have you taken in the past 24 hours" and were provided with a reference guide of common medications and supplements if they needed help recalling the names. Later, research assistants classified each medication by type, and dummy variables were created to identify whether participants were taking each of the following kinds of medication (0 = no, 1 = yes): corticosteroid, allergy medication, antibiotic, antidepressant or anxiety medication, ADHD medication, analgesic, antihistamine, or anti-inflammatory. Additionally, wives were asked to identify the type and dosage of contraceptive (e.g., oral contraceptive, patch) they used, if any. This information was later dummy coded to indicate whether or not wives were using any hormonal contraceptive (0 = no, 1 = yes).

CHAPTER 3

RESULTS

3.1 Analytic Strategy

The present work addresses two central questions. First, how is an adverse early environment related to physiological stress patterns in response to a conflict discussion with one's spouse? And second, does spousal support during the conflict interaction (received support) and/or relationship satisfaction (perceived support) moderate the association between early environment and physiological stress responses? To account for the nonindependence of spouses' data and to examine cortisol trajectories over time, analyses were performed using hierarchical linear modeling (Raudenbush & Bryk, 2002). Specifically, the analyses examine (1) whether an individual's risky family background and/or childhood SES are related to cortisol secretions in response to a conflict with one's spouse, and (2) whether having a supportive spouse, or being in a higher quality relationship, moderates this relation.

Descriptive information (i.e., mean, standard deviation, minimum, and maximum) for each predictor variable can be found in Table 2 for husbands and Table 3 for wives. Table 4 provides correlations among the husbands' predictor variables and cortisol measures, and Table 5 provides this information for the wives' measures.

I used the Hierarchical Linear Modeling program, Version 7.0, of Raudenbush and Bryk (2002) to carry out multilevel modeling analyses. Specifically, I used growth modeling to plot trajectories of each participant's 6 cortisol responses and to predict variance in these trajectories from participants' risky family background, childhood SES, and spousal support/relationship satisfaction. Inspection of the distribution of cortisol scores revealed a highly skewed distribution, so a log transformation (log base 10) was applied in order to create a more normal distribution of the outcome variable. Additionally, I centered the data around the third cortisol sample (taken 10 minutes after the end of the conflict interaction), and because salivary cortisol reflects the release of cortisol into bloodstream approximately 15 minutes prior, this sample serves as an index of the individual's stress response *during* the conflict interaction. Consequently, the intercept for males (β_{m1j}) and females (β_{f5j}) represents their cortisol level as sampled 10 minutes after the conflict but reflects their cortisol level during the conflict discussion.

3.2 Model Comparison

To begin exploring the relationship between early environment and cortisol responses to marital conflict, I first fit an unconditional linear model to the data. The Level 1 unconditional linear growth model was represented by the following equation:

$$Y_{ij} = \beta_{h1j}(\textit{husband intercept})_{ij} + \beta_{h2j}(\textit{husband linear})_{ij} + \beta_{w3j}(\textit{wife intercept})_{ij} + \beta_{w4j}(\textit{wife linear})_{ij} + e_{ij}$$

Y is the cortisol level i for couple j. For husbands, β_{h1j} is the model intercept and represents the predicted cortisol level measured 10 minutes after the conflict interaction. B_{h2j} is the linear change in cortisol level per hour for husbands, and e is the error. β_{w3j} and β_{w4j} represent the same parameters (i.e., the model intercept and growth rate, respectively) for the wives' trajectories. No predictors were included in the Level 2 model:

$$\beta_{h1j} = \gamma_{10} + u_{1j}$$

$$\beta_{h2j} = \gamma_{20} + u_{2j}$$

$\beta_{w3j} = \gamma_{30} + u_{3j}$

$\beta_{w4j} = \gamma_{40} + u_{4j}$

Table 6 includes a description of the fixed effects and random effects for the model. Husbands' mean cortisol level 10 minutes after the conflict interaction (i.e., when time is equal to zero) was .052 µg/dl, t = -49.183, p < .001, and their average change in cortisol level per hour was -0.109, t = -12.544, p < .001. For wives, the mean cortisol level 10 minutes post-conflict was .054 µg/dl, t = -52.243, p < .001, and the mean rate of change in cortisol level per hour was -0.082, t = -7.749, p < .001. Thus, overall, cortisol levels for both males and females decreased over the assessment period.

The variance of the Level 1 residuals across the sample (σ^2) was .025. For both males and females, there was significant variability in cortisol level measured 10 minutes after the conflict, variance component = .079, χ^2 = 3659.810, for males, and variance component = .066, χ^2 = 3187.776, for females, both ps < .001. Additionally, there was significant variability in the cortisol levels over time (i.e., trajectories), variance component = .007, χ^2 = 415.311, for males, and variance component = .011, χ^2 = 594.421, for females, both ps < .001. This variation in cortisol levels and trajectories indicates that there is significant variability in individuals' physiological stress responses to the conflict interaction.

A sampling of the individual plots suggested a possible curvilinear relationship between time and cortisol levels, but it was difficult to distinguish whether a quadratic or a cubic model best captured the relationship. To determine which model fit the data best, I first fit an unconditional quadratic model for comparison with the previously described linear model.

$$Y_{ij} = \beta_{h1j}(husband\ intercept)_{ij} + \beta_{h2j}(husband\ linear)_{ij} + \beta_{h3j}(husband\ quadratic)_{ij} + \beta_{w4j}(wife\ intercept)_{ij} + \beta_{w5j}(wife\ linear)_{ij} + \beta_{w6j}(wife\ quadratic)_{ij} + e_{ij}$$

For husbands, the model intercept β_{h1j} represents the predicted cortisol level 10 minutes after the conflict interaction, and β_{h2j} is the linear rate of change in cortisol level at 10 minutes post-conflict (i.e., the instantaneous rate of change). β_{h3j} is the rate of change in cortisol level over the entire period of assessment (i.e., the curvature of the growth trajectory) for husbands. β_{w4j}, β_{w5j}, and β_{w6j} represent the same parameters (i.e., the model intercept, instantaneous growth rate, and curvature of the growth trajectory, respectively) for the wives' trajectories. In the Level 2 model, each β from the Level 1 model becomes an outcome, and as before, no predictors were included in this model:

$$\beta_{h1j} = \gamma_{10} + u_{1j}$$

$$\beta_{h2j} = \gamma_{20} + u_{2j}$$

$$\beta_{h3j} = \gamma_{30} + u_{3j}$$

$$\beta_{w4j} = \gamma_{40} + u_{4j}$$

$$\beta_{w5j} = \gamma_{50} + u_{5j}$$

$$\beta_{w6j} = \gamma_{60} + u_{6j}$$

A multivariate hypothesis test comparing the quadratic model to the linear model showed that the quadratic model was a better fit to the data, $\chi^2 = 693.989$, $p < .001$. The fixed effects and random effects for the quadratic model are detailed in Table 7.

I then fit an unconditional cubic model to determine whether this model provided a better fit to the data than the quadratic model.

$Y_{ij} = \beta_{h1j}(husband\ intercept)_{ij} + \beta_{h2j}(husband\ linear)_{ij} + \beta_{h3j}(husband\ quadratic)_{ij} + \beta_{h4j}(husband\ cubic)_{ij} + \beta_{w5j}(wife\ intercept)_{ij} + \beta_{w6j}(wife\ linear)_{ij} + \beta_{w7j}(wife\ quadratic)_{ij} + \beta_{w8j}(wife\ cubic)_{ij} + e_{ij}$

β_{h1j}, β_{h2j}, β_{w5j}, and β_{w6j} represent the same parameters as they did in the quadratic model. In the cubic model, β_{h3j} now represents the acceleration of the growth trajectory at 10 minutes post-conflict (i.e., instantaneous acceleration), and β_{h4j} represents the overall curvature of the growth trajectory for husbands. β_{w7j} and β_{w8j} represent the same parameters (i.e., the instaneous acceleration and curvature of the growth trajectory, respectively) for the wives' trajectories. Again, each β from the Level 1 model becomes an outcome at Level 2, and no predictors were included in this model:

$\beta_{h1j} = \gamma_{10} + u_{1j}$

$\beta_{h2j} = \gamma_{20} + u_{2j}$

$\beta_{h3j} = \gamma_{30} + u_{3j}$

$\beta_{h4j} = \gamma_{40} + u_{4j}$

$\beta_{w5j} = \gamma_{50} + u_{5j}$

$\beta_{w6j} = \gamma_{60} + u_{6j}$

$\beta_{w7j} = \gamma_{70} + u_{7j}$

$\beta_{w8j} = \gamma_{80} + u_{8j}$

The fixed effects and random effects for the cubic model can be found in Table 8. A multivariate hypothesis test comparing the cubic model to the quadratic model showed that the cubic model was a better fit to the data, $\chi^2 = 954.378$, $p < .001$. Consequently, I will retain the cubic model for further analyses.

3.3 Medication Controls

Given the number of ways in which medications can affect measurement of salivary cortisol (Granger et al., 2009), I examined the relationship between medications and cortisol in the present sample by entering each medication type as a predictor at Level 2. For example, to test the effect of antibiotics on cortisol, husbands' antibiotic use was entered at Level 2 as a predictor of each of the husbands' Level 1 parameters: cortisol level at sample 3 (intercept), rate of change in cortisol level at sample 3 (linear term), acceleration in cortisol rate of change at sample 3 (quadratic term), and curvature across the trajectory (cubic term); at the same time, wives' antibiotic use was entered as a predictor of each of these terms for wives. I then systematically trimmed any non-significant variables from each term. If a given variable was significant on a higher order term, it was retained as a predictor on the lower order terms. (e.g., if antibiotics had a significant effect on the quadratic term for husbands, I included antibiotics on the husbands' intercept, linear term, and quadratic term). Finally, I ran model comparison tests for each trimmed model to ensure that the model was a significantly better fit than the cubic model without any medication variables; only medications that remained significant and produced a better model fit were retained. This analysis was carried out separately for each medication type (corticosteroid, allergy medication, antibiotic, antidepressant or anxiety medication, ADHD medication, analgesic, antihistamine, and anti-inflammatory), with the effects of hormonal contraceptive use examined for wives only. Medications taken by fewer than 5 participants were not entered into these analyses due to the small sample size. The final model contained all significant medications from the trimmed models described above and provided a significantly better fit to the data than the unconditional cubic model, $\chi^2 = 28.861$, $p < .001$. Thus, all subsequent models included the following medication controls at Level 2:

$$\beta_{h1j} = \gamma_{10} + u_{1j}$$

$$\beta_{h2j} = \gamma_{20} + u_{2j}$$

$$\beta_{h3j} = \gamma_{30} + u_{3j}$$

$$\beta_{h4j} = \gamma_{40} + u_{4j}$$

$$\beta_{w5j} = \gamma_{50} + \gamma_{51}\,(hormonal\ contraceptive) + \gamma_{52}\,(wife\ ADHD\ medication) + u_{5j}$$

$$\beta_{w6j} = \gamma_{60} + \gamma_{61}\,(hormonal\ contraceptive) + u_{6j}$$

$$\beta_{w7j} = \gamma_{70} + u_{7j}$$

$$\beta_{w8j} = \gamma_{80} + u_{8j}$$

That is, for wives it was necessary to control for hormonal contraceptives and ADHD medication at the intercept as well as hormonal contraceptives at the linear term; these findings are described in Table 9. For husbands, no medications were controlled for.

