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Maternal Emotional and Physiological Reactivity: Implications for Parenting and the Parenting-Adolescent Relationship

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Abstract

Objective: Parent physiology and emotion may play an important role in parenting and parent-child relationship quality, yet little research has examined these associations in parents of adolescents. This study employed a naturalistic laboratory-based approach to observe maternal reactivity (mothers' cardiovascular and negative emotional responses) during a parent-adolescent interaction task (PAIT) and associations with parenting behavior and parent-adolescent relationship quality. We also examined possible indirect effect of maternal reactivity on parent-adolescent relationship quality through parenting variables.

Methods: Mothers ($n = 196$) of 12–14 year olds completed the PAIT, a 10-minute laboratory task in which mothers and adolescents discussed a family conflict topic. Mother-rated negative emotional experience, mother heart rate (HR), and systolic and diastolic blood pressure (BP) responses to PAIT were collected. Additionally, observed maladaptive and positive parenting during PAIT and reported parent-adolescent relationship quality were collected.

Results: We found that mothers' heightened negative emotional experience in PAIT was associated with heightened observed and reported maladaptive parenting and lower parent-adolescent relationship quality ($p < .001$). Additionally, blunted HR reactivity was related to higher positive parenting in PAIT ($p < .05$). Lastly, we found an indirect effect of HR on parent-adolescent relationship through positive parenting and an indirect effect of maternal negative emotional experience on parent-adolescent relationship quality through maladaptive and positive parenting. In sum, high emotional reactivity and blunted HR predicted poorer parenting, and directly and indirectly affected parent-adolescent relationship quality.

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Author Contributions

CEN: did the majority of the data analyses and wrote the paper. TMC: designed and executed the study and collaborated in editing the manuscript, CCT assisted in data analyses and data collection. SFG: cleaned a large portion of the data and assisted with data analyses.

Conflict of Interest

The authors declare no conflicts of interest.

Compliance with Ethical Standards

All of the authors declare no conflicts of interest.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee by George Mason University and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Conclusions: Parent reactivity may be important to consider in interventions.

Keywords

positive parenting; maladaptive parenting; physiological reactivity; emotional responses; parent-adolescent relationship

Decades of research have highlighted the importance of parenting and parent-child relationship quality in predicting child psychosocial developmental outcomes. Research has shown the adverse effects of maladaptive parenting (e.g. inconsistent or inattentive parenting), the beneficial effects of positive parenting (e.g. providing the child with praise, rewarding desired behavior, and providing support), and the importance of a positive parent-child relationship in impacting a child's socio-emotional and behavioral development (Amato & Fowler, 2002; Chang, Schwartz, Dodge, & McBride, 2003; Clark & Ladd, 2000; Eisenberg, Zhou, Spinrad, Valiente, Fabes, & Liew, 2005). Given the critical importance of parenting behaviors and the parent-child relationship for youth development, it is important to understand factors that affect parenting behavior and parent-child relationship quality across development. Furthering this understanding may help us to understand ways to improve parenting and promote positive child development.

One factor that may influence parenting is parents' negative emotional and physiological reactivity during challenging interactions with their children. Parents who experience heightened negative emotion during difficult parent-child interactions may have less capacity to engage in positive parenting and may be more likely to engage in emotionally-reactive parenting that is maladaptive. Additionally, parent physiological reactivity during parent-child interactions could also impact a parent's ability to respond appropriately to their child's needs.

It is important to study the effect of parent emotional experience and physiological reactivity on parenting and parent-child relationship quality across children's development. It might be particularly important to examine this during adolescence. Adolescence introduces changes to the parent-child relationship and to parenting behavior, as youth begin to assert autonomy (McGue, Etkins, Walden, & Iacono, 2005). Some research has found that conflicts between parents and children increase in frequency and emotional intensity during early adolescence (Laursen, Coy, & Collins, 1998) as parents adjust to youth's new bids for autonomy. Nonetheless, parenting and the parent-child relationship still have important effects on child socio-emotional outcomes and protect against elevated risky behavior and psychopathology during adolescence (Clark & Ladd, 2000). Thus, fostering positive parenting and relationship quality may be particularly important in this developmental period.

One factor that may impact parenting is parent emotional experience. Parenting is known to be an emotional task. Several theorists have viewed emotion as a central determinant of parenting (Barrett & Fleming, 2011; Dix, 1991). For example, Dix (1991) proposed a theoretical model of the role of parent emotional experiences in parenting. He argued that some level of parent negative emotional experience during parenting is adaptive and helpful for the parent-child relationship, yet if parent negative emotion is too strong it may result in family dysfunction. Dix described that parents who have high negative emotional

experiences while parenting may have greater challenges in sensitively attending to the child's needs. Consequently, they may exhibit increased maladaptive parenting behaviors and decreased positive parenting behaviors. For instance, there is evidence that experimentally induced negative emotion is associated with poorer parenting behaviors in parents of children (Jouriles, Murphy, & O'Leary, 1989).

Other authors have extended this conceptualization of effects of emotion and parenting to encompass parent physiology (e.g. Autonomic Nervous System (ANS) response) (Swain, Lorberbaum, Kose & Strathearn, 2007). These authors posited that parent physiological reactivity in response to parenting tasks may have important associations with parenting behavior (Barrett & Fleming, 2011). Very high levels of physiological reactivity, like high negative emotion experience, may interfere with parents' ability to sensitively attend to their child's needs, leading to greater maladaptive parenting and lower positive parenting behaviors, consistent with Dix's (1991) model.

In addition to theory, prior research has also supported associations between parents' emotional experience and parenting behaviors. Several studies have found that parent self-reports of their global daily level of negative emotional experience are associated with more maladaptive parenting (e.g., Shaffer & Obradovi, 2016). In addition to these global studies, there have been only a few laboratory studies examining parents' negative expressions during in-vivo parent-child interactions and associations with parenting behavior. These are important to understand moment-to-moment effects of negative emotion on parenting. Typically, these laboratory studies have found that greater parent negative emotional experience during parenting-related tasks is associated with higher levels of observed maladaptive parenting behaviors and lower observed positive parenting behaviors. In one study, expectant mothers' higher reported negative emotional experience while watching videos of infants crying (which was intended to model challenging parenting situations), was associated with lower observed maternal positive parenting (e.g. sensitivity) with their infants 6 months later in 3 parent-infant distress tasks (Leerkes et al., 2015). Similarly, higher self-reported parent negative emotional experience and higher observed parent negative emotional expressions during challenging interactions with their children has been associated with higher observed maladaptive parenting behavior in those interactions (e.g. harsher discipline, parent engaging in coercive cycles) in parents of 2–3 year olds (Lorber & Smith Slep, 2005) and in parents of 11–16 year olds (Moed et al., 2015). Thus, higher levels of parent negative emotional experience during challenging parent-child interactions may be associated with increased maladaptive parenting behaviors and decreased positive parenting behaviors which is theorized to reflect the difficulty of thinking clearly and behaving sensitively towards one's child in the presence of high negative emotional experience.

