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# Fathers' Physiological Reactions to Child-Related Stimuli and Observed Fathering Behaviors

Brian D. Hunter
*University of North Florida*

# Fathers' Physiological Reactions to Child-Related Stimuli And Observed Fathering Behaviors

by

Brian D. Hunter

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The thesis of Brian David Hunter is approved: (Date)

Signature Deleted

Signature Deleted 7-2-04

Committee Chairperson 7/2/04

Accepted for the Department:

Signature Deleted

Chairperson 7-2-04

Accepted for the College:

Signature Deleted

Dean 7·6·04

Accepted for the University:

Signature Deleted

Dean of Graduate Studies 7-26-04

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Abstract

Child abuse studies have measured physiological reactivity of parents in response to several child- and nonchild-related stimuli. Abusive parents have responded to aversive stimuli, including that which is child-related, with atypical physiological reactivity, suggesting a trait of hyperreactivity. The current study tested the hypothesis that variation in observed parenting behaviors is associated with physiological reactivity to child-related stimuli. To explore this association, researchers measured fathers' skin conductance level, heart rate and respiration rate in reaction to video segments of a quiet, crying and happy infant, then scored observed father-child interactions for the use of parenting warmth and control across four interaction tasks. Additionally, hypotheses concerning the influence of parenting stress and reported child temperament on the observed fathering behaviors were explored.

Fathers' Physiological Reactions to Child-Related Stimuli

and Observed Fathering Behaviors

Several factors have been hypothesized and identified as influential in the relationship between parent and child. Belsky (1984) proposed a process model of parent functioning in which the separate personal characteristics of the parent and the child, as well as the contextual sources of stress and support, are thought to determine parenting behavior. This conceptualization invites new and beneficial variables and mandates the exploration of multi-directional influences in the relationships between parent and child. The current project, in a similar multi-directional approach, aimed to identify the relationships between fathers' reactions to child-related stimuli, self-reported parenting stress, reported child temperament and observed father-child interactions.

*Parent Reactivity*

Much of the current understanding of physiological reactivity of parents has stemmed from child abuse and aggression literature. Knutson's (1978) hyperreactivity model of child abuse proposed that abusive parents characteristically respond to aversive stimuli, including those that are child-related, in an aggressive manner. These parents, it is argued, display aggression toward their child because they possess a trait for responding to noxious stimuli with aggression. This form of child abuse, described as irritable aggression (Knutson, 1978), is a behavioral response that is provoked by noxious social behaviors and that is more extreme than the response that would be expected based on the characteristics of the noxious behaviors. This is in contrast to instrumental aggression, that which has been either positively or negatively reinforced over several interactions. Knutson (1978) suggested that the parent trait of hyperreactivity plays a role

in irritable aggression in that noxious child behaviors (e.g. urinating on the floor) sometimes, but not always, result in abuse. Thus, it is not that noxious behaviors evoke abuse; rather some parents have a higher probability of responding to these behaviors with aggression.

Several studies since the introduction of the hyperreactivity model have found evidence for systematic differences in affective and physiological reactivity between abusive and nonabusive mothers. Self-acknowledged abusive mothers experienced a greater increase in heart rate than nonabusive mothers in response to observing a video of a crying infant (Frodi & Lamb, 1980). These same mothers also reported more aversion and less sympathy for the crying infant displayed in the video (Frodi & Lamb, 1980). When these two groups of mothers were shown a video of the same infant smiling, the nonabusive mothers showed reactivity levels similar to those they displayed while at rest during a baseline period, whereas abusive mothers showed heightened reactivity similar to that observed during the presentation of the crying infant. These results, in conjunction with the participants' responses to a mood adjective checklist, suggest that the abusive mothers experienced the child-related stimuli as aversive regardless of the behavior of the child, while the non-abusive mothers appeared better able to differentially react to varying child stimuli (Frodi & Lamb, 1980).