3.4 Early Family Environment and Cortisol

To test the hypothesis that growing up in an adverse early family environment is related to cortisol responses to a conflict with one's spouse, I examined the effects of risky family questionnaire score and childhood SES on cortisol. Thus, the Level 2 model was represented by the following equations:

$$\beta_{h1j} = \gamma_{10} + \gamma_{11}\,(husband\ RFQ) + \gamma_{12}\,(husband\ CSES) + u_{1j}$$

$$\beta_{h2j} = \gamma_{20} + \gamma_{21}\,(husband\ RFQ) + \gamma_{22}\,(husband\ CSES) + u_{2j}$$

$\beta_{h3j} = \gamma_{30} + \gamma_{31}$ *(husband RFQ)* + γ_{32} *(husband CSES)* + u_{3j}

$\beta_{h4j} = \gamma_{40} + \gamma_{41}$ *(husband RFQ)* + γ_{42} *(husband CSES)* + u_{4j}

$\beta_{w5j} = \gamma_{50} + \gamma_{51}$ *(hormonal contraceptive)* + γ_{52} *(wife ADHD medication)* + γ_{53} *(wife RFQ)* + γ_{54} *(wife CSES)* + u_{5j}

$\beta_{w6j} = \gamma_{60} + \gamma_{61}$ *(hormonal contraceptive)* + γ_{62} *(wife RFQ)* + γ_{63} *(wife CSES)* + u_{6j}

$\beta_{w7j} = \gamma_{70} + \gamma_{71}$ *(wife RFQ)* + γ_{72} *(wife CSES)* + u_{7j}

$\beta_{w8j} = \gamma_{80} + \gamma_{81}$ *(wife RFQ)* + γ_{82} *(wife CSES)* + u_{8j}

The results from this analysis are described in Table 10 for husbands and Table 11 for wives. Consistent with the hypothesis, husbands' scores on the risky family questionnaire were associated with the acceleration cortisol trajectory at the post-conflict measurement point, controlling for childhood SES, $\beta = .060$, $t = 2.321$, $p = .022$. As depicted in Figure 1, higher scores on the risky family questionnaire were associated with a decreasing deceleration in cortisol level at the post-conflict sample, while lower risky family scores were related to a steadier deceleration. Risky family scores were not associated with any other aspects of husbands' cortisol trajectories, *p*s > .434. Wives' risky family scores were not associated with their cortisol trajectories, all *p*s > .566. Childhood SES was not associated with cortisol responses for husbands or for wives, *p*s > .097, so this variable was excluded from subsequent models.

3.5 Spousal Support as a Moderator

To explore the hypothesis that spousal support moderates the association between a risky family background and cortisol responses, I examined the relation between a risky family background, spousal support, and the interaction between the two on cortisol. I carried out separate analyses for each indicator of spousal support: received support during the conflict interaction and perceived relationship satisfaction.

3.5.1 Received Support as a Moderator

I first tested the role of received support during the conflict. The Level 2 model was represented by the following equations:

$$\beta_{h1j} = \gamma_{10} + \gamma_{11}\ (\textit{husband RFQ}) + \gamma_{12}\ (\textit{husband perception of wife's support}) + \gamma_{13}\ (\textit{husband RFQ * husband perception of wife's support}) + u_{1j}$$

$$\beta_{h2j} = \gamma_{20} + \gamma_{21}\ (\textit{husband RFQ}) + \gamma_{22}\ (\textit{husband perception of wife's support}) + \gamma_{23}\ (\textit{husband RFQ * husband perception of wife's support}) + u_{2j}$$

$$\beta_{h3j} = \gamma_{30} + \gamma_{31}\ (\textit{husband RFQ}) + \gamma_{32}\ (\textit{husband perception of wife's support}) + \gamma_{33}\ (\textit{husband RFQ * husband perception of wife's support}) + u_{3j}$$

$$\beta_{h4j} = \gamma_{40} + \gamma_{41}\ (\textit{husband RFQ}) + \gamma_{42}\ (\textit{husband perception of wife's support}) + \gamma_{43}\ (\textit{husband RFQ * husband perception of wife's support}) + u_{4j}$$

$$\beta_{w5j} = \gamma_{50} + \gamma_{51}\ (\textit{hormonal contraceptive}) + \gamma_{52}\ (\textit{wife ADHD medication}) + \gamma_{53}\ (\textit{wife RFQ}) + \gamma_{54}\ (\textit{wife perception of husband's support}) + \gamma_{55}\ (\textit{wife RFQ * wife perception of husband's support}) + u_{5j}$$

$$\beta_{w6j} = \gamma_{60} + \gamma_{61}\ (\textit{hormonal contraceptive}) + \gamma_{62}\ (\textit{wife RFQ}) + \gamma_{63}\ (\textit{wife perception of husband's support}) + \gamma_{64}\ (\textit{wife RFQ * wife perception of husband's support}) + u_{6j}$$

$$\beta_{w7j} = \gamma_{70} + \gamma_{71}\ (\textit{wife RFQ}) + \gamma_{72}\ (\textit{wife perception of husband's support}) + \gamma_{73}\ (\textit{wife RFQ * wife perception of husband's support}) + u_{7j}$$

$\beta_{w8j} = \gamma_{80} + \gamma_{81}$ *(wife RFQ)* + γ_{82} *(wife perception of husband's support)* +

γ_{83} *(wife RFQ * wife perception of husband's support)* + u_{8j}

Table 12 describes the results from this analysis for husbands; Table 13 provides this information for wives. Perceptions of received spousal support during the conflict were not related to cortisol responses for husbands or for wives, all *p*s > .292. Moreover, contrary to the hypothesis, there were no significant interactions between risky family background and received spousal support, all *p*s > .246. However, husbands' risky family background remained a significant predictor of the acceleration of their cortisol level at the post-conflict measurement point, $\beta = .063$, $t = 2.590$, $p = .011$.

3.5.2 Perceived Relationship Quality as a Moderator

I next tested the role of mean PRQC in the relation between risky family environment and cortisol. Each level 2 equation contained risky family questionnaire score, mean PRQC score, and the interaction between the two:

$\beta_{h1j} = \gamma_{10} + \gamma_{11}$ *(husband RFQ)* + γ_{12} *(husband PRQC)* + γ_{13} *(husband RFQ * husband PRQC)* + u_{1j}

$\beta_{h2j} = \gamma_{20} + \gamma_{21}$ *(husband RFQ)* + γ_{22} *(husband PRQC)* + γ_{23} *(husband RFQ * husband PRQC)* +u_{2j}

$\beta_{h3j} = \gamma_{30} + \gamma_{31}$ *(husband RFQ)* + γ_{32} *(husband PRQC)* + γ_{33} *(husband RFQ * husband PRQC)* + u_{3j}

$\beta_{h4j} = \gamma_{40} + \gamma_{41}$ *(husband RFQ)* + γ_{42} *(husband PRQC)* + γ_{43} *(husband RFQ * husband PRQC)* + u_{4j}

$\beta_{w5j} = \gamma_{50} + \gamma_{51}$ *(hormonal contraceptive)* + γ_{52} *(wife ADHD medication)* + γ_{53} *(wife RFQ)* + γ_{54} *(wife PRQC)* + γ_{55} *(wife RFQ * wife PRQC)* + u_{5j}

$\beta_{w6j} = \gamma_{60} + \gamma_{61}$ *(hormonal contraceptive)* + γ_{62} *(wife RFQ)* + γ_{63} *(wife PRQC)* + γ_{64} *(wife RFQ * wife PRQC)* + u_{6j}

$\beta_{w7j} = \gamma_{70} + \gamma_{71}$ *(wife RFQ)* + γ_{72} *(wife PRQC)* + γ_{73} *(wife RFQ * wife PRQC)* + u_{7j}

$\beta_{w8j} = \gamma_{80} + \gamma_{81}$ *(wife RFQ)* + γ_{82} *(wife PRQC)* + γ_{83} *(wife RFQ * wife PRQC)* + u_{8j}

The results of this analysis are described in Table 14 for husbands and Table 15 for wives. Mean PRQC scores were not related to cortisol responses for husbands or for wives, all *p*s > .097, and there were no significant interactions between risky family questionnaire score and mean PRQC, all *p*s > .192. Again, husbands' risky family questionnaire score was a significant predictor of the acceleration of their cortisol level at the post-conflict measurement point, $\beta = .057$, $t = 2.253$, $p = .026$.

3.5.2.1 PRQC Subscales as Moderators

I also examined each PRQC subscale score (satisfaction, commitment, intimacy, trust, passion, love) and its interaction with risky family questionnaire score in predicting cortisol responses individually, for a total of six additional analyses. These models were identical to the previously described model that included mean PRQC score except each PRQC subscale score was substituted for the mean PRQC score. For example, to examine PRQC trust, each Level 2 equation included risky family questionnaire score, PRQC trust, and the interaction between the two. In each of the following analyses, husbands' risky family questionnaire score remained a significant predictor of the acceleration of their cortisol level at the post-conflict measurement point, so this finding will not be discussed in text. However, details of this relation can be found in the tables corresponding to each PRQC subscale analysis.

3.5.2.1.1 PRQC Satisfaction

The results of this analysis are described in Table 16 (husbands) and Table 17 (wives). PRQC satisfaction scores were not related to cortisol responses for husbands or for wives, all *p*s > .241. For wives, the interaction between PRQC satisfaction and risky family score on the rate of change in cortisol level at the post-conflict point was marginally significant, $\beta = .041$, $t = 1.730$, $p = .086$; this interaction is depicted in Figure 2. Otherwise, there were no significant interactions between risky family questionnaire score and PRQC satisfaction among husbands or wives, *p*s > .137.

3.5.2.1.2 PRQC Commitment

Table 18 provides the results of this analysis for husbands; Table 19 provides the results for wives. Among wives, PRQC commitment was negatively related to the post-conflict cortisol level, $\beta = -.091$, $t = -2.218$, $p = .028$, such that having a higher PRQC commitment score was associated with lower cortisol at the post-conflict measurement point. PRQC commitment was not associated with any other aspects of wives' cortisol trajectories, all *p*s > .139. Husbands' PRQC commitment scores showed no reliable association with their cortisol responses, all *p*s > .642. Among husbands, the interaction between risky family score and PRQC commitment showed a marginally significant association with the acceleration of their cortisol level at the post-conflict measurement point, β = -.099, t = -1.860, p = .065 (Figure 3). This interaction was not related to other aspects of the cortisol trajectory for husbands, all ps > .154. Among wives, the interaction between risky family score and PRQC commitment was not associated with cortisol, all ps > .297.

3.5.2.1.3 PRQC Intimacy

The results of this analysis are described in Table 20 (husbands) and Table 21 (wives). PRQC intimacy scores were not related to cortisol for husbands or wives, all ps > .296. Among wives, there was a marginally significant interaction between risky family score and PRQC intimacy on post-conflict cortisol level, β = -.088, t = -1.841, p = .068 (Figure 4). Consistent with the hypothesis, wives with higher RFQ scores who also reported higher PRQC intimacy had lower cortisol levels at the post-conflict measurement point than high RFQ wives reporting low intimacy. This interaction did not predict other aspects of wives' cortisol trajectory, all ps > .322. Among husbands, the interaction between risky family score and PRQC intimacy was not associated with cortisol, all ps > .186.

3.5.2.1.4 PRQC Trust

The results of this analysis are described in Table 22 (husbands) and Table 23 (wives). Wives' PRQC trust showed a marginally significant relationship with the acceleration of their cortisol level at the post-conflict measurement point, β = .034, t = 1.878, p = .063, but was unrelated to other aspects of the cortisol trajectory, ps > .161.

For husbands, PRQC trust was positively associated with their post-conflict cortisol level, $\beta = .086$, $t = 2.399$, $p = .018$, such that husbands with higher PRQC trust scores showed higher cortisol levels following the conflict. Husbands' PRQC trust was not associated with other aspects of the cortisol trajectory, *p*s > .485. The interaction between risky family score and PRQC trust was not related to cortisol for husbands or wives, all *p*s > .406.