Previous research has also found associations between parent physiological reactivity and parenting behaviors. Specifically, the Sympathetic Nervous System (SNS) of the Autonomic Nervous System (ANS)—involved in stress responses to environmental stimuli—is important in the study of parent responses to challenging parent-child interactions. Two of the most widely used markers of SNS reactivity are heart rate (HR) and blood pressure (BP) reactivity. Studies have found that HR increases in response to stressful stimuli, including parent-child interactions (Chaplin et al., 2015). Blood pressure also changes in responses to

psycho-social stressors, including parent-child interactions (Rainforth et al., 2007). Additionally, BP is divided into diastolic blood pressure (DBP) and systolic blood pressure (SBP) responses. While DBP and SBP are often tied to similar outcomes, some research suggests that DBP is associated with appraisals of threat whereas SBP is associated with self-efficacy in coping with an appraised threat; thus, they may have slightly different implications in a parent-child interaction (Chen, Matthews, Salomon, & Ewart, 2002; Manczak, McLean, McAdams, & Chen, 2015). Overall, there are several advantages to measuring parent physiological reactivity to parent-child interactions in addition to parent negative emotional experience. First, measures of physiology provide information into the biological bases for parenting behaviors that cannot be captured by behavioral measures alone. Second, physiological indicators may reflect parent responses to parent-child interactions that are outside of parents' awareness and not affected by social desirability.

A few studies have examined parental HR and BP reactivity to parent-child interactions and associations with parenting behavior. Most studies have found that heightened HR or BP reactivity is associated with more maladaptive parenting behaviors. Two studies found that heightened parent HR and BP reactivity to parent-child discussions of both positive and negative topics were correlated with higher observed maladaptive parenting behaviors in the same tasks (e.g. parent negative scaffolding or overreactive discipline) in parents of adolescents (Manczak et al., 2015) and toddlers (Lorber & O'Leary, 2005). In addition, in the marital literature, heightened BP in response to conflictual marital interactions is associated with heightened hostility of interactions and lower HR reactivity associated with greater positive behaviors, which provides further support for disadvantages of high BP in terms of behavior (Broadwell & Light, 1999; Smith & Gallo, 1999). However, there is one study that found that greater increases in parent HR over the course of a parent-adolescent conflict interaction task were associated with higher levels of observed positive parenting (e.g. emotional sensitivity) during the task (Zhang, Cui, Han, & Yan, 2017). Thus, in sum, high HR and BP levels typically predict more maladaptive and less positive parenting behavior, but it is possible that parents' moderate levels of HR engagement during parent-youth interactions (particularly those that are conflictual; e.g. Lorber & O'Leary, 2005) may be associated with positive parenting in that it may allow parents to be engaged and attend to the adolescent.

In addition to associations with maladaptive and positive parenting behaviors it is also possible that parent emotional experience and physiological reactivity to parent-child interactions may impact the parent-child relationship, either directly or through its influence on parenting behaviors. Parent-adolescent relationship quality reflects the overall quality of the bond between parent and child or the "closeness" of the relationship. It is possible that high negative emotional experience and physiological reactivity in parents during parent-child interactions may affect this bond adolescents may be less likely to disclose to their parent if they are expressing high levels of negative emotion and high physiological arousal. It is also possible that high negative emotional experience and physiological reactivity may lead a parent to engage in high maladaptive parenting and low positive parenting, which then over time may subsequently lead the adolescent to feel resentful or unsafe disclosing information to their parents and thus may lead to poorer parent-child relationship quality.

Consistent with this, prior studies have found that high positive and low maladaptive parenting behavior is related to higher parent-child relationship quality (Pinquart, 2013).

There have been no studies that have examined direct or indirect effects of parent emotional experience or physiological reactivity on parent-child relationship quality. Given that parent-child relationship quality is an important predictor of child social and emotional outcomes, our study will examine this

In sum, parenting is an essential context in determining child and adolescent adjustment and positive development. Examining a parents' negative emotional experience and physiological reactivity in response to a conflictual parent-adolescent interaction could serve to illuminate what influences maladaptive and positive parenting as well as the parent-child relationship. To date, much of the research on parental negative emotional experience and physiological reactivity to parent-child interactions has focused on parents of infants or young children and thus our study contributes to this literature by examining parent reactivity during a unique and important stage of development: adolescence. It remains unclear whether parent negative emotional experience and physiological responses to their child have a similar impact in adolescence as they do in infancy and early childhood. We expect that these associations are similar in adolescence, however it is also possible the associations would differ. For example, it is possible that moderate emotional and physiological arousal during parent-child interactions during adolescence may be beneficial given that they may reflect parent engagement with youth during a period of time (early adolescence) when many youth become disengaged from parents (Laursen et al. 1998). Given that adolescence is a time characterized by heightened risk and changes in the parent-child relationship, further research on the association between parent emotional experience and physiological reactivity and parenting may help inform intervention efforts to improve parenting and parent-child relationship quality during this formative time.

The present study examined mothers' in-the-moment negative emotional experience and physiological reactivity (referred to as *maternal reactivity*) during a challenging parent-adolescent interaction in the lab to examine associations between maternal negative emotional experience and physiological (HR, BP) reactivity and observed maladaptive parenting behavior (e.g. harshness or criticism) during the task, observed positive parenting behavior (e.g. giving child praise and warmth) during the task, and adolescent and parent-reported parent-adolescent relationship quality (parent-adolescent "closeness"). We also examined whether parent negative emotional experience and physiological reactivity to the interaction indirectly impacted parent-adolescent relationship quality through effects on parenting behavior. Based on previous research and theory we formulated three hypotheses. First, based on the prior literature, we predicted that higher maternal negative emotional experience in response to the parent-adolescent interaction task would be associated with higher maladaptive parenting behaviors (harsh/critical parenting) during the task, lower positive parenting behaviors (warmth/praise) during the task, and lower reported parent-adolescent relationship quality. Second, we hypothesized that higher maternal HR/BP reactivity to the parent-adolescent interaction task would predict higher maladaptive and lower positive parenting behaviors in the task and lower reported parent-adolescent relationship quality. Lastly, based on theory that parent reactivity may impact parenting

behavior and consequently the parent-child relationship, we hypothesized that maternal emotional and HR/BP reactivity would indirectly affect parent-adolescent relationship quality through parenting behavior.