A similar study found that abusive mothers not only responded to child-related stressors with heightened emotional and physiological arousal, but these mothers also remained more aroused than nonabusive controls during presentations of both stressful and nonstressful stimuli (Wolfe, Faribank, Kelly & Bradlyn, 1983). Consistent with Knutson's idea of hyperreactivity, these findings indicate a trait of oversensitivity to all

child-related stimuli in abusive mothers. Researchers also have found systematic differences in attributional styles between abusive and nonabusive mothers. Abusive mothers have consistently ascribed more malevolent intentionality to a child behaving inappropriately (Bauer & Twentyman, 1985), and also have minimized both their own contributions to negative parent-child interactions and their child's role in more positive parent-child interactions (Bradley & Peters, 1991).

Using questionnaires such as the Child Abuse Potential Inventory (Milner, 1986), researchers have been able to identify parents not previously suspected of child abuse for their level of risk for enacting child abuse. This "flagging" ability has allowed researchers to make comparisons between the reactivity of parents from a nonabusive population. Studies of this nature have shown high-risk mothers to have greater and more prolonged sympathetic activation (i.e. heart rate, skin conductance and respiration rate) in response to both child- and nonchild-related stressors (Cassanova, Domanic, McCanne, & Milner, 1992). Similar to comparisons made between abusive and nonabusive mothers, comparisons between high- and low-risk for child abuse mothers have revealed significant differences in affective reactivity to child stimuli. Milner, Halsey and Fultz (1995) categorized mothers as high- or low-risk then had them watch video segments of a quiet, happy and crying infant. After each video segment, mothers completed questionnaires designed to measure emotional reactions and various aspects of empathy. Because the dimensions of empathy were found to be intercorrelated, the researchers developed a composite score of general emotional reactivity. Comparisons of this composite score between high- and low-risk mothers showed that the high-risk mothers were more emotionally reactive to the behavior of the child. Taken together, the results of

these studies support the use of the hyperreactivity model in describing differences between abusive or potentially abusive mothers and a comparison group of nonabusive mothers. For an extensive review of the research on the physiological reactivity of known or potential child abusive mothers, see the article by McCanne and Hagstrom (1996).

The hyperreactivity model has been able to explain reactivity in comparisons of abusive or high-risk for abuse parents to control groups of nonabusive parents, but the model has not been extended to other parenting behaviors or tendencies. It is conceivable that if hyperreactivity is associated with abnormal parenting behavior (i.e. physical child abuse), observed differences in reactivity also might be associated with variations in a more normal range of parenting. Parents who are more warm and nurturing in general may show physiological reactivity different from that displayed by parents who are less warm in general. Unlike previous studies that relied on past parenting behavior (i.e. abuse vs. no abuse) the current study explored the relationship between parents' reactivity and parenting behaviors observed during parent-child interactions in a laboratory setting.

Another major limitation of the research concerning the hyperreactivity model is the focus on mothers, leaving questions about fathers mostly unexplored. One notable exception to this tendency is a study comparing the reactivity of mothers to fathers during the presentation of a smiling and a crying infant. In this study, fathers showed a greater increase than mothers in skin conductance and heart rate during the presentation of a crying infant stimulus (Brewster, Nelson, McCanne, Lucas, & Milner, 1998). The results of this study suggest that, on average, fathers show more reactivity than mothers to aversive child stimuli. Given this trend, differences in response tendencies for fathers should be at least as drastic as those previously observed in mothers, if not more drastic.

Thus, it may be possible to discern characteristic differences in reactivity among fathers without having to compare extremely divergent cases, such as those at high versus low risk for child abuse.

*Fathering Behavior*

The last three decades of the 20th century were witness to a relative explosion of parenting research incorporating fathers and fathering behavior. This interest has stemmed from numerous societal changes including the increasing number of mothers seeking careers rather than functioning as fulltime caregivers and the increasing number of single-parent families, including households in which fathers serve as single parents (Jain, Belsky, & Crnic, 1996). Research conducted in the realms of social, personality and developmental psychology as well as in medical and clinical arenas has begun to establish a rich and growing body of fathering research. For current reviews, see Tamis-LeMonda and Cabrera (2002) or Lamb (1997). Consistent with Belsky's (1984) proposed process model, Jain et al. (1996) established fathering types based on in-home observations of father-child interactions and were able to correlate these types with various characteristics of the fathers. Family demographics, father's personality, quality of marital relationship, and child characteristics were found to account for variation in fathering behaviors. Fathers categorized into the *playmate-teacher* type, for example, were more educated, had more prestigious occupations, were less neurotic, had more confidence in the dependability of others, and experienced fewer daily hassles than other fathers (Jain et al., 1996).