3.5.2.1.5 PRQC Passion

Table 24 (husbands) and Table 25 (wives) display the results of this analysis. PRQC passion did not predict cortisol for husbands or wives, all *p*s > .145. Among wives, the interaction between risky family score and PRQC passion was not associated with cortisol, all *p*s > .240. However, among husbands, there was a significant interaction between risky family score and PRQC passion on post-conflict cortisol level, $\beta = -.089$, $t = -2.847$, $p = .005$. Contrary to the hypothesis, husbands reporting high RFQ and high PRQC passion exhibited higher cortisol levels at the post-conflict measurement point than husbands with high RFQ and low passion (Figure 5). This interaction did not predict other aspects the cortisol trajectory for husbands, *p*s > .475.

3.5.2.1.6 PRQC Love

The results of this analysis are described in Table 26 (husbands) and Table 27 (wives). Wives' PRQC love scores were not related to their cortisol, all *p*s > .100. Among husbands, PRQC love was positively associated with cortisol level after the conflict, $\beta = .103$, $t = 2.478$, $p = .015$, such that higher PRQC love scores were related to higher cortisol levels. PRQC love was not associated with other aspects of the cortisol trajectory for husbands, *p*s > .411. Among wives, the interaction between risky family score and PRQC love on post-conflict cortisol level was marginally significant, $\beta = -.173$, $t = -1.879$, $p = .063$. In line with the hypothesis, wives with higher RFQ scores and higher PRQC love had lower cortisol levels at the post-conflict measurement point than wives with high RFQ and low love (Figure 6). This interaction was not significant for other aspects of wives' cortisol trajectory, *p*s > .275. The interaction between risky family score and PRQC love was not associated with cortisol for husbands, all *p*s > .323.

3.6 Controlling for Neuroticism

As expected, risky family questionnaire scores were positively associated with neuroticism for both husbands ($r = .289$, $p = .001$) and wives ($r = .200$, $p = .023$); that is, higher scores on the risky family questionnaire were associated with higher neuroticism scores. To ensure that all findings in support of the hypotheses were indeed related to a risky family environment rather than to neuroticism, I controlled for neuroticism in all analyses that produced significant or marginally significant results. To do so, I added neuroticism scores to each model such that the wife's neuroticism score was entered as a predictor of each of the wife's parameters (i.e., intercept, linear term, quadratic term, cubic term), and the husband's score was entered as a predictor of each of his parameters. Including neuroticism did not alter the direction or significance of the effects reported above in any meaningful way, with one exception. The original analysis examining the effect of a risky family background, PRQC trust, and the interaction between the two on cortisol showed a marginally significant relationship between PRQC trust and the acceleration of cortisol at the post-conflict measurement point among wives, β = .034, t = 1.878, p = .063. However, controlling for neuroticism reduced this effect to non-significance, β = .024, t = 1.392, p = .166.

CHAPTER 4

DISCUSSION

4.1 Summary of Results

The present work examined two central questions. First, does growing up in an adverse early environment influence cortisol responses to a conflict with one's spouse? Second, given a link between early environment and cortisol, does having a supportive spouse or higher relationship satisfaction moderate this link? I hypothesized that individuals who grew up in an adverse early environment would show greater cortisol reactivity to a spousal conflict as well as slower recovery following the conflict. Specifically, I predicted that individuals who had higher scores on the risky family questionnaire and/or lower childhood SES would show higher cortisol levels following the spousal conflict interaction (i.e., at sample 3) and take longer to recover in the hour after the interaction than those with lower RFQ scores and/or higher childhood SES. An examination of risky family background, childhood SES, and cortisol reactivity over the course of a conflict with one's spouse provided limited support for this hypothesis. Namely, a risky family background was reliably associated with the acceleration of the cortisol trajectory during the conflict (i.e., at sample 3) among husbands. Otherwise, the risky family questionnaire scores were not associated with cortisol trajectory parameters among husbands or among wives. The results for childhood SES did not support the hypothesis either; childhood SES did not predict any aspect of husbands' or wives' cortisol trajectory.

I also predicted that individuals from a riskier family background who are paired with more supportive spouses will show less pronounced cortisol reactivity and quicker recovery than those with less supportive spouses. Following the literature on social support and health, I explored both received and perceived support by examining perceptions of spousal support providing during the interaction (received support) as well as more general feelings of relationship satisfaction (perceived support). To test this hypothesis, I ran a series of analyses testing the effects of a risky family background, spousal support (i.e., support received during the interaction and relationship satisfaction), and the interaction between the two on cortisol.

Contrary to the hypothesis, there were no significant interactions between risky family background and perceptions of received spousal support during the conflict on cortisol levels. Similarly, the interaction between risky family background and mean PRQC on cortisol did not produce any significant results. However, an examination of the PRQC subscales offered preliminary support for the hypothesis that having a more supportive spouse could lessen cortisol reactivity and speed recovery for those from a riskier family background. As expected, the results varied by gender, so findings will be described separately for husbands and wives.

Among wives, there were three marginally significant interactions between growing up in a risky family environment and aspects of relationship satisfaction on cortisol. First, the interaction between PRQC satisfaction and risky family score on the rate of change in cortisol level at the post-conflict point was marginally significant (Figure 2). Second, there was a marginally significant interaction between risky family score and PRQC intimacy on post-conflict cortisol level (Figure 4). In support of the hypothesis, wives who grew up in a riskier family environment and who reported higher intimacy in their relationship had lower cortisol levels at the post-conflict measurement point than wives from a risky family environment reporting low marital intimacy. Third, the marginally significant interaction between risky family score and PRQC love on post-conflict cortisol level corroborates the finding with PRQC intimacy; wives who grew up in a riskier family environment and reported more love in the relationship had lower cortisol levels at the post-conflict measurement point than wives from a risky family background who reported less love in their marriage (Figure 6).

Among husbands, the findings were less straightforward. There was a marginally significant interaction between risky family score and PRQC commitment on the acceleration of the cortisol trajectory at the post-conflict measurement point (Figure 3). In other words, the relationship between growing up in a risky family environment and the change in the rate of cortisol level over time may depend on perceptions of commitment in the marriage, but it is unclear exactly what role commitment plays. There was also a significant interaction between risky family score and PRQC passion on post-conflict cortisol level. However, contrary to the hypothesis, husbands who grew up in a riskier family environment and reported higher passion in their marriage exhibited higher cortisol levels (rather than the hypothesized lower levels) at the post-conflict measurement point than husbands from a risky family background who had low passion in their relationship (Figure 5).

Although the focus of this work was on the effects of growing up in an adverse family environment on physiological reactivity in the context of marriage and whether a supportive spouse could alter this relationship, it is worth noting that relationship satisfaction was associated with cortisol. Among wives, perceiving more commitment in the relationship was associated with lower cortisol at the post-conflict measurement point, while for husbands, perceiving more trust and love in the relationship were related to higher cortisol levels.

4.2 Limitations

There are a few limitations that must be addressed. First, the present work offers some support for the hypothesis that growing up in a risky family environment has enduring effects on physiological responses to marital conflict, at least among men, but the moderating effect of spousal support in the link between early environment and physiological stress responses was much more tenuous. It is notable that many of the hypothesized interactions were marginally significant, and one explanation may be that the couples in this sample were only recently married (6-7 months, at most). If an individual was exposed to an adverse family environment during all of childhood and adolescence, one might reasonably expect that having a highly supportive spouse for a short amount of time is not sufficient to counteract the enduring physiological effects of the early environment. Perhaps an examination of couples who have been married longer would yield clearer results.

Second, previous work notes that the effects of an adverse early environment are most pronounced when experienced at younger ages and for longer periods of time (e.g., Gunnar & Cheatham, 2003. The manner by which early environment was assessed in the present work (i.e., RFQ, childhood SES) did not allow collection of this information. Accounting for the age at which one was exposed to an adverse environment and the length of exposure will be important to include in future work on this topic; I imagine that experiencing a risky family environment at a younger age and for a longer period of time would produce more distinct physiological stress responses to marital conflict then were observed in the present work.

Finally, the method used to control for the effects of various medications was straightforward in both execution and interpretation, but another method might have been more appropriate to account for variance in cortisol responses. I tested whether different kinds of medications were related to cortisol and created a model based on a series of these analyses. However, medications have varying likelihoods of affecting salivary cortisol, so future studies with salivary cortisol as an outcome might take this into consideration. One might also account for the total number of medications taken as well as the particular combination of medications (Granger et al., 2009).

4.3 Summary and Conclusions

The present work sought to demonstrate a link between experiencing an adverse early environment and physiological functioning in response to marital stress in adulthood. In all, the findings suggest a very specific, yet reliable relationship between the two in predicting husbands' acceleration of the cortisol trajectory during the conflict. This work also examined whether received support (i.e., spousal support provided during the conflict) or more general perceived support (i.e., relationship satisfaction) might reduce the heightened physiological stress responses associated with a risky family background. Received support did not show any moderating effects, but analyses with relationship satisfaction suggested that particular aspects of relationship quality (i.e., satisfaction, intimacy, love, commitment, passion) may indeed moderate the effects of an adverse early environment on physiological stress responses to marital conflict, though these effects varied by gender and by the aspect of the cortisol trajectory examined.

Growing up in an adverse early environment is associated with a variety of negative health outcomes over the lifetime, both physical and psychological. That one's early environment can produce such lasting, negative effects makes it essential to discover protective or ameliorative factors. Moreover, the spousal relationship is arguably the most significant relationship in adulthood, and the present work serves as a first step in understanding the ways that this relationship can exacerbate or reduce the negative effects of early experience on physiological stress reactivity.

Table 1. Timing of saliva samples for cortisol assay.

Sample	Approximate time into study	Description
0	Set at 30 minutes before Sample 1	Home sample
1	45 min	Lab baseline
2	1 hr 30 min	Anticipatory
3	2 hr	10-minutes post-conflict
4	2 hr 30 min	30-minutes post-conflict
5	3 hr	60-minutes post-conflict

Table 2. Descriptive information for husbands' predictor variables.

	Mean	SD	Min	Max
Risky family	2.08	.65	1.00	4.00
Childhood SES	4.78	1.50	1.00	8.00
Support received	3.73	.87	1.20	5.00
PRQC total	6.27	.55	4.72	7.00
PRQC satisfaction	6.40	.66	4.00	7.00
PRQC commitment	6.74	.49	5.00	7.00
PRQC intimacy	6.14	.78	3.67	7.00
PRQC trust	6.53	.63	4.33	7.00
PRQC passion	5.16	1.22	1.00	7.00
PRQC love	6.65	.54	4.33	7.00

Note. Information in this table refers to true scores.

Table 3. Descriptive information for wives' predictor variables.

	Mean	SD	Min	Max
Risky family	2.18	.73	1.08	4.08
Childhood SES	4.77	1.63	1.00	8.00
Support received	3.82	.88	1.60	5.00
PRQC total	6.31	.56	4.00	7.00
PRQC satisfaction	6.39	.75	3.67	7.00
PRQC commitment	6.80	.46	4.00	7.00
PRQC intimacy	6.30	.73	3.00	7.00
PRQC trust	6.44	.78	3.33	7.00
PRQC passion	5.17	1.23	1.33	7.00
PRQC love	6.74	.49	4.00	7.00

Note. Information in this table refers to true scores.

Table 4. Correlations among husbands' predictor variables and cortisol scores.

	Childhood SES	Mean PRQC	Sample 1a	Sample 2	Sample 4	Sample 5	Sample 6	Home Sample
Risky family	-.160	-.060	.107	.097	.054	.027	.164	.195*
Childhood SES		.022	-.076	-.085	-.062	.019	-.108	-.131
Mean PRQC			.088	.120	.167	.036	.020	.018
Sample 1a				.848**	.755**	.715**	.580**	.389**
Sample 2					.868**	.850**	.712**	.460**
Sample 4						.850**	.705**	.526**
Sample 5							.757**	.501**
Sample 6								.562**

Note. * = $p < .05$. ** = $p < .01$.