Method

Participants

The present study included 196 mothers and their 12–14 year olds (51.3% male, Mean age=13.28 SD=1.43). Parents who participated were all mothers or mother figures. 96.4% were biological mothers, 1% were grandmothers, and 2.6% were adoptive mothers. Power analysis using G*Power was conducted prior to the study to determine that 156 participants were needed to detect a small to medium effect which was reported in similar studies of the relationship between maternal physiological reactivity and parenting in parents of adolescents (e.g. Manczak et al., 2015). However, since there have been few studies of maternal emotional experience and physiological reactivity and parenting in adolescents, we wanted to allow for the possibility that our effect sizes may be lower and thus collected 196 participants. The majority of mothers reported an annual household income over \$100,000 (71.1%) and the majority of adolescents were White (69.5%, 9.1% biracial/multiracial, 8.1% Hispanic/Latino, 3.6% Asian, 3% African American, 0.5% Hawaiian/Pacific Islander, and 6.2% Other/Unknown).

Mothers were drawn from two studies that included the same parent-adolescent laboratory interaction task (99 participants were from Study 1 and 97 from Study 2). Study 1 aimed to examine parent-adolescent interactions and adolescent risk behavior and Study 2 aimed to examine an intervention to reduce parenting stress (only pre-intervention data was used from Study 2). For both studies, mothers were recruited from a northeastern metropolitan area from newspaper advertisements, flyers, and mailings. Interested mothers were screened over the phone for eligibility. For both studies, inclusion criteria were that mothers and adolescents had adequate English proficiency to complete questionnaires, adolescents had IQ $\geq$ 80, and adolescents did not have a history of developmental disabilities. For the Study 2, there was an additional inclusion criterion that mothers must have high levels of stress, which was based on a mean score of greater than or equal to 3 (on a scale of 1 to 5) on 2 questions rating maternal overall life stress and parenting-related stress. Thus, we expect there would be higher levels of stress for mothers in the second study and to address study differences, we added study membership as a covariate in our analyses.

Procedures

Mother-adolescent dyads completed the parent-adolescent interaction task (PAIT) together and separately completed questionnaires and interviews. Mothers and adolescents completed questionnaires on parent-adolescent relationship quality and questionnaires and interviews to assess other constructs in the larger studies. Dyads from Study 1 completed the questionnaires and interviews in a session about a week prior to the PAIT task and dyads from Study 2 completed questionnaires and interviews on the same day directly after the PAIT task. At the start of the study, parental informed consent and adolescent assent were obtained. The University's Institutional Review Board approved the protocol.

PAIT task.—The PAIT portion of the study was scheduled at 4pm. Before the start of the PAIT task, the mother and adolescent separately completed the Issues Checklist (IC; Prinz, Foster, Kent, & O’Leary, 1979), a checklist of common parent-adolescent conflict topics that has been used in prior research with adolescents (e.g. Sheeber, Hops, Alpert, Davis, & Andrews, 1997). The mother and adolescent indicated which conflict topics they had discussed with one another in the past month and the level of anger they experienced while discussing those ranging from 1 (*calm*) to 5 (*angry*). The mutually highest rated conflict topic was selected as the discussion topic for the PAIT task. If the two differed in their highest rated topic, the mother’s highest rated topic was selected. Preceding the PAIT task there was a 20-minute adaptation period during which the mother and adolescent went into separate rooms and listened to guided relaxation tapes for 5 minutes then sat quietly in a dim room without distractions for 15 minutes.

After the 20-minute adaptation period, baseline HR, BP, and negative emotional experience ratings were collected from the mother for 5 minutes. Next, the mother was brought into the room with the adolescent and seated next to him or her. Then the two discussed the selected conflict topic for 10 minutes. The dyad was asked to try to come to a resolution for the issue and was instructed to continue talking for a full 10 minutes and “discuss the issue as if you were at home.” One RA was in the room, collecting HR and BP measures and that RA cued the dyad to continue talking about the conflict topic if the mother or adolescent stopped the conversation before the end of the 10 minutes. Interactions were videotaped and later coded for parenting behaviors. Immediately after the interaction, HR, BP, and emotional experience ratings were also measured at “post-task.”

Measures

Heart rate response to PAIT.—Maternal HR was measured with a pulse sensor on the index finger connected to a Critikon Dinamap 120 Patient Monitor. A HR value were recorded in beats per minute once every 30 seconds throughout the 10-minute task. The HR reactivity to PAIT variable was calculated by taking the average of maternal HR during the interaction task and subtracting out baseline HR, consistent with prior studies (Nealey-Moore, Smith, Uchino, Hawkins, & Olson-Cerny, 2007). We excluded the first 2 minutes of the interaction task in our average since HR during that time was very low in our sample as mothers were warming up to the task. Previous studies have taken similar approach of removing times in which responses were low due to warming up to the task (e.g. Chaplin et al., 2014). Since HR values were the highest during the task for our sample rather than immediately post task, we decided to focus our HR variable on parent HR during the task.

Of note, continuous electrocardiogram (ECG) data was collected during the interaction task for participants from Study 1 (about half of the current sample) in addition to HR recordings from the Dinamap monitor. For those participants that had ECG data, this was collected by placing 4 pre-gelled disposable electrodes on the chest and collecting signals from the electrodes on the computer using Biopac systems (Acq Knowledge software V.3.5, Biopac Systems Incorporated). We created an additional HR variable from the ECG data for half the sample to mirror the Dinamap 30 second-interval data by averaging the beats per minute (bpm’s) for each heartbeat peak during the last 8 minutes of the 10-minute interaction. Then

we subtracted out an average of bpm for each heartbeat peak during the baseline 5-minute period from the calculated task HR average. We used this additional HR variable in additional analyses for participants for which it was available (participants from Study 1) to test if measurement of HR changed our results.