Fathering behaviors can be described in a multitude of ways. In the current study, researchers used a behavioral coding system developed by Belsky, Youngblade, Rovine

and Volling (1991) to analyze specific fathering behaviors observed during videotaped father-child interactions. An important aspect of a father's behavior that may strongly influence the father-child relationship over time is that of parental warmth (Belsky, 1984). Belsky et al. (1991) surmised that a father's warmth toward his child can be derived from specific actions that depict expressions of *positive affect, negative affect, positive feedback,* and *negative feedback*, with negative affect and negative feedback detracting from ratings of warmth. An interaction in which a father is smiling and laughing with his child, using an affirming tone of voice, and praising the child's behavior would be considered high in warmth.

Another parent variable thought to influence the parent-child relationship is the level of control that a parent attempts to exert over his child's behavior. Belsky et al. (1991) theorized that a parent's specific acts of *facilitation, intrusiveness, undercontrolling,* and *demands for self reliance* contribute as separate aspects to the single dimension of parental *control.* An interaction high in control might be one in which the father guides the child through a task with little allowance for the child to make her or his own decisions. Conversely, a father low in control fails to help the child when he or she clearly needs assistance or allows the child to stray from the assigned task. Warmth and control have been described as central and influential parameters of parental behavior (Belsky et al., 1991; Youngblade & Belsky, 1995).

Along with the dimensions of warmth and control, other aspects of fathering behavior that help to inform about a father-child relationship include fathers' *physical activity, spontaneous structure,* and *redirection.* A father who moves quickly through a room and physically manipulates available interaction materials would be rated higher in

physical activity than a father who merely sits in a chair throughout an interaction task. Spontaneous structure reflects a father's use of rules or limit-setting beyond those immediately imposed by the situation. Examples of this would include taking turns, keeping score, or creating a game out of present materials. Redirection can be defined as the number of times that a father prompts his child to attend to a current task rather than distract to engage in other activities. These three ratings were developed for the current investigation in order to explore a wider range of fathering behavior than that which has been examined in prior research. Although it has not been included in previous research concerning parental control, redirection was included as an aspect of the parental control in the current investigation because of its similarity to the other control constructs. Physical activity and spontaneous structure were separately explored as facets of fathering independent of warmth and control.

*Child Temperament*

Since its conception, the idea of temperament has been described in several ways. For the current study, temperament is conceptualized as biologically based individual differences in behavioral tendencies that are present in early life and are relatively stable across situations and over time (Ball, Pelco, Havill, & Reed-Victor, 2001). Temperament is arguably the core of child behavior and personality. Several studies have demonstrated the pervasiveness of temperament, linking temperamental qualities to constructs such as parental involvement and parenting stress. Parents of children perceived as less emotionally intense have reported lower levels of parenting stress (McBride, Schoppe, & Rane, 2002). Fathers who perceived their daughters as low in sociability scored lower in parental involvement than other fathers (McBride et al., 2002). Mothers of hyperactive

children were more directive and negative than mothers of normal children (Mash & Johnston, 1982). Across the transition to parenthood, fathers of difficult infants reported lowered feelings of control and efficacy, whereas fathers of easy infants reported an increased sense of control (Sirignano & Lachman, 1985). As evidenced by these findings, child temperament may have profound effects on the interactions between parent and child. Children perceived as having negative temperamental characteristics such, as high impulsivity, may provoke more controlling or harsh parenting behaviors from their parents (Braungart-Reiker, Garwood, & Stifter, 1997).