Table 5. Correlations among wives' predictor variables and cortisol scores.

	Childhood SES	Mean PRQC	Sample 1a	Sample 2	Sample 4	Sample 5	Sample 6	Home Sample
Risky family	-.043	-.233**	-.017	-.025	-.084	-.020	.027	-.012
Childhood SES		.074	.097	.093	.014	.088	.050	-.047
Mean PRQC			-.804	-.044	-.090	-.101	-.094	-.054
Sample 1a				.833**	.754**	.722**	.634**	.360**
Sample 2					.820**	.812**	.731**	.246**
Sample 4						.887**	.784**	.290**
Sample 5							.850**	.326**
Sample 6								.221*

Note. * = p < .05. ** = p < .01.

Table 6. Linear model of growth in cortisol responses centered 10 minutes post-conflict.

Fixed Effect	Coefficient	*se*	*t Ratio*	
Husbands' mean cortisol level, β_1	-1.284	.026	-50.215	
Husbands' mean growth rate, β_2	-.109	.009	-12.566	
Wives' mean cortisol level, β_3	-1.275	.023	-54.312	
Wives' mean growth rate, β_4	-.082	.010	-7.979	
Random Effect	Variance Component	*df*	χ^2	*p value*
Husbands' cortisol level, γ_1	.079	124	3659.810	< .001
Husbands' growth rate, γ_2	.007	124	415.311	< .001
Wives' cortisol level, γ_3	.066	124	3187.776	< .001
Wives' growth rate, γ_4	.011	124	594.421	< .001
Level-1 error, *e*	.025			

Table 7. Quadratic model of growth in cortisol responses centered 10 minutes post-conflict.

Fixed Effect	Coefficient	*se*	*t Ratio*	
Husbands' mean cortisol level, β_1	-1.243	.028	-44.455	
Husbands' instantaneous growth rate, β_2	-.177	.014	-12.744	
Husbands' curvature of growth trajectory, β_3	-.072	.013	-5.716	
Wives' mean cortisol level, β_4	-1.256	.028	-45.435	
Wives' instantaneous growth rate, β_5	-.121	.013	-9.496	
Wives' curvature of growth trajectory, β_6	-.040	.012	-3.265	
Random Effect	Variance Component	*df*	χ^2	*p value*
Husbands' cortisol level, γ_1	.095	124	3968.967	< .001
Husbands' instantaneous growth rate, γ_3	.019	124	632.490	< .001
Husbands' curvature of growth trajectory, γ_5	.016	124	741.700	< .001
Wives' cortisol level, γ_2	.093	124	4034.327	< .001
Wives' instantaneous growth rate, γ_4	.015	124	523.893	< .001
Wives' curvature of growth trajectory, γ_6	.015	124	671.511	< .001
Level-1 error, *e*	.016			

Table 8. Cubic model of growth in cortisol responses centered 10 minutes post-conflict.

Fixed Effect	Coefficient	*se*	*t Ratio*	
Husbands' mean cortisol level, β_1	-1.285	.028	-46.697	
Husbands' instantaneous growth rate, β_2	-.263	.019	-13.905	
Husbands' instantaneous acceleration, β_3	.068	.018	3.830	
Husbands' curvature across trajectory, β_4	.111	.014	8.091	
Wives' mean cortisol level, β_5	-1.290	.027	-47.289	
Wives' instantaneous growth rate, β_6	-.190	.018	-10.442	
Wives' instantaneous acceleration, β_7	.074	.016	4.675	
Wives' curvature across trajectory, β_8	.090	.013	6.764	
Random Effect	Variance Component	*df*	χ^2	*p value*
Husbands' cortisol level, γ_1	.093	121	4553.696	< .001
Husbands' instantaneous growth rate, γ_2	.039	121	1026.680	< .001
Husbands' instantaneous acceleration, γ_3	.031	121	574.963	< .001
Husbands' curvature across trajectory, γ_4	.019	121	721.519	< .001
Wives' cortisol level, γ_5	.091	121	5135.743	< .001
Wives' instantaneous growth rate, γ_6	.036	121	866.337	< .001
Wives' instantaneous acceleration, γ_7	.023	121	443.296	< .001
Wives' curvature across trajectory, γ_8	.018	121	633.117	< .001
Level-1 error, *e*	.010			

Table 9. Final estimation of Level 2 medication controls (wives only).

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level post-conflict				
Intercept	-1.394	.032	-43.484 (122)	< .001
Wife hormonal contraceptive	.193	.036	5.345 (122)	< .001
Wife ADHD medication	.169	.040	4.192 (122)	< .001
Wife rate of change at post-conflict point				
Intercept	-.218	.021	-10.467 (123)	< .001
Wife hormonal contraceptive	.054	.018	2.949 (123)	.004
Wife acceleration at post-conflict point				
Intercept	.073	.016	4.646 (124)	< .001
Wife curvature across trajectory				
Intercept	.090	.013	6.748 (124)	< .001

Table 10. Final estimation of level 2 predictors of husbands' cortisol responses.

Predictor	Estimate	*SE*	*t (df)*	*p*
Husband cortisol level at post-conflict point				
Intercept	-1.286	.027	-46.773 (122)	< .001
Husband risky family background	-.022	.042	-.529 (122)	.598
Husband childhood SES	-.023	.036	-.644 (122)	.520
Husband rate of change at post-conflict point				
Intercept	-.263	.019	-13.966 (122)	< .001
Husband risky family background	.015	.030	.485 (122)	.629
Husband childhood SES	.020	.022	.893 (122)	.374
Husband acceleration at post-conflict point				
Intercept	.068	.017	3.895 (122)	< .001
Husband risky family background	.060	.026	2.321 (122)	.022
Husband childhood SES	.005	.018	.269 (122)	.788
Husband curvature across trajectory				
Intercept	.111	.014	8.127 (122)	< .001
Husband risky family background	.018	.023	.785 (122)	.434
Husband childhood SES	-.005	.016	-.321 (122)	.749

Table 11. Final estimation of level 2 predictors of wives' cortisol responses.

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level at post-conflict point				
Intercept	-1.399	.032	-44.390 (120)	< .001
Wife risky family background	.022	.039	.576 (120)	.566
Wife childhood SES	.045	.027	1.674 (120)	.097
Wife hormonal contraceptive	.202	.036	5.652 (120)	< .001
Wife ADHD medication	.165	.039	4.202 (120)	< .001
Wife rate of change at post-conflict point				
Intercept	-.221	.021	-10.517 (121)	< .001
Wife risky family background	.011	.032	.358 (121)	.721
Wife childhood SES	-.020	.022	-.905 (121)	.367
Wife hormonal contraceptive	.061	.020	3.131 (121)	.002
Wife acceleration at post-conflict point				
Intercept	.073	.016	4.651 (122)	< .001
Wife risky family background	.011	.028	.389 (122)	.698
Wife childhood SES	-.007	.018	-.373 (122)	.710
Wife curvature across trajectory				
Intercept	.090	.013	6.740 (122)	< .001
Wife risky family background	.009	.025	.370 (122)	.712

Wife childhood SES	.011	.015	.748 (122)	.456

Table 12. Final estimation of level 2 predictors of husbands' cortisol responses with received spousal support as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Husband cortisol level at post-conflict point				
Intercept	-1.285	.027	-47.406 (121)	< .001
Husband risky family background	-.012	.038	-.313 (121)	.755
Husband perception of wife support	.029	.091	.316 (121)	.753
Husband RFQ * perception of wife support	.017	.042	.416 (121)	.678
Husband rate of change at post-conflict point				
Intercept	-.265	.019	-14.077 (121)	< .001
Husband risky family background	.011	.029	.375 (121)	.708
Husband perception of wife support	.082	.078	1.059 (121)	.292
Husband RFQ * perception of wife support	-.042	.036	-1.165 (121)	.246
Husband acceleration at post-conflict point				
Intercept	.067	.018	3.794 (121)	< .001
Husband risky family background	.063	.024	2.590 (121)	.011
Husband perception of wife support	.030	.070	.421 (121)	.675
Husband RFQ * perception of wife	-.009	.032	-.264 (121)	.793

support				
Husband curvature across trajectory				
Intercept	.112	.014	8.147 (121)	< .001
Husband risky family background	.020	.023	.894 (121)	.373
Husband perception of wife support	-.044	.057	-.765 (121)	.446
Husband RFQ * perception of wife support	.028	.028	1.012 (121)	.313

Table 13. Final estimation of level 2 predictors of wives cortisol responses with received spousal support as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level at post-conflict point				
Intercept	-1.396	.031	-45.080 (119)	< .001
Wife risky family background	.025	.036	.708 (119)	.480
Wife perception of husband support	.019	.084	.230 (119)	.818
Wife RFQ * perception of husband support	.014	.036	.388 (119)	.699
Wife hormonal contraceptive	.201	.037	5.477 (119)	< .001
Wife ADHD medication	.155	.041	3.803 (119)	< .001
Wife rate of change at post-conflict point				
Intercept	-.220	.021	-10.682 (120)	< .001
Wife risky family background	.013	.028	.486 (120)	.628
Wife perception of husband support	-.032	.057	-.559 (120)	.577
Wife RFQ * perception of husband support	.020	.026	.744 (120)	.458
Wife hormonal contraceptive	.063	.018	3.411 (120)	< .001
Wife acceleration at post-conflict point				
Intercept	.072	.016	4.604 (121)	< .001
Wife risky family background	.006	.023	.261 (121)	.794
Wife perception of husband support	.023	.060	.378 (121)	.706
Wife RFQ * perception of husband	-.018	.027	-.683 (121)	.496

support				
Wife curvature across trajectory				
Intercept	.089	.013	6.645 (121)	< .001
Wife risky family background	.006	.021	.283 (121)	.777
Wife perception of husband support	.029	.043	.679 (121)	.498
Wife RFQ * perception of husband support	-.015	.018	-.832 (121)	.407

Table 14. Final estimation of level 2 predictors of husbands' cortisol responses with mean PRQC as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Husband cortisol level at post-conflict point				
Intercept	-1.289	.028	-46.871 (121)	< .001
Husband risky family background	-.008	.039	-.211 (121)	.833
Husband PRQC	.072	.043	1.673 (121)	.097
Husband RFQ * PRQC	-.089	.068	-1.313 (121)	.192
Husband rate of change at post-conflict point				
Intercept	-.265	.019	-14.012 (121)	< .001
Husband risky family background	.006	.029	.213 (121)	.831
Husband PRQC	-.017	.038	-.457 (121)	.649
Husband RFQ * PRQC	-.039	.067	-.588 (121)	.558
Husband acceleration at post-conflict point				
Intercept	.067	.018	3.754 (121)	< .001
Husband risky family background	.057	.025	2.253 (121)	.026
Husband PRQC	.006	.033	.179 (121)	.858
Husband RFQ * PRQC	-.023	.051	-.452 (121)	.652
Husband curvature across trajectory				
Intercept	.111	.014	7.996 (121)	< .001

Husband risky family background	.021	.023	.927 (121)	.356
Husband PRQC	.020	.030	.671 (121)	.504
Husband RFQ * PRQC	.014	.053	.259 (121)	.796