Blood pressure response to PAIT.—Maternal systolic and diastolic BP was measured with an arm cuff connected to the Dinamap monitor. Due to the intrusiveness of inflating the BP cuff during the interaction, BP was only collected during the baseline period and at post-task (immediately following the task). Thus, unfortunately we did not have BP available during the task and thus we were not able to calculate BP in the same way as HR. The BP reactivity to PAIT variable was calculated as the post-task BP score minus the BP score at baseline. Given that we measured BP at post-task rather than during the task, it is possible that BP levels were beginning to recover by this point in time. However, studies that have modeled BP throughout a task show that BP is most elevated immediately following a stressful task (Gerin, Davidson, Christenfeld, Goyal, & Schwartz, 2006). We also examined mean levels of BP in our study sample and they did increase from baseline to post-task (and then returned to baseline levels at later time points), indicating that our post-task measure of BP did capture some reactivity to the parent-adolescent interaction and not just BP recovery.

Emotional experience response to PAIT.—Maternal negative emotional experience in the PAIT task was assessed with two items examining the mothers' reported level/intensity of anxiety and frustration experience. These questions were on a 1 to 10 scale denoting level of anxiety and frustration experienced at that moment (for baseline) and immediately after the task (for post-task), from 1 (*not at all*) to 10 (*more than ever*). The anxiety and frustration items were highly correlated ($r = .72, p < .001$) and both measured intensity of negative emotional experience, so we created an average score of maternal negative emotional experience combining the two items. Reliability of this average score was good ($\alpha = 0.83$). The negative emotional experience in PAIT variable was calculated as the emotion average score collected at post-task minus the emotion average score at baseline.

Observed parenting behaviors.—Our parenting variables consisted of observed maladaptive and positive parenting behaviors during the PAIT task, coded using the PAIT Coding System (Chaplin, 2010; Chaplin et al., 2014). We used two of the parenting codes from the coding system: maternal warmth/support (e.g., nods head, appears to listen to the youth, provides hugs or other physical comfort, praises the youth) as an indicator of positive parenting and maternal negative/critical parenting (e.g., puts down child, interrupts child) as an indicator of maladaptive parenting.

Coders viewed the 10-minute discussions and rated each parenting behavior on a scale from 1 (*none present*) to 5 (*high level*), based on the mother's facial expressions, behaviors, tone of voice, and content of speech. Coders underwent 6 hours of training by the second author on the system and met for bi-monthly coding meetings to discuss coding questions. One third of the videotapes were randomly chosen, double-coded by a second rater, and checked for inter-rater reliability. Reliability was acceptable, with single-rater intra-class correlation coefficients (*ICC*) (using absolute agreement) of 0.68 for positive parenting and .77 for maladaptive parenting.

Parent-adolescent relationship quality.—Parent-adolescent relationship quality was assessed using an average of mother and adolescent reported relationship quality. An average was used to minimize the number of models while still capturing both adolescent and mother perspectives. We also tested individual models with adolescent and mother-reported relationship quality but they did not differ notably. For mother-reported parent-adolescent relationship quality the adolescent-parent relationship domain (APRD) subscale of the Stress Index for Parents of Adolescents was used (SIPA; Sheras, Abidin, & Konold, 1998). The SIPA measured several aspects of the mother's life including parent social support, parent feelings of guilt, relationship with partner, and also relationship with her child. For the purposes of the present study, we focused only on the APRD subscale, which consisted of 16 items rated on a 1 (*strongly disagree*) to 5 (*strongly agree*) scale. The APRD subscale assessed mothers' report of the closeness and quality of their relationship with the target adolescent and the extent that the adolescent confides in them (e.g. "my child shows affection towards me"). The SIPA APRD subscale has demonstrated good reliability and validity in prior studies (Sheras et al., 1998; Wiener, Biondic, Grimbos, & Herbert, 2016).

Adolescent-reported parent-adolescent relationship quality was assessed with the Parent Family Connectedness Scale (PFCS; Resnick et al., 1997). This is a nine-item Likert-type adolescent-reported questionnaire that assessed adolescent relationships with and feelings of closeness towards his or her mother or mother figure (4 items (e.g. "how close do you feel to your mother?"), father or father figure (4 items), and family members as a whole (1 item). For the purposes of the present study, we examined the items that pertained to the adolescent's connectedness with their mother since only mothers participated in the PAIT task. Those 4 items were summed to create a total parent-adolescent relationship quality variable used in analyses. PFCS has demonstrated good reliability and validity as well (Lloyd-Richardson, Papandonatos, Kazura, Stanton, & Niaura, 2002; Resnick et al., 1997). For the present study, the internal consistency of the composite of APRD and PFCS items was adequate ($\alpha = .75$).

Data Examination

We additionally examined if our data were significantly skewed to determine the most appropriate analyses to use. The observed maladaptive parenting variable was positively skewed (skewness value = 1.6) but none of the other variables had a skewness of less than -1 or greater than 1. Since we had a skewed variable for one of our outcome measures, we reported all correlations with bias corrected accelerated bootstrap 95% confidence intervals using 1000 bootstraps per recommendations when working with skewed data (Wichmann & Hill, 2001). We also used bootstrapping for our mediational models to address skewness.

Data Analyses

To test the hypothesis that maternal PAIT responses (HR, BP, negative emotional experience) would be predict positive parenting behavior, maladaptive parenting behavior, and parent-adolescent relationship quality, we examined the direct effects of each PAIT response variable to maladaptive and positive parenting and parent adolescent relationship quality in mediation models. We also examined the bootstrap correlations to determine the effect size of each direct relationship such that a r value of 0.10 was considered a "small"

effect, 0.30 was considered a “medium” effect and 0.50 was considered a “large” effect (Cohen, 1992).

Next, to test the second hypothesis that emotional experience and physiological responses to PAIT may be associated with parent-adolescent relationship quality through parenting behavior, we tested for indirect effects of responses to PAIT on relationship quality through parenting behavior. To do this, we conducted simple mediational analyses (PROCESS Model 4) using Hayes’ PROCESS software (Hayes, 2013). This approach allows for bootstrapping standard errors for indirect effects, which is the recommended approach for mediation and mirrors our bootstrapping for correlations to minimize the impact of nonnormality on results (Hayes, 2013). The indirect effect for the independent variable on the dependent variable through the mediator is calculated as the difference between the total effect (not controlling for the mediator) and direct effect (controlling for the mediator). For these analyses, we used bias-corrected 95% confidence intervals (CI) using bootstrapping with 5000 bootstrapped samples (CIs significant when not overlapping zero; Hayes, 2013).