In the current study, fathers completed the Temperament Assessment Battery for Children - Revised (TABC-R; Martin & Bridger, 1998) to provide researchers with a measurement of each child's temperamental tendencies. This parent-report questionnaire describes child temperamental characteristics along two dimensions, inhibition and impulsivity. The inhibition scale is designed to assess a child's tendency to physically withdraw or to become emotionally upset in novel situations. The child's tendencies to become emotionally upset, to engage in energetic gross motor activity, to show persistence on difficult tasks, and overall attention level are assessed by the impulsivity scale (Martin & Bridger, 1998).

*Parenting Stress*

It has been proposed that child temperament can influence parenting behavior by increasing or decreasing the level of stress for the parent (McBride et al., 2002). The stress associated specifically with the parenting role has been deemed parenting stress. This concept has received special attention in studies of parent-child interaction. Mothers of temperamentally difficult children have reported higher levels of parenting stress in

general (Gelfand, Teti, & Radin Fox, 1992) and have more specifically reported doubts about their parenting competence and feelings that the parenting role is restrictive (Sheeber & Johnson, 1992). These findings by Sheeber and Johnson illustrate two of the various topics that can be included as part of the larger construct of parenting stress. In the current study, fathers' self-reports of parenting stress were assessed via the Parenting Stress Scale (PSS; Berry & Jones, 1995). Items on this scale cover closeness with one's children, satisfaction with the parental role, positive and negative emotions related to being a parent, and difficulties associated with being a parent.

*Hypotheses*

The multidimensional nature of this study allowed for the exploration and testing of several hypotheses. Due to the nature of the variables under investigation, however, determination of causal relationships was not possible. Thus, all of the hypotheses pertain to directions of correlation between the variables. The physiological reactivity of the fathers was hypothesized to correlate with the parenting behaviors observed during the interaction tasks. Researchers predicted that fathers rated as low in warmth and those high in control would respond to the video of the crying infant with greater increases in physiological arousal than fathers rated as high in warmth and low in control, respectively.

Researchers hypothesized that self-reported parenting stress, as measured by scores on the PSS, would correlate with fathers' reports of their child's temperament. Specifically, fathers who rate their child as higher in impulsivity and lower in inhibition, as reported on the TABC-R, would report higher levels of parenting stress. Further, it was

hypothesized that fathers who report higher levels of parenting stress would show more control and less warmth behaviors during the interaction tasks.

In addition to correlating with parenting stress, it was hypothesized that fathers' reports of their child's temperament would correlate with the parenting behaviors observed during the interaction tasks. Specifically, it was thought that fathers who report their child as being more inhibited would show less spontaneous structure and less physical activity due to the child's shyness anxious nature. Conversely, fathers who report their child as being more impulsive would provide more spontaneous structure and would show greater physical activity to keep up with the child's lack of task persistence and high activity level.

## Method

### *Participants*

Twenty-four father-child dyads were recruited from childcare facilities in the greater Jacksonville, Florida area and from undergraduate psychology courses at a local public university. At the time of the study, the average ages of the fathers and children were 35.58 years ($SD$ = 8.28, range: 23-59) and 53.38 months ($SD$ = 9.83, range: 36-72), respectively. Eighteen of the fathers (75%) reported their ethnicity as Caucasian, three (12.5%) reported being Pacific Islanders, two (8.3%) reported Hispanic and one (4.2%) reported Asian ethnicity. The estimated yearly income for the fathers ranged from $20,000 to $100,000, with a mean of approximately $43,000 ($SD$ = $26,000). The two most frequently reported levels of education for the fathers were high school diploma and graduate degree, with six (25%) fathers reporting each. Additionally, five (20.8%) fathers indicated having obtained either a B.A. or a B.S. degree, while four (16.7%) and two

(8.3%) of the fathers reported having obtained an AA degree or having completed some college, respectively.