Table 15. Final estimation of level 2 predictors of wives' cortisol responses with mean PRQC as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level at post-conflict point				
Intercept	-1.398	.031	-44.454 (119)	< .001
Wife risky family background	.007	.035	.198 (119)	.844
Wife PRQC	-.054	.040	-1.385 (119)	.169
Wife RFQ * PRQC	-.031	.061	-.510 (119)	.611
Wife hormonal contraceptive	.199	.035	5.660 (119)	< .001
Wife ADHD medication	.172	.040	4.307 (119)	< .001
Wife rate of change at post-conflict point				
Intercept	-.219	.021	-10.659 (120)	< .001
Wife risky family background	.008	.028	.290 (120)	.772
Wife PRQC	-.021	.028	-.721 (120)	.472
Wife RFQ * PRQC	.018	.046	.393 (120)	.695
Wife hormonal contraceptive	.061	.019	3.130 (120)	.002
Wife acceleration at post-conflict point				
Intercept	.073	.016	4.566 (121)	< .001
Wife risky family background	.015	.025	.601 (121)	.549
Wife PRQC	.025	.021	1.198 (121)	.233
Wife RFQ * PRQC	-.003	.033	-.082 (121)	.935
Wife curvature across trajectory				
Intercept	.088	.014	6.513 (121)	< .001

Wife risky family background	.011	.021	.518 (121)	.606
Wife PRQC	.020	.020	.978 (121)	.330
Wife RFQ * PRQC	-.016	.035	-.461 (121)	.645

Table 16. Final estimation of level 2 predictors of husbands' cortisol responses with PRQC satisfaction as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Husband cortisol level at post-conflict point				
Intercept	-1.288	.027	-47.200 (121)	< .001
Husband risky family background	-.007	.038	-.195 (121)	.846
Husband PRQC satisfaction	.044	.037	1.178 (121)	.241
Husband RFQ * PRQC satisfaction	-.091	.068	-1.339 (121)	.183
Husband rate of change at post-conflict point				
Intercept	-.263	.019	-14.022 (121)	< .001
Husband risky family background	.005	.030	.154 (121)	.878
Husband PRQC satisfaction	-.022	.029	-.758 (121)	.450
Husband RFQ * PRQC satisfaction	.008	.054	.142 (121)	.887
Husband acceleration at post-conflict point				
Intercept	.067	.017	3.863 (121)	< .001
Husband risky family background	.056	.025	2.221 (121)	.028
Husband PRQC satisfaction	-.018	.025	-.731 (121)	.466
Husband RFQ * PRQC satisfaction	<.001	.042	.002 (121)	.998
Husband curvature across trajectory				
Intercept	.111	.014	8.112 (121)	< .001

Husband risky family background	.020	.023	.862 (121)	.391
Husband PRQC satisfaction	.003	.021	.143 (121)	.887
Husband RFQ * PRQC satisfaction	.009	.040	.229 (121)	.819

Table 17. Final estimation of level 2 predictors of wives' cortisol responses with PRQC satisfaction as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level at post-conflict point				
Intercept	-1.399	.032	-44.176 (119)	< .001
Wife risky family background	.012	.035	.337 (119)	.736
Wife PRQC satisfaction	-.004	.031	-.117 (119)	.907
Wife RFQ * PRQC satisfaction	-.015	.047	-.308 (119)	.758
Wife hormonal contraceptive	.203	.036	5.692 (119)	< .001
Wife ADHD medication	.156	.042	3.728 (119)	< .001
Wife rate of change at post-conflict point				
Intercept	-.218	.021	-10.570 (120)	< .001
Wife risky family background	.009	.027	.325 (120)	.746
Wife PRQC satisfaction	-.015	.020	-.758 (120)	.450
Wife RFQ * PRQC satisfaction	.041	.023	1.730 (120)	.086
Wife hormonal contraceptive	.062	.019	3.278 (120)	.001
Wife acceleration at post-conflict point				
Intercept	.072	.016	4.478 (121)	< .001
Wife risky family background	.013	.025	.543 (121)	.588
Wife PRQC satisfaction	.006	.020	.289 (121)	.773
Wife RFQ * PRQC satisfaction	-.015	.030	-.496 (121)	.620
Wife curvature across trajectory				
Intercept	.087	.014	6.430 (121)	< .001

Wife risky family background	.011	.021	.541 (121)	.589
Wife PRQC satisfaction	.017	.017	1.011 (121)	.314
Wife RFQ * PRQC satisfaction	-.032	.021	-1.495 (121)	.137

Table 18. Final estimation of level 2 predictors of husbands' cortisol responses – PRQC commitment as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Husband cortisol level at post-conflict point				
Intercept	-1.281	.028	-45.576 (121)	< .001
Husband risky family background	-.031	.039	-.788 (121)	.432
Husband PRQC commitment	-.023	.054	-.423 (121)	.673
Husband RFQ * PRQC commitment	.159	.111	1.435 (121)	.154
Husband rate of change at post-conflict point				
Intercept	-.264	.019	-13.939 (121)	< .001
Husband risky family background	.009	.034	.258 (121)	.797
Husband PRQC commitment	.009	.046	.186 (121)	.852
Husband RFQ * PRQC commitment	-.004	.110	-.034 (121)	.973
Husband acceleration at post-conflict point				
Intercept	.065	.017	3.707 (121)	< .001
Husband risky family background	.064	.024	2.690 (121)	.008
Husband PRQC commitment	.018	.038	.466 (121)	.642
Husband RFQ * PRQC commitment	-.099	.053	-1.860 (121)	.065
Husband curvature across trajectory				
Intercept	.111	.014	8.029 (121)	< .001

Husband risky family background	.021	.024	.868 (121)	.387
Husband PRQC commitment	.013	.029	.456 (121)	.649
Husband RFQ * PRQC commitment	-.009	.063	-.140 (121)	.889

Table 19. Final estimation of level 2 predictors of wives' cortisol responses – PRQC commitment as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level at post-conflict point				
Intercept	-1.340	.032	-43.524 (119)	< .001
Wife risky family background	.010	.035	.296 (119)	.768
Wife PRQC commitment	-.091	.041	-2.218 (119)	.028
Wife RFQ * PRQC commitment	.040	.093	.428 (119)	.669
Wife hormonal contraceptive	.208	.037	5.630 (119)	< .001
Wife ADHD medication	.160	.043	3.702 (119)	< .001
Wife rate of change at post-conflict point				
Intercept	-.227	.021	-11.045 (120)	< .001
Wife risky family background	.011	.028	.391 (120)	.696
Wife PRQC commitment	-.042	.028	-1.488 (120)	.139
Wife RFQ * PRQC commitment	-.075	.072	-1.048 (120)	.297
Wife hormonal contraceptive	.068	.019	3.678 (120)	< .001
Wife acceleration at post-conflict point				
Intercept	.073	.016	4.692 (121)	< .001
Wife risky family background	.012	.024	.475 (121)	.635
Wife PRQC commitment	.017	.026	.667 (121)	.506
Wife RFQ * PRQC commitment	.012	.063	.187 (121)	.852
Wife curvature across trajectory				
Intercept	.090	.014	6.681 (121)	< .001

Wife risky family background	.008	.020	.410 (121)	.682
Wife PRQC commitment	.008	.018	.415 (121)	.679
Wife RFQ * PRQC commitment	.026	.035	.748 (121)	.456

Table 20. Final estimation of level 2 predictors of husbands' cortisol responses with PRQC intimacy as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Husband cortisol level at post-conflict point				
Intercept	-1.287	.028	-46.605 (121)	< .001
Husband risky family background	-.014	.039	-.369 (121)	.713
Husband PRQC intimacy	.035	.033	1.049 (121)	.296
Husband RFQ * PRQC intimacy	-.020	.038	-.520 (121)	.604
Husband rate of change at post-conflict point				
Intercept	-.264	.019	-13.980 (121)	< .001
Husband risky family background	.007	.028	.254 (121)	.800
Husband PRQC intimacy	-.010	.028	-.366 (121)	.715
Husband RFQ * PRQC intimacy	-.048	.036	-1.331 (121)	.186
Husband acceleration at post-conflict point				
Intercept	.067	.018	3.794 (121)	< .001
Husband risky family background	.056	.025	2.247 (121)	.026
Husband PRQC intimacy	.010	.025	.394 (121)	.694
Husband RFQ * PRQC intimacy	-.008	.029	-.286 (121)	.775
Husband curvature across trajectory				
Intercept	.111	.014	8.086 (121)	< .001

Husband risky family background	.020	.022	.902 (121)	.369
Husband PRQC intimacy	.019	.022	.893 (121)	.374
Husband RFQ * PRQC intimacy	.022	.029	.759 (121)	.449

Table 21. Final estimation of level 2 predictors of wives' cortisol responses with PRQC intimacy as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level at post-conflict point				
Intercept	-1.400	.031	-45.094 (119)	< .001
Wife risky family background	.009	.035	.244 (119)	.808
Wife PRQC intimacy	-.038	.038	-1.050 (119)	.296
Wife RFQ * PRQC intimacy	-.088	.048	-1.841 (119)	.068
Wife hormonal contraceptive	.199	.035	5.386 (119)	< .001
Wife ADHD medication	.191	.039	4.947 (119)	< .001
Wife rate of change at post-conflict point				
Intercept	-.218	.021	-10.231 (120)	< .001
Wife risky family background	.005	.029	.176 (120)	.860
Wife PRQC intimacy	-.026	.025	-1.037 (120)	.302
Wife RFQ * PRQC intimacy	.035	.035	.995 (120)	.322
Wife hormonal contraceptive	.063	.019	3.311 (120)	< .001
Wife acceleration at post-conflict point				
Intercept	.075	.017	4.465 (121)	< .001
Wife risky family background	.014	.025	.563 (121)	.575
Wife PRQC intimacy	.016	.021	.775 (121)	.440
Wife RFQ * PRQC intimacy	.022	.031	.694 (121)	.489
Wife curvature across trajectory				
Intercept	.088	.014	6.184 (121)	< .001

Wife risky family background	.013	.022	.567 (121)	.572
Wife PRQC intimacy	.019	.019	1.014 (121)	.313
Wife RFQ * PRQC intimacy	-.008	.029	-.272 (121)	.786

Table 22. Final estimation of level 2 predictors of husbands' cortisol responses with PRQC trust as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Husband cortisol level at post-conflict point				
Intercept	-1.286	.028	-46.469 (121)	< .001
Husband risky family background	-.002	.039	-.049 (121)	.961
Husband PRQC trust	.086	.036	2.399 (121)	.018
Husband RFQ * PRQC trust	-.023	.050	-.469 (121)	.640
Husband rate of change at post-conflict point				
Intercept	-.266	.019	-14.170 (121)	< .001
Husband risky family background	.004	.028	.152 (121)	.879
Husband PRQC trust	-.020	.028	-.700 (121)	.485
Husband RFQ * PRQC trust	-.039	.046	-.834 (121)	.406
Husband acceleration at post-conflict point				
Intercept	.065	.018	3.691 (121)	< .001
Husband risky family background	.051	.026	1.983 (121)	.050
Husband PRQC trust	-.024	.026	-.923 (121)	.358
Husband RFQ * PRQC trust	-.026	.034	-.787 (121)	.433
Husband curvature across trajectory				
Intercept	.111	.014	7.921 (121)	< .001

Husband risky family background	.020	.023	.849 (121)	.398
Husband PRQC trust	.006	.022	.283 (121)	.777
Husband RFQ * PRQC trust	.007	.032	.230 (121)	.819