Covariates.—As stated above, we included study membership as a covariate in our analyses. We also considered several demographic variables including child sex, race, and household income as covariates if they were significantly correlated with the outcome variable and at least one of the predictors. None of the demographic variables we tested met these criteria and thus we did not include demographic covariates in our analyses.

Nonlinearity.—Some prior findings and theory suggest that very low and very high maternal physiological reactivity may both be associated with maladaptive parenting (e.g. Sturge-Apple, Skibo, Rogosch, Ignjatovic, & Heinzelman, 2011). Consequently, in addition to examining linear effects of HR and BP, we tested for nonlinear (quadratic) relationships between maternal HR/BP responses and parenting behaviors. To do this, we ran bias-corrected accelerated bootstrapped regression models that contained quadratic terms for HR and BP (e.g., HR^2 , BP^2) in Step 3 of a hierarchical regression (with study membership in Step 1 and the parent reactivity variables in Step 2 predicting parenting and parent-adolescent relationship quality). However, neither HR nor BP exhibited a significant curvilinear/quadratic relationship and thus we did not include these variables in our final models.

Results

Data Inspection

We performed exploratory correlation analyses to examine the relationships among our variables. Bias-corrected accelerated bootstrap correlations among main variables are presented in Table 1. All of the variables in the present study had less than 5% missing data. Data was missing mostly due to equipment malfunction and items that were left intentionally blank by participants.

Outliers.—Data were examined for normality. Additionally, per recommendations when working with physiological data we replaced outliers (values outside of 3 standard

deviations above or below the mean) with the value of 3 standard deviations from the mean (e.g. Kertes & Gunnar, 2004). There were 2 outliers for DBP, 3 for SBP, 2 for HR.

Descriptive information

Maternal negative emotional experience levels, HR levels, and BP levels all increased from before to after the PAIT task. Descriptive statistics for primary study variables are described in Table 2.

Relations Between Maternal Responses to PAIT and Parenting and Parent-Adolescent Relationship Quality

The results of the direct effects of parent negative emotional experience and physiological reactivity on parenting and parent-adolescent relationship quality are presented in Table 3. First, we examined direct effects of parent SBP and DBP reactivity to the PAIT task on observed positive and maladaptive parenting and reported parent-adolescent relationship quality. Direct effects of SBP and DBP on parenting and parent-adolescent relationship quality were not significant.

Second, we examined direct effects of parent HR reactivity to the PAIT task on observed positive and maladaptive parenting and reported parent-adolescent relationship quality. There was a significant positive direct effect of higher parent HR reactivity on higher observed positive parenting (see Table 3), with a small effect size of $r = .17$. HR reactivity was not significantly related to maladaptive parenting or parent-adolescent relationship quality.

Third, we examined direct effects of parent negative emotional experience in response to the PAIT task on observed positive and maladaptive parenting and reported parent-adolescent relationship quality. There was a significant positive direct effect of higher parent negative emotional experience on higher maladaptive parenting with a small to medium effect size of $r = .24$ (see Table 3). There was also a significant negative direct effect of higher parent negative emotional experience on lower positive parenting with a small to medium effect size of $r = .22$. Lastly, there was a significant negative direct effect of higher parent negative emotional experience on lower parent-adolescent relationship quality with a medium to large effect size of $r = .44$.

Follow-up analyses using ECG data as an index of HR for half of the participants that had this data did not reveal any significant associations between the continuous ECG data and maladaptive parenting, positive parenting, or parent-adolescent relationship quality.

Indirect effects of maternal responses to PAIT on parent-adolescent relationship quality through parenting behavior.—To test our second hypothesis, we tested if parent SBP, DBP or emotional experience responses to PAIT were indirectly related to parent-child relationship quality through observed maladaptive or positive parenting. Mediation results are presented in Table 3. For maternal negative emotional experience in PAIT, results revealed that the indirect effects of higher maternal negative emotional experience on lower parent-adolescent relationship quality through lower positive parenting and higher maladaptive parenting was statistically significant. In other words, higher

maternal emotional experience in response to PAIT was associated with lower parent-adolescent relationship quality through its effect on decreasing positive parenting and increasing maladaptive parenting. Additionally, the indirect effect of higher maternal HR reactivity on higher parent-adolescent relationship quality through higher positive parenting was statistically significant. In other words, higher maternal HR reactivity in response to PAIT was associated with higher parent-adolescent relationship quality through its effect on increasing positive parenting. None of the other mediation models showed significant indirect effects.

Discussion

The present study investigated how maternal negative emotional experience and physiological reactivity to a challenging parent-adolescent interaction related to observed parenting behaviors and to reported parent-adolescent relationship quality. This is one of the first studies to examine both maternal emotional experience and maternal physiological reactivity during parent-child interactions in mothers of adolescents, a developmental period marked by important changes in parenting and in the parent-child relationship. Results indicated that higher maternal negative emotional experience during a challenging discussion with her adolescent was associated with decreased positive parenting, increased maladaptive parenting, and decreased parent-adolescent relationship quality. There was also an indirect effect of higher maternal negative emotional experience in response to PAIT on lower parent-adolescent relationship quality through lower positive parenting and higher maladaptive parenting. Additionally, higher maternal HR reactivity was significantly related to higher positive parenting. And there was an indirect effect of higher maternal HR reactivity to higher parent-adolescent relationship quality through higher positive parenting. Results indicate potential for maternal negative emotional experience and HR reactivity to parent-child interactions as a target for interventions to improve parenting and associated youth outcomes, with perhaps different therapy implications for emotion experience versus cardiovascular reactivity.

It is important to note that these findings are cross-sectional, so it is not possible to determine the direction of effects. It is possible that maternal negative emotional experience and physiological reactivity affects parenting behavior and the parent-adolescent relationship. However, it is also possible that mothers who exhibit higher maladaptive parenting behaviors, low positive parenting behaviors, and have poorer relationship quality with their adolescent would have increased negative emotional experience to the parent-adolescent interaction task and may also withdraw from and have a blunted HR reactivity to the task. Further longitudinal and experimental research is needed to determine the direction of this relationship.