Fliers giving a brief description of the study and listing incentives for participation as well as researcher contact information were posted at the recruiting sites. Interested fathers were interviewed via telephone to ensure that the following characteristics were met: a) target child was between 3 and 5 years old, b) biological mother and father of the target child were currently married and sharing residence, c) no history of child abuse by the biological mother or father of the target child, d) neither mother, father, nor child had received treatment for mental illness or drug abuse since the birth of the target child. Father-child pairs who did not meet these criteria were thanked for their time and were not further pursued for participation. Father-child pairs who satisfied these criteria were told more about the study. Fathers who were still interested after the study was more fully explained scheduled a time to complete the laboratory portion of the study. Although limiting participation based on these criteria somewhat constricted the generalizability of the findings, controlling for variables such as drug abuse history helped to maintain internal validity.

Researchers mailed a participant package containing an informed consent form (Appendix A), a consent for videotaping form (Appendix B), the Parenting Stress Scale, the Temperament Assessment Battery for Children-Revised: Parent Form, and a demographics questionnaire (Appendix C) to participating fathers. Also included in the package was a description of the study and directions to the on-campus laboratory. Fathers brought the completed questionnaires with them to the scheduled laboratory appointment. At the lab, researchers again explained the study and asked the fathers to

give their informed consent for participation. Upon completion of the questionnaires and the laboratory tasks, participants were paid $20.00 and given a small toy. All participants were treated in accordance with the Ethical Principles of Psychologists and Code of Conduct (American Psychological Association, 1992). All procedures were reviewed and approved by the Institutional Review Board of the university at which the research was conducted. Video equipment malfunction while recording the father-child interaction barred two of the fathers from inclusion in the analyses of parenting behavior.

*Self-Report Instruments*

*Parenting Stress Scale (PSS).* The PSS (Berry & Jones, 1995) measures respondents' perceptions of stress associated with the parenting role. Fathers denote their level of agreement with 18 statements on a 5-point scale ranging from *strongly disagree* to *strongly agree*. Statements pertain to topics including closeness with child, satisfaction with the parenting role, positive and negative emotions associated with parenting, and difficulties associated with parenting (e.g. "Caring for my child sometimes takes more time and energy than I have to give"). Scores on each item range from 1 to 5, with a score of 5 indicating the highest level of stress on 10 of the 18 items. The remaining eight items are reverse scored. An overall score of parental stress is obtained by summing the scores on each of 18 items, accounting for negative scoring where necessary. These summed scores can range from 18 to 90, with 90 indicating highest levels of parental stress. The PSS has a reported Chronbach's alpha of .83, and a 6-week test-retest reliability coefficient of .81. The PSS correlates well with other inventories of parental stress ($r$= .41 to .75.)

*Temperament Assessment Battery for Children-Revised: Parent Form (TABC-R).* The TABC-R (Martin & Bridger, 1998) is designed to characterize child temperament based on parents' responses to questions about the frequency of various child behaviors. Parents respond to 37 items using a 7-point Likert-type scale ranging from *hardly ever* to *almost always* (e.g. "When my child becomes angry about something, it is difficult to get him/her out of this mood"). Parents base their answers on the child's behavior during the previous three months. Responses load onto two scales, inhibition and impulsivity. Scores on these two scales are obtained for each child by summing the parent responses on appropriate items, taking into account reverse scoring where necessary. Questions that load onto the inhibition scale assess the child's tendency to socially withdraw or to become upset in novel situations. A child high in inhibition might hide behind a parent, act overly shy, or become emotionally upset during visits to the doctor. The impulsivity scale score is made up of three subscales: negative emotionality, activity level, and lack of task persistence. A child high in impulsivity tends to throw tantrums or act out when he is unhappy, engages in activities involving gross body movement, and is easily discouraged by difficult tasks. The raw scores for inhibition and impulsivity are converted to normalized t-scores based on the child's age. For the present study, child temperament was identified in terms of the obtained t-scores on the inhibition and impulsivity dimensions of the TABC-R. This allowed child temperament to be evaluated in terms of continuous scale scores rather than temperamental types (Martin & Bridger, 1998).

Reported Chronbach's Alpha ($\alpha$) for the temperament scales are .84 for inhibition and .90 for impulsivity. One-year test-retest coefficients range from .59 to .76 for the

temperamental scales, including the impulsivity subscales. Comparisons between the scores reported by mothers and fathers on the same child indicate that fathers tend to report slightly higher scores across all scales. This is not an issue of concern for the current study, as only fathers will be reporting on the temperament of the child. Factor analysis of the TABC-R scales supports the validity of the battery.