Table 23. Final estimation of level 2 predictors of wives' cortisol responses with PRQC trust as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level at post-conflict point				
Intercept	-1.396	.032	-43.495 (119)	< .001
Wife risky family background	.021	.035	.592 (119)	.555
Wife PRQC trust	-.001	.033	-.019 (119)	.985
Wife RFQ * PRQC trust	-.029	.049	-.599 (119)	.551
Wife hormonal contraceptive	.196	.036	5.386 (119)	< .001
Wife ADHD medication	.153	.084	1.830 (119)	.070
Wife rate of change at post-conflict point				
Intercept	-.220	.020	-10.921 (120)	< .001
Wife risky family background	.011	.025	.423 (120)	.673
Wife PRQC trust	-.013	.024	-.528 (120)	.598
Wife RFQ * PRQC trust	-.022	.036	-.598 (120)	.551
Wife hormonal contraceptive	.059	.018	3.202 (120)	.002
Wife acceleration at post-conflict point				
Intercept	.072	.016	4.625 (121)	< .001
Wife risky family background	.013	.022	.576 (121)	.566
Wife PRQC trust	.034	.021	1.633 (121)	.105
Wife RFQ * PRQC trust	-.005	.031	-.153 (121)	.878
Wife curvature across trajectory				
Intercept	.089	.013	6.720 (121)	< .001

Wife risky family background	.010	.029	.541 (121)	.590
Wife PRQC trust	.025	.018	1.402 (121)	.163
Wife RFQ * PRQC trust	-.006	.026	-.217 (121)	.829

Table 24. Final estimation of level 2 predictors of husbands' cortisol responses with PRQC passion as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Husband cortisol level at post-conflict point				
Intercept	-1.287	.027	-47.698 (121)	< .001
Husband risky family background	-.020	.036	-.562 (121)	.575
Husband PRQC passion	.017	.021	.820 (121)	.414
Husband RFQ * PRQC passion	-.089	.031	-2.847 (121)	.005
Husband rate of change at post-conflict point				
Intercept	-.264	.019	-13.983 (121)	< .001
Husband risky family background	.007	.029	.242 (121)	.809
Husband PRQC passion	-.002	.018	-.087 (121)	.931
Husband RFQ * PRQC passion	-.017	.023	-.716 (121)	.475
Husband acceleration at post-conflict point				
Intercept	.068	.017	3.881 (121)	< .001
Husband risky family background	.057	.025	2.261 (121)	.026
Husband PRQC passion	.011	.015	.754 (121)	.453
Husband RFQ * PRQC passion	.006	.021	.287 (121)	.775
Husband curvature across trajectory				
Intercept	.111	.014	8.109 (121)	< .001

Husband risky family background	.020	.023	.865 (121)	.389
Husband PRQC passion	.006	.013	.492 (121)	.624
Husband RFQ * PRQC passion	.004	.018	.229 (121)	.819

Table 25. Final estimation of level 2 predictors of wives' cortisol responses with PRQC passion as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level at post-conflict point				
Intercept	-1.394	.032	-44.128 (119)	< .001
Wife risky family background	.011	.036	.297 (119)	.767
Wife PRQC passion	-.031	.021	-1.469 (119)	.145
Wife RFQ * PRQC passion	.028	.024	1.181 (119)	.240
Wife hormonal contraceptive	.201	.037	5.461 (119)	< .001
Wife ADHD medication	.174	.044	3.967 (119)	< .001
Wife rate of change at post-conflict point				
Intercept	-.221	.020	-11.092 (120)	< .001
Wife risky family background	.014	.026	.543 (120)	.588
Wife PRQC passion	.003	.015	.231 (120)	.818
Wife RFQ * PRQC passion	.007	.022	.305 (120)	.761
Wife hormonal contraceptive	.063	.019	3.285 (120)	.001
Wife acceleration at post-conflict point				
Intercept	.072	.016	4.594 (121)	< .001
Wife risky family background	.009	.023	.412 (121)	.681
Wife PRQC passion	.006	.011	.559 (121)	.577
Wife RFQ * PRQC passion	-.009	.016	-.603 (121)	.548
Wife curvature across trajectory				
Intercept	.089	.013	6.811 (121)	< .001

Wife risky family background	.006	.020	.299 (121)	.766
Wife PRQC passion	-.001	.010	-.072 (121)	.943
Wife RFQ * PRQC passion	-.004	.016	-.246 (121)	.806

Table 26. Final estimation of level 2 predictors of husbands' cortisol responses with PRQC love as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Husband cortisol level at post-conflict point				
Intercept	-1.284	.027	-46.983 (121)	< .001
Husband risky family background	< .001	.039	.008 (121)	.993
Husband PRQC love	.103	.041	2.478 (121)	.015
Husband RFQ * PRQC love	.068	.068	.992 (121)	.323
Husband rate of change at post-conflict point				
Intercept	-.260	.019	-13.893 (121)	< .001
Husband risky family background	.005	.029	.188 (121)	.851
Husband PRQC love	-.025	.036	-.675 (121)	.501
Husband RFQ * PRQC love	.053	.081	.651 (121)	.516
Husband acceleration at post-conflict point				
Intercept	.064	.017	3.693 (121)	< .001
Husband risky family background	.056	.025	2.198 (121)	.030
Husband PRQC love	.010	.037	.270 (121)	.788
Husband RFQ * PRQC love	-.056	.057	-.973 (121)	.332
Husband curvature across trajectory				
Intercept	.109	.014	7.781 (121)	< .001

Husband risky family background	.021	.023	.935 (121)	.352
Husband PRQC love	.026	.032	.825 (121)	.411
Husband RFQ * PRQC love	-.027	.064	-.427 (121)	.670

Table 27. Final estimation of level 2 predictors of wives' cortisol responses with PRQC love as moderator.

Predictor	Estimate	*SE*	*t (df)*	*p*
Wife cortisol level at post-conflict point				
Intercept	-1.402	.032	-43.855 (119)	< .001
Wife risky family background	.026	.034	.756 (119)	.451
Wife PRQC love	-.083	.050	-1.658 (119)	.100
Wife RFQ * PRQC love	-.173	.092	-1.879 (119)	.063
Wife hormonal contraceptive	.206	.035	5.820 (119)	< .001
Wife ADHD medication	.198	.044	4.542 (119)	< .001
Wife rate of change at post-conflict point				
Intercept	-.222	.021	-10.654 (120)	< .001
Wife risky family background	.011	.027	.408 (120)	.684
Wife PRQC love	-.044	.030	-1.470 (120)	.144
Wife RFQ * PRQC love	-.051	.068	-.749 (120)	.455
Wife hormonal contraceptive	.063	.019	3.331 (120)	.001
Wife acceleration at post-conflict point				
Intercept	.073	.016	4.644 (121)	< .001
Wife risky family background	.009	.024	.376 (121)	.707
Wife PRQC love	.014	.027	.494 (121)	.622
Wife RFQ * PRQC love	.060	.055	1.096 (121)	.275
Wife curvature across trajectory				
Intercept	.089	.013	6.722 (121)	< .001

Wife risky family background	.008	.020	.439 (121)	.661
Wife PRQC love	.019	.024	.813 (121)	.418
Wife RFQ * PRQC love	.025	.045	.552 (121)	.582

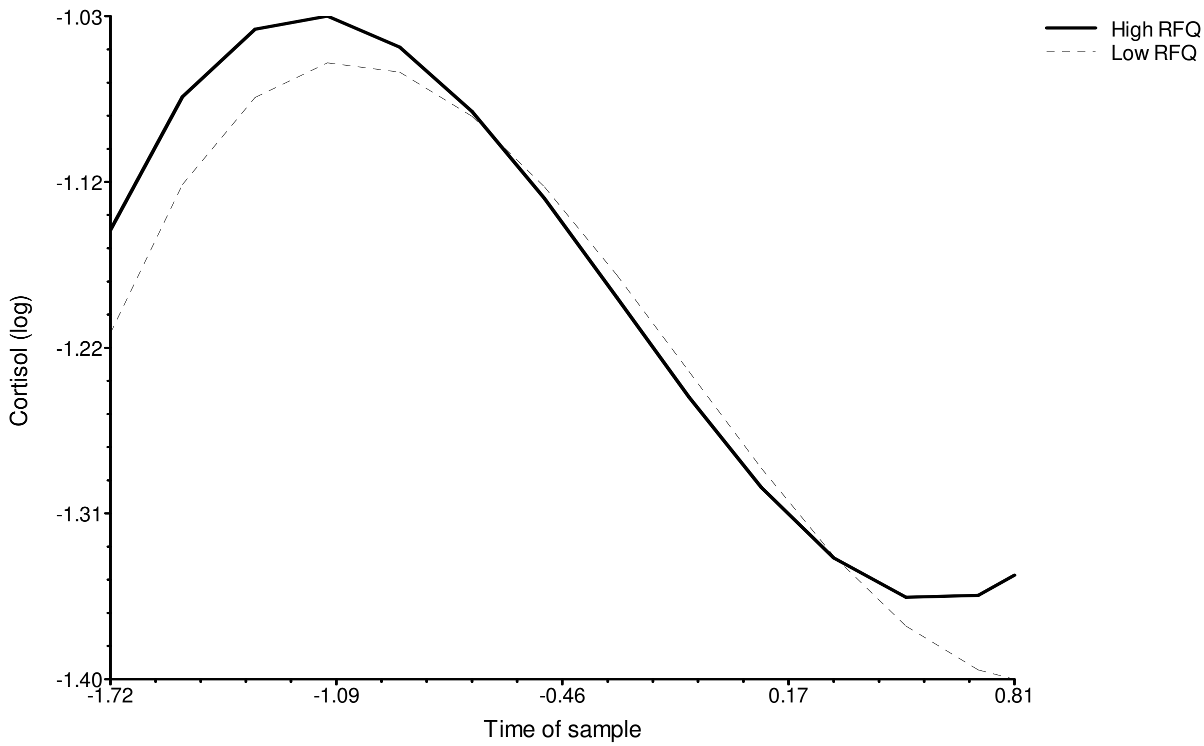

Figure 1. Husbands' cortisol levels over time (centered at post-conflict sample) by Risky Family Questionnaire (RFQ) scores.

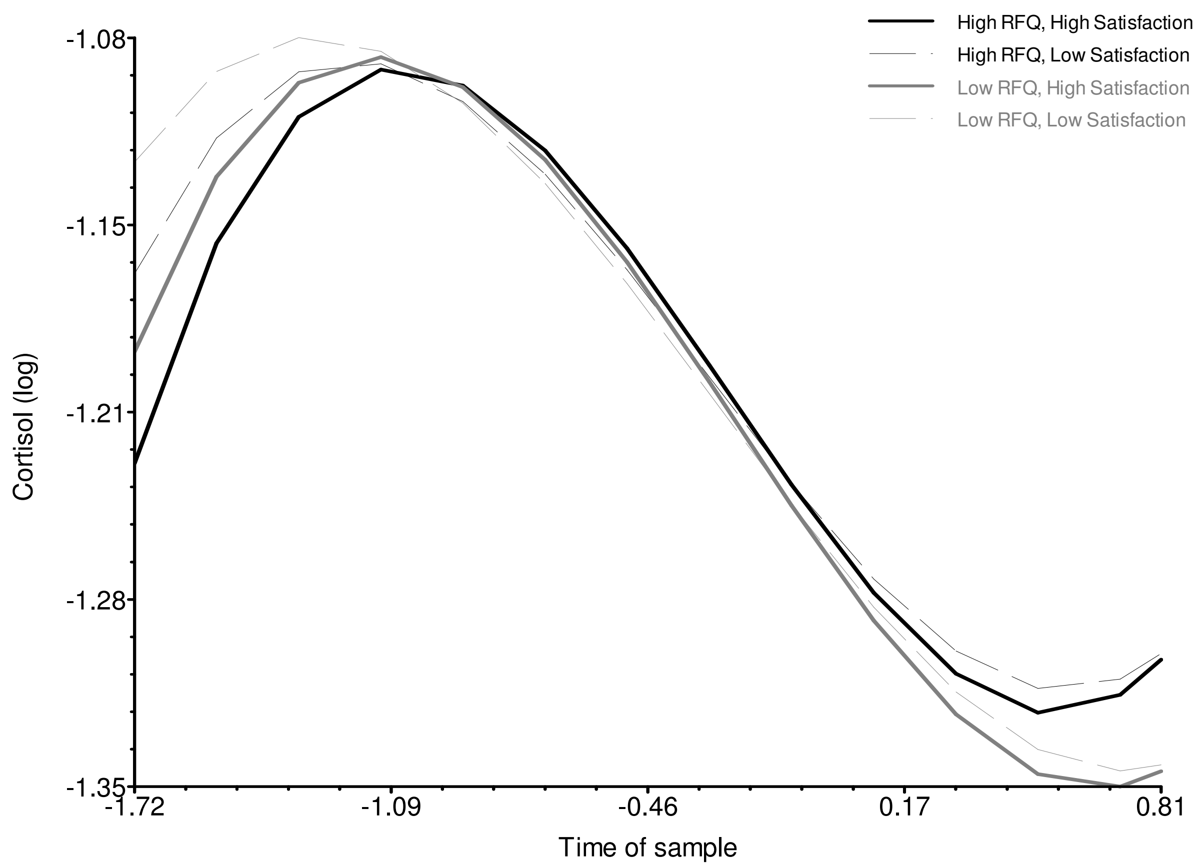

Figure 2. Wives' cortisol levels over time (centered at post-conflict sample) by Risky Family Questionnaire (RFQ) and PRQC satisfaction scores.