Maternal emotion experience in response to PAIT.

The results found that higher maternal negative emotional experience in the challenging parent-adolescent interactions—including higher feelings of anxiety and frustration—predicted all three outcomes (maladaptive parenting, positive parenting, and parent-adolescent relationship quality) and indirectly influenced parent-adolescent relationship

quality through maladaptive and positive maladaptive parenting. These results are consistent with the literature that suggests a higher level of parent negative emotional experience may compromise parenting and is associated with greater risk of high maladaptive and low positive parenting (e.g. Leerkes et al., 2015). The present study adds to this literature by suggesting a link between high parent negative emotional experience and poorer parent-child relationship quality indirectly through parenting behavior. When engaged in parenting tasks, if a mother is experiencing heightened negative emotion and/or is unable to regulate her negative emotions, she may be more likely to engage in maladaptive parenting behaviors such as harsh or critical parenting and this may subsequently harm the parent-child relationship over time (e.g. Dix, 1991). Given the importance of parenting and parent-child relationship quality in predicting youth socioemotional outcomes, examining these connections is could be helpful for intervention and prevention efforts.

Maternal Cardiovascular Responses to PAIT.

Contrary to hypotheses, we found higher maternal HR reactivity predicted *higher positive parenting* and indirectly predicted higher parent-adolescent relationship quality through higher positive parenting. Our results suggest that HR could be a useful indicator of parents' reactivity that may influence their ability to parent sensitively in the moment and their relationship-quality. The indirect effect of maternal HR reactivity on parent-adolescent relationship quality through positive parenting is significant given the importance of positive parent-adolescent relationship quality in predicting adolescent adjustment (Clark & Ladd, 2000). This suggests that interventions that aim to strengthen the parent-adolescent relationship as a way to protect against negative youth outcomes may wish to direct attention at both parental physiological reactivity and at its effects on parenting behavior.

Notably, the direction of our findings—that *higher* HR reactivity was associated with higher positive parenting behavior and better parent-adolescent relationship quality—is contrary to our hypotheses, prior theory, and two prior studies that found that that heightened HR/BP reactivity to parent-child interactions were associated with increased maladaptive parenting (Lorber & O'Leary, 2005; Manczak et al., 2015). However, our finding is consistent with one study finding that high HR over the course of a conflict task was associated with greater positive parenting (e.g. sensitive and responsive parenting) (Zhang et al., 2017). Our results may be more similar to the Zhang et al. study because our participants were similar in age to this study which included pre-adolescents rather than children or late adolescents. It is possible that moderate to high physiological reactivity in parents of early adolescents may represent higher engagement with these youth, which may be particularly critical for positive parenting and relationship quality during this time period when youth start to pull away from parents. Also, the Zhang et al. study found associations between higher HR reactivity and higher *positive* parenting, whereas the other two studies (Lorber & O'Leary, 2005; Manczak et al., 2015) focused on maladaptive parenting. It may be that somewhat high HR reactivity to parent-youth interactions may facilitate positive parenting in particular. Finally, it is notable that very few of our parents exhibited a large increase in HR from baseline to the task—90% of parents increased less than 6.57 bpm from baseline — suggesting parents mostly had a low to moderate level of elevation which might be fairly adaptive to show in

response to a conflict task. It may be that since few of our parents were very “high” in HR reactivity, this may have limited our ability to detect curvilinear effects.

SBP and DBP were not related to parenting behaviors or parent-child relationship quality. We may have found relationships with HR and parenting but not BP given that HR was measured more continuously in our task and thus we were better able to measure in the moment maternal arousal with HR which may be more associated with parenting and parent-child relationship quality. Nonetheless, our findings highlight important relationships between parent emotional experience and HR reactivity in the moment and parenting behaviors and parent-adolescent relationship quality.

Further research is needed to confirm the relationship between these variables and further explore these relationships in other parenting contexts and with other physiological or neural measures of parent stress responses. Although it is very common to only examine female caregivers in similar studies (e.g. Deater-Deckard & Bell, 2017; Leerkes et al., 2015; Lorber & O’Leary, 2005), we also were limited by a female caregiver sample and thus we did not explore parent gender effects on parent reactivity or parenting or parent-adolescent relationship quality. It is possible that the laboratory reactivity responses of fathers would differ in their implications for parenting and relationship outcomes. Another limitation of our study is that we only examined negative emotional experience of mothers in response to the parent-adolescent interaction, and future work may examine parent positive emotional experiences and parenting. Moreover, our measurement of BP was limited given that we did not measure BP during the PAIT task, which may have contributed to a lack of BP findings while we did have HR findings. Finally, our measurement of HR relied on single recordings on a pulse sensor rather than a continuous ECG-based measurement. We had ECG recordings for one half of our sample and conducted analyses with these, but it would have been a strength to have ECG data for the full sample.

This study provides initial evidence to the literature for the contribution of in-the-moment maternal negative emotional experience and physiological reactivity during parent-adolescent interactions on parenting and parent-adolescent relationship quality. Specifically, low negative emotional experience and higher heart rate during parents’ interactions with adolescents corresponded with higher positive parenting, lower maladaptive parenting, and better parent-adolescent relationship quality. Additionally, this study found some indirect effects of parent negative emotional experience and physiological reactivity on parent-child relationship through parenting, suggesting that negative emotional experience and physiological reactivity may have important effects on the parent-child relationship through parenting. If these findings hold true in future longitudinal research, they may help in developing laboratory-based measures to determine parents that are at most risk for maladaptive parenting and poor-quality relationships with their youth. In turn, these findings may suggest targets for interventions to strengthen family relationships in adolescence. In particular, our findings suggest that interventions may aim at decreasing parents’ negative emotional experience during challenging parenting interactions but may not wish to decrease parents’ HR engagement during these interactions.