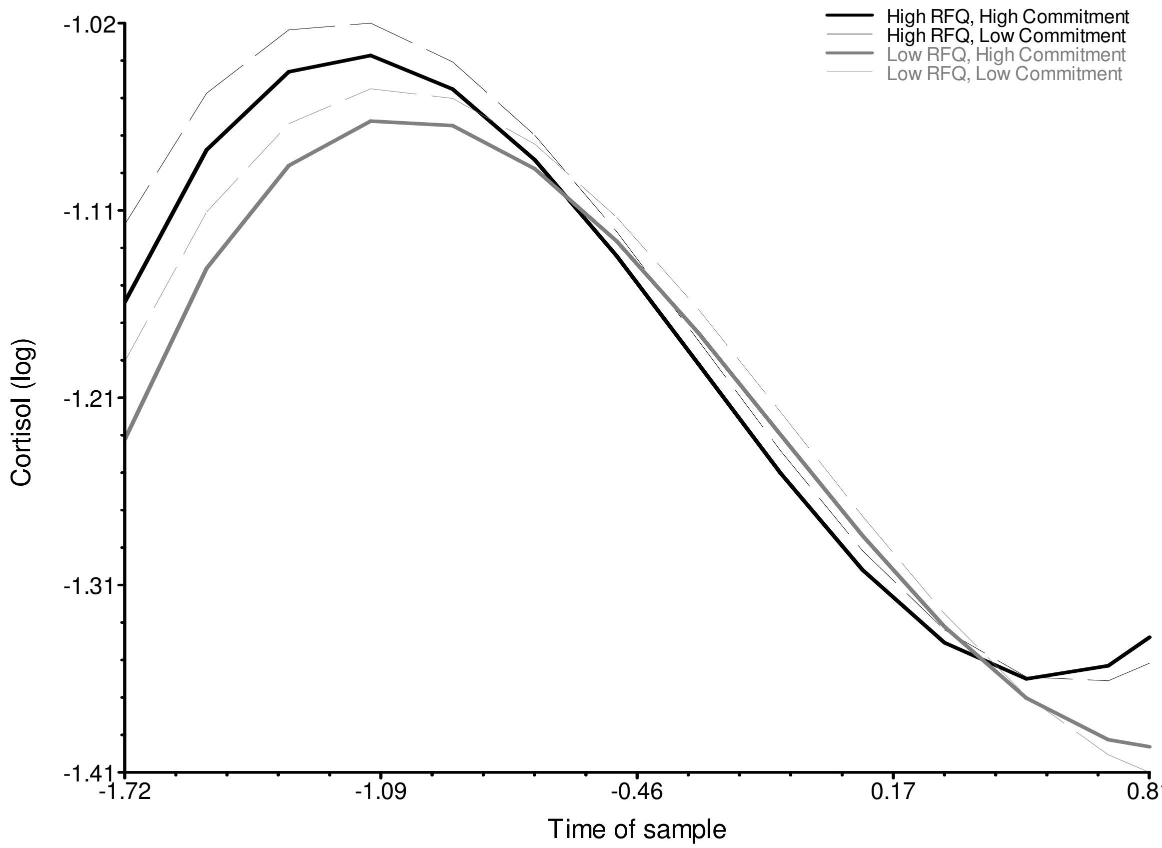

Figure 3. Husbands' cortisol levels over time (centered at post-conflict sample) by Risky Family Questionnaire (RFQ) and PRQC commitment scores.

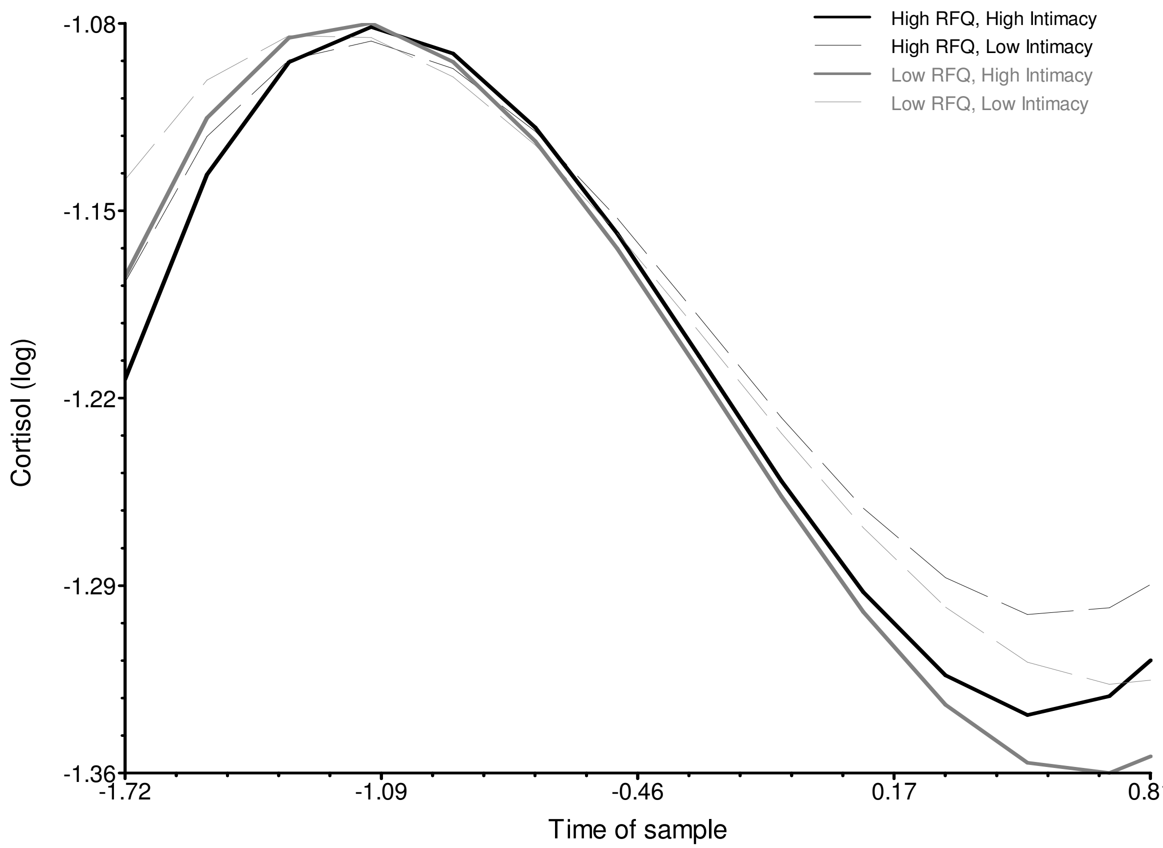

Figure 4. Wives' cortisol levels over time (centered at post-conflict sample) by Risky Family Questionnaire (RFQ) and PRQC intimacy scores.

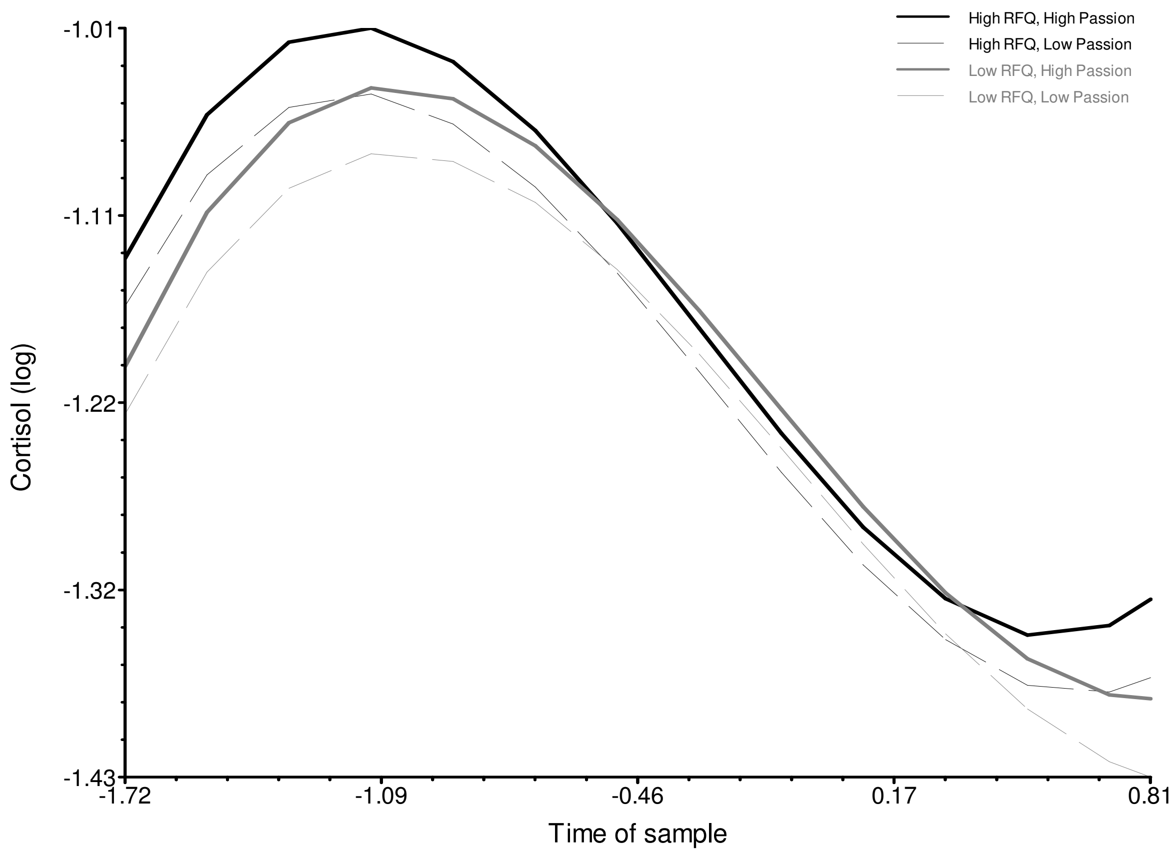

Figure 5. Husbands' cortisol levels over time (centered at post-conflict sample) by Risky Family Questionnaire (RFQ) and PRQC passion scores.

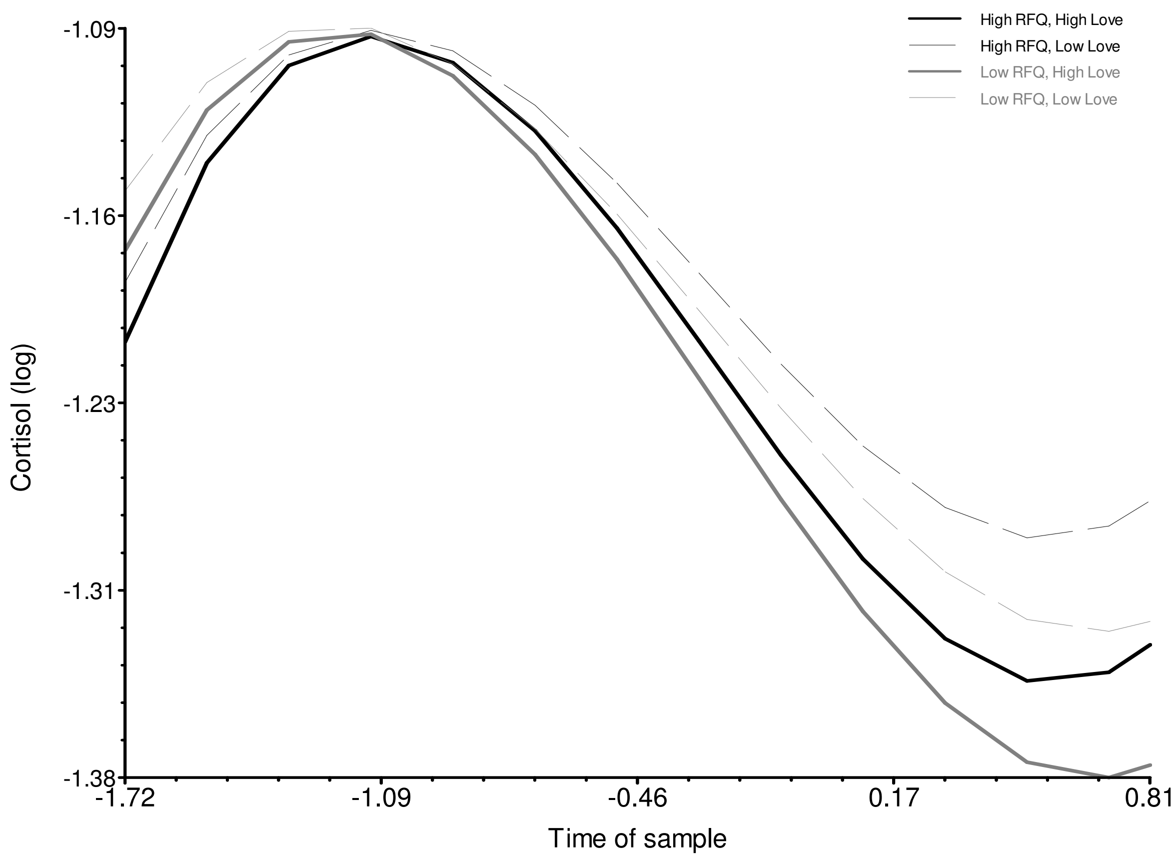

Figure 6. Wives' cortisol levels over time (centered at post-conflict sample) by Risky Family Questionnaire (RFQ) and PRQC love scores.

APPENDIX A

RISKY FAMILY QUESTIONNAIRE ITEMS

1. How often did a parent or other adult in the household make you feel that you were loved, supported, and cared for?
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?
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?
4. How often did a parent or other adult in the household push, grab, shove, or slap you?
5. In your childhood, did you live with anyone who was a problem drinker or alcoholic, or who used street drugs?
6. Would you say that the household you grew up in was well-organized and well-managed?
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?
8. How often would you say there was quarreling, arguing, or shouting between your parents?
9. How often would you say there was quarreling, arguing, or shouting between a parent and you?
10. How often would you say there was quarreling, arguing, or shouting between a parent and one of your siblings?
11. How often would you say there was quarreling, arguing, or shouting between your sibling(s) and you?
12. Would you say the household you grew up in was chaotic and disorganized?

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

APPENDIX B

PERCEIVED RELATIONSHIP QUALITY COMPONENTS SCALE ITEMS

Relationship Satisfaction

1. How satisfied are you with your relationship?

2. How content are you with your relationship?

3. How happy are you with your relationship?

Commitment

4. How committed are you to your relationship?

5. How dedicated are you to your relationship?

6. How devoted are you to your relationship?

Intimacy

7. How intimate is your relationship?

8. How close is your relationship?

9. How connected are you to your partner?

Trust

10. How much do you trust your partner?

11. How much can you count on your partner?

12. How dependable is your partner?

Passion

13. How passionate is your relationship?

14. How lustful is your relationship?

15. How sexually intense is your relationship?

Love

16. How much do you love your partner?

17. How much do you adore your partner?

18. How much do you cherish your partner?

BIBLIOGRAPHY

Bakermans-Kranenburg, M. J., Van Ijzendoorn, M. H., Mesman, J., Alink, L. R. A., & Juffer, F. (2008). Effects of an attachment-based intervention on daily cortisol moderated by dopamine receptor D4: A randomized control trial. *Development and Psychopathology, 20*, 805-820.

Brooks, K. P., Robles, T. F., & Schetter, C. D. (2011). Adult attachment and cortisol responses to discussions with a romantic partner. *Personal Relationships, 18*, 302-320.

Champagne, F. A. & Meaney, M. J. (2006). Stress during gestation alters postpartum maternal care and the development of the offspring in a rodent model. *Biological Psychiatry, 59*, 1227-1235.

Clark, M. S. & Lemay, E. P. (2010). Close relationships. In S. T. Fiske, D. T. Gilbert & G. Lindzey (Eds.) *Handbook of social psychology* (pp. 898-940). Hoboken, N. J.: Wiley.

Collins, N. L. & Feeney, B. C. (2000). A safe haven: An attachment theory perspective on support seeking and caregiving in intimate relationships. *Journal of Personality and Social Psychology, 78*, 1053-1073.

Emery, R. E. (1982). Interparental conflict and the children of discord and divorce. *Psychological Bulletin, 92*, 310-330.

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Apitz, A. M., Edwards, V., et al. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine, 14*, 245-258.

Fletcher, G. J. O., Simpson, J. A., & Thomas, G. (2000). The measurement of perceived relationship quality components: A confirmatory factor analytic approach. *Personality and Social Psychology Bulletin, 26*, 340-354.

Goldberg, L. R. (1999). A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality Psychology in Europe*, Vol. 7 (pp. 7-28). Tilburg, The Netherlands: Tilburg University Press.

Granger, D. A., Hibel, L. C., Fortunato, C. K., & Kapelewski, C. H. (2009). Medication effects on salivary cortisol: Tactics and strategy to minimize impact in behavioral and developmental science. *Psychoneuroendocrinology, 34*, 1437-1448.

Grych, J. H. & Fincham, F. D. (1990). Marital conflict and children's adjustment: A cognitive-contextual framework. *Psychological Bulletin, 108*, 267-290.

Gunnar, M. R. & Cheatham, C. L. (2003). Brain and behavior interface: Stress and the developing brain. *Infant Mental Health Journal, 24*, 195-211.

Heffner, K. L., Kiecolt-Glaser, J. K., Loving, T. J., Glaser, R., & Malarkey, W. B. (2004). Spousal support satisfaction as a modifier of physiological responses to marital conflict in younger and older couples. *Journal of Behavioral Medicine, 27*, 233-254.

International Personality Item Pool: A Scientific Collaboratory for the Development of Advanced Measures of Personality Traits and Other Individual Differences (2012). From http://ipip.ori.org/

Kiecolt-Glaser, J. K. & Newton, T. L. (2001). Marriage and health: His and hers. *Psychological Bulletin, 127*, 474-503.

Kirschbaum, C., Pirke, K., & Hellhammer, D. H. (1993). The "Trier Social Stress Test": A tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology, 28*, 76-81.

Kirschbaum, C., Wüst, S., & Hellhammer, D. (1992). Consistent sex differences in cortisol responses to psychological stress. *Psychosomatic Medicine, 54*, 648-657.

Kudielka, B. M. & Kirschbaum, C. (2005). Sex differences in HPA axis responses to stress: A review. *Biological Psychology, 69*, 113-132.

Laurent, H. K. & Powers, S. I. (2006). Social-cognitive predictors of hypothalamic-pituitary-adrenal reactivity to interpersonal conflict in emerging adult couples. *Journal of Social and Personal Relationships, 23*, 703-720.

Lehman, B. J., Taylor, S. E., Kiefe, C. I., & Seeman, T. E. (2005). Relation of childhood socioeconomic status and family environment to adult metabolic functioning in the CARDIA study. *Psychosomatic Medicine, 67*, 846-854.

Lissau, I. & Sorensen, T. I. A. (1994). Parental neglect during childhood and increased risk of obesity in young adulthood. *The Lancet, 343*, 324-328.

Lundberg, O. (1993). The impact of childhood living conditions on illness and mortality in adulthood. *Social Science Medicine, 36*, 1047-1052.

Montgomery, S. M., Bartley, M. J., & Wilkinson, R. G. (1997). Family conflict and slow growth. *Archives of Disease in Childhood, 77*, 326-330.

Powers, S. I., Pietromonaco, P. R., Gunlicks, M., & Sayer, A. (2006). Dating couples' attachment styles and patterns of cortisol reactivity and recovery in response to a relationship conflict. *Journal of Personality and Social Psychology, 90*, 613-628.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods (2nd ed.). Newbury Park, CA:* Sage.

Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin, 128*, 330-366.

Russek, L. G. & Schwartz, G. E. (1997). Feelings of parental caring can predict health status in mid-life: A 35-year follow-up of the Harvard Mastery of Stress study. *Journal of Behavioral Medicine, 20*, 1-13.

Stroud, L. R., Salovey, P., & Epel, E. S. (2002). Sex differences in stress responses: Social rejection versus achievement stress. *Biological Psychiatry, 52*, 318-327.

Taylor, S. E., Lerner, J. S., Sage, R. M., Lehman, B. J., & Seeman, T. E. (2004). Early environment, emotions, responses to stress, and health. *Journal of Personality, 72*, 1365-1393.

Uchino, B. N. (2009). Understanding the links between social support and physical health: A life-span perspective with emphasis on the separability of perceived and received support. *Perspectives on Psychological Science, 4*, 236-255.

Uhart, M., Chong, R. Y., Oswald, L., Lin, P., & Ward, G. S. (2006). Gender differences in hypothalamic-pituitary-adrenal (HPA) axis reactivity. *Psychoneuroendocrinology, 31*, 642-652.

United States Census Bureau (2010). *Educational attainment*. From http://www.census.gov/hhes/socdemo/education/about/faqs.html#ged.

United States Department of Health and Human Services (2007). *The effects of marriage on health: A synthesis of recent research evidence.* From http://aspe.hhs.gov/_/topic/subtopic.cfm?subtopic=377.

Walker, E. A., Gelfand, A., Katon, W. J., Koss, M. P., Von Korff, M., Bernstein, D., & Russo, J. (1999). Adult health status of women with histories of childhood abuse and neglect. *The American Journal of Medicine, 107*, 332-339.

Weaver, I. C. G., Cervoni, N., Champagne, F. A., D'Alessio, A. C., Sharma, S., Seckl, J. R., et al. (2004). Epigenetic programming by maternal behavior. *Nature Neuroscience, 7*, 847-854.

Wills, T. A., & Shinar, O. (2000). Measuring perceived and received social support. In S. Cohen, L. Gordon, & B. Gottlieb (Eds.), *Social support measurement and intervention: A guide for health and social scientists* (pp. 86–135). New York: Oxford University Press.