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References

- Amato PR, & Fowler F (2002). Parenting practices, child adjustment, and family diversity. *Journal of Marriage and Family*, 64(3), 703–716.
- Barrett J, & Fleming AS (2011). Annual research review: All mothers are not created equal: Neural and psychobiological perspectives on mothering and the importance of individual differences. *Journal of Child Psychology and Psychiatry*, 52(4), 368–397. [PubMed: 20925656]
- Broadwell SD, & Light KC (1999). Family support and cardiovascular responses in married couples during conflict and other interactions. *International Journal of Behavioral Medicine*, 6(1), 40–63. [PubMed: 16250691]
- Chang L, Schwartz D, Dodge KA, & McBride-Chang C (2003). Harsh parenting in relation to child emotion regulation and aggression. *Journal of Family Psychology*, 17(4), 598–606. [PubMed: 14640808]
- Chaplin TM (2010). Parent-Adolescent Interaction Task (PAIT) Coding System. Unpublished manual, Yale University School of Medicine
- Chaplin TM, Hansen A, Simmons J, Mayes LC, Hommer RE, & Crowley MJ (2014). Parental–adolescent drug use discussions: Physiological responses and associated outcomes. *Journal of Adolescent Health*, 55(6), 730–735. [PubMed: 24957574]
- Chaplin TM, Visconti KJ, Molfese PJ, Susman EJ, Klein LC, Sinha R, & Mayes LC (2015). Prenatal cocaine exposure differentially affects stress responses in girls and boys: Associations with future substance use. *Development and Psychopathology*, 27(1), 163–180. [PubMed: 25036298]
- Chen E, Matthews KA, Salomon K, & Ewart CK (2002). Cardiovascular reactivity during social and nonsocial stressors: Do children’s personal goals and expressive skills matter? *Health Psychology*, 21(1), 16. [PubMed: 11846340]
- Clark KE, & Ladd GW (2000). Connectedness and autonomy support in parent–child relationships: Links to children’s socioemotional orientation and peer relationships. *Developmental Psychology*, 36(4), 485–498. [PubMed: 10902700]
- Cohen J (1992). A power primer. *Psychological Bulletin*, 112(1), 155–159. [PubMed: 19565683]
- Deater-Deckard K, & Bell MA (2017). Maternal executive function, heart rate, and EEG alpha reactivity interact in the prediction of harsh parenting. *Journal of Family Psychology*, 31(1), 41. [PubMed: 28165280]
- Dix T (1991). The affective organization of parenting: Adaptive and maladaptive processes. *Psychological Bulletin*, 110(1), 3–25. [PubMed: 1891517]
- Eisenberg N, Zhou Q, Spinrad TL, Valiente C, Fabes RA, & Liew J (2005). Relations among positive parenting, children’s effortful control, and externalizing problems: A three-wave longitudinal study. *Child Development*, 76(5), 1055–1071. [PubMed: 16150002]
- Gerin W, Davidson KW, Christenfeld NJ, Goyal T, & Schwartz JE (2006). The role of angry rumination and distraction in blood pressure recovery from emotional arousal. *Psychosomatic Medicine*, 68(1), 64–72. [PubMed: 16449413]
- Hayes AF (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* Guilford Press.
- Jouriles EN, Murphy CM, & O’Leary KD (1989). Interspousal aggression, marital discord, and child problems. *Journal of Consulting and Clinical Psychology*, 57(3), 453–455. [PubMed: 2738217]
- Kertes DA, & Gunnar MR (2004). Evening activities as a potential confound in research on the adrenocortical system in children. *Child Development*, 75(1), 193–204. [PubMed: 15015684]

- Laursen B, Coy KC, & Collins WA (1998). Reconsidering changes in parent-child conflict across adolescence: A meta-analysis. *Child Development*, 69(3), 817–832. [PubMed: 9680687]
- Leerkes EM, Supple AJ, O'Brien M, Calkins SD, Haltigan JD, Wong MS, & Fortuna K (2015). Antecedents of maternal sensitivity during distressing tasks: Integrating attachment, social information processing, and psychobiological perspectives. *Child Development*, 86(1), 94–111. [PubMed: 25209221]
- Lloyd-Richardson EE, Papandonatos G, Kazura A, Stanton C, & Niaura R (2002). Differentiating stages of smoking intensity among adolescents: Stage-specific psychological and social influences. *Journal of Consulting and Clinical Psychology*, 70(4), 998. [PubMed: 12182283]
- Lorber MF, & O'Leary SG (2005). Mediated paths to overreactive discipline: Mothers' experienced emotion, appraisals, and physiological responses. *Journal of Consulting and Clinical Psychology*, 73(5), 972–981. [PubMed: 16287397]
- Lorber MF, & Smith Slep AM (2005). Mothers' emotion dynamics and their relations with harsh and lax discipline: Microsocial time series analyses. *Journal of Clinical Child and Adolescent Psychology*, 34(3), 559–568. [PubMed: 16026219]
- Manczak EM, McLean KC, McAdams DP, & Chen E (2015). Physiological reactivity during parent-adolescent discussions: Associations with scaffolding behaviors and relationship quality. *Annals of Behavioral Medicine*, 49(4), 522–531. [PubMed: 25582990]
- McGue M, Elkins I, Walden B, & Iacono WG (2005). Perceptions of the parent-adolescent relationship: A longitudinal investigation. *Developmental Psychology*, 41(6), 971–984. [PubMed: 16351340]
- Moed A, Gershoff ET, Eisenberg N, Hofer C, Losoya S, Spinrad TL, & Liew J (2015). Parent–adolescent conflict as sequences of reciprocal negative emotion: Links with conflict resolution and adolescents' behavior problems. *Journal of Youth and Adolescence*, 44(8), 1607–1622. [PubMed: 25358960]
- Nealey-Moore JB, Smith TW, Uchino BN, Hawkins MW, & Olson-Cerny C (2007). Cardiovascular reactivity during positive and negative marital interactions. *Journal of behavioral medicine*, 30(6), 505–519. [PubMed: 17882542]
- Pinquart M (2013). Do the parent–child relationship and parenting behaviors differ between families with a child with and without chronic illness? A meta-analysis. *Journal of Pediatric Psychology*, 38(7), 708–721. [PubMed: 23660152]
- Prinz RJ, Foster S, Kent RN, & O'Leary KD (1979). Multivariate assessment of conflict in distressed and nondistressed mother–adolescent dyads. *Journal of Applied Behavioral Analysis*, 12(4), 691–700.
- Rainforth MV, Schneider RH, Nidich SI, Gaylord-King C, Salerno JW, & Anderson JW (2007). Stress reduction programs in patients with elevated blood pressure: A systematic review and meta-analysis. *Current Hypertension Reports*, 9(6), 520. [PubMed: 18350109]
- Resnick MD, Bearman PS, Blum RW, Bauman KE, Harris KM, Jones J, ... & Ireland M (1997). Protecting adolescents from harm: findings from the National Longitudinal Study on Adolescent Health. *Jama*, 278(10), 823–832. [PubMed: 9293990]
- Shaffer A, & Obradović J (2016). Unique contributions of emotion regulation and executive functions in predicting the quality of parent–child interaction behaviors. *Journal of Family Psychology*, 31(2), 150–159. [PubMed: 27929314]
- Sheeber L, Hops H, Alpert A, Davis B, & Andrews J (1997). Family support and conflict: Prospective relations to adolescent depression. *Journal of Abnormal Child Psychology*, 25(4), 333–344. [PubMed: 9304449]
- Sheras PL, Abidin RR, & Konold T (1998). Stress index for parents of adolescents Odessa, FL, USA: Psychological Assessment Resources.
- Smith TW, & Gallo LG (1999). Hostility and cardiovascular reactivity during marital interaction. *Psychosomatic Medicine*, 61(4), 436–445. [PubMed: 10443751]
- Sturge-Apple ML, Skibo MA, Rogosch FA, Ignjatovic Z, & Heinzelman W (2011). The impact of allostatic load on maternal sympathovagal functioning in stressful child contexts: Implications for problematic parenting. *Development and Psychopathology*, 23(3), 831–844. [PubMed: 21756435]

- Swain JE, Lorberbaum JP, Kose S, & Strathearn L (2007). Brain basis of early parent–infant interactions: Psychology, physiology, and in vivo functional neuroimaging studies. *Journal of Child Psychology and Psychiatry*, 48(3–4), 262–287. [PubMed: 17355399]
- Wichmann FA, & Hill NJ (2001). The psychometric function: II. Bootstrap-based confidence intervals and sampling. *Perception & Psychophysics*, 63(8), 1314–1329. [PubMed: 11800459]
- Wiener J, Biondic D, Grimbos T, & Herbert M (2016). Parenting stress of parents of adolescents with attention-deficit hyperactivity disorder. *Journal of Abnormal Child Psychology*, 44(3), 561–574. [PubMed: 26183609]
- Zhang X, Cui L, Han ZR, & Yan J (2017). The heart of parenting: parent HR dynamics and negative parenting while resolving conflict with child. *Journal of Family Psychology*, 31(2), 129–138. [PubMed: 28080081]

Table 1**Bootstrapped Correlations Among Primary Study Variables**

Variable	1	2	3	4	5	6	7
1. MP	–						
2. PP	–0.48 [–0.59, –0.36]**	–					
3. PARQ	–0.10 [–0.25, 0.06]	0.23 [0.07, 0.09]**	–				
4. SBP	0.03 [–0.12, 0.16]	0.03 [–0.11, 0.17]	0.12 [–0.07, 0.28]	–			
5. DBP	–0.03 [–0.18, 0.11]	0.05 [–0.10, 0.20]	0.11 [–0.03, 0.24]*	0.35 [0.01, 0.08]**	–		
6. HR	–0.13 [–0.28, 0.03]	0.17 [0.04, 0.28]*	–0.01 [–0.15, 0.14]	0.03 [–0.12, 0.19]	0.01 [–0.13, 0.15]	–	
7. NE	0.24 [0.10, 0.34]**	–0.22 [–0.37, –0.006]**	–0.44 [–0.60, –0.25]**	–0.01 [–0.13, 0.12]	–0.17 [–0.26, 0.03]	–0.01 [–0.17, 0.13]	–

Note. MP= maladaptive parenting; PP= positive parenting; PARQ= parent-adolescent relationship quality; SBP=parent systolic blood pressure reactivity; DBP= parent diastolic blood pressure reactivity; HR=parent heart rate reactivity; NE= parent negative emotional experience.

Bias corrected accelerated bootstrapped 95% confidence intervals are in brackets.

*

p<.05.

**

p<.01.

Table 2

Descriptive Statistics for Maternal Response to PAIT Measures

Response Measures	Mean	Standard Deviation	Minima	Maxima
SBP Pre PAIT	115.28	13.66	86.00	156.00
SBP Post PAIT	120.28	15.74	79.00	167.51
SBP reactivity to PAIT	4.24	11.65	-30.95	39.19
DBP Pre PAIT	68.39	9.44	51.00	96.00
DBP Post PAIT	72.83	10.13	50.00	103.22
DBP reactivity to PAIT	4.08	6.72	-16.08	24.24
HR Pre PAIT	72.31	10.41	49.50	101.70
HR Post PAIT	72.38	10.81	50.00	104.00
HR reactivity to PAIT	1.99	3.39	-8.18	12.16
Emotion Pre PAIT	1.87	2.32	0.00	14.00
Emotion Post PAIT	3.17	3.36	0.00	20.00
Emotional experience to PAIT	4.10	4.31	-8.00	20.00
Observed Maladaptive Parenting	1.43	0.67	1.00	4.00
Observed Positive Parenting	3.06	1.04	1.00	5.00
Reported Relationship Quality	42.73	6.21	19.00	75.00

Note. SBP= systolic blood pressure; DBP= diastolic blood pressure; HR=heart rate. Systolic and diastolic blood pressure are reported in millimeters of mercury and heart rate is reported in beats per minute.

Table 3.

Bootstrapped Regression Analyses Examining Maternal Reactivity to PAIT on Parenting Outcomes

Maternal Reactivity Variable	B	R ²	F	Unstandardized Coefficient		BCa 95% Confidence Interval	
				Bias	Standard Error	Lower Bound	Upper Bound
Observed Positive Parenting		.045 *	2.778 *				
HR	.060 *			-.001	.028	.008	.118
SBP	-.001			.000	.010	-.023	.020
DBP	.004			.001	.013	-.032	.042
Neg. Emotion	-.079**			.001	.025	-.122	-.029
Observed Maladaptive Parenting		.095**	3.85**				
HR	-.027 ^a			.001	.015	-.058	.002
SBP	.002			.000	.005	-.007	.012
DBP	-.003			.000	.007	-.017	.009
Neg. Emotion	.042**			.000	.010	.021	.061
Reported Parent-Adolescent Relationship		.134**	12.68**				
HR	-.016			.001	.096	-.224	.163
SBP	.121			-.005	.038	-.015	.116
DBP	-.031			.000	.060	-.145	.088
Neg. Emotion	-.367**			-.001	.115	-.703	-.230

Neg.= Negative

* study membership is a covariate in each model in Step 1 of the model