*Demographics Questionnaire*. The demographic questionnaire provided researchers with information about the age, education level, and income of both the mother and the father (see Appendix C). This questionnaire also served as a second check of the families' status on the recruiting criteria.

*Child-Related Stimuli*

Researchers measured fathers' physiological reactions to one of two 20-minute videotapes made up of distinct segments of infant behavior. These same video segments have been used in several other studies examining physiological reactions to child-related stimuli (Casanova, Domanic, McCanne, & Milner, 1994; Milner et al., 1995; Brewster et al., 1998.) These color video segments show a healthy, 5-month-old, white, female infant sitting in a car seat, which was placed at a 30-degree angle to the camera in front of a white backdrop (Casanova et al., 1994). The infant was shown wearing a gender-neutral, yellow one-piece outfit. Each videotape had two 6-minute stimuli segments separated by a 4-minute gap during which the television screen was black. Each tape showed the infant laughing and crying during separate 2-minute segments that were preceded and followed by an identical 2-minute segment of the child sitting quietly. The stimulus segments were counterbalanced, and fathers were randomly assigned either view the quiet-crying-quiet segment first or the quiet-happy-quiet segment first.

Casanova and colleagues (1994) assessed the content validity of each of the videotape segments as part of their original study. They had 10 female volunteers watch the segments and indicate the behavior of the infant at the segment's completion. The participants identified the infant as smiling, crying, or being quiet in the expected manner for each segment. When the same volunteers were asked to identify the infant's gender, 50% indicated that the infant was female, and 50% indicated that the infant was male (Casanova et al., 1994).

*Physiological Apparatus*

Researchers measured fathers' physiological responses to the child behavior videotapes using an ADInstrument Powerlab/4S interfaced with a Dell Optiplex GX1 computer. Elctrodermal sensors and a photoelectric phethsymograph attached to the right hand measured skin conductance and heart rate. Researchers continuously measured heart rate during all video segments with the Powerlab/4SP and an MLT1010 Pulse Transducer. Using the Powerlab/4SP and an MLT1132 Respiratory Belt Transducer strapped with Velcro around the participant's chest, researchers continuously measured respiratory rate. Researchers continuously recorded skin conductance using the Powerlab/4SP, an ML116 GSR Amp and dry polarized electrodes attached with Velcro straps to the index and ring fingers of each father's right hand. A constant current of 5 microamperes was applied across the skin resistance electrodes. The GSR Amp was optically isolated to ensure that participants were protected from shock and to prevent contamination of data from any fluctuations in nearby electrical currents. This level of protection for participant safety while using these physiological measures is approved to the IEC601.1 body protection (BF rating) standard for all human connections.

*Interaction Materials*

The area of the laboratory in which the father-child interactions occurred, the play room, housed various attractive toys such as matchbox cars, dolls, puzzles, books, a play kitchen, crayons and paper, and age appropriate action figures. Also in this area was a large plastic laundry basket. The *clean-up* task involved the father instructing the child to put a prearranged "mess" of toys into the laundry basket. Prior to the father and child entering the play room, a research assistant arranged 9 toys on the floor. The arrangement was held constant for all dyads. For the *tower building* task, dyads were given access to 54 small wooden blocks which measured approximately 12.7 cm x 2.54 cm x 2.54 cm. The dyad used these blocks to build a tower with the stipulation that the father was not allowed to actually manipulate the blocks himself. For the *ball-play* task, dyads were given an inflated rubber ball approximately 20.32 cm in diameter. The dyads were instructed to play with the ball in any manner they wished. In the *chin soccer* task, dyads passed a 10.16 cm foam soccer ball back and forth with the ball clutched between each person's chin and chest.

The clean-up task ended when the child successfully placed all of the toys into the basket or after 4 minutes had elapsed. The other three tasks, tower building, ball-play and chin soccer, each had a 4-minute time limit. Fathers were given both verbal and written instructions for all of the tasks except for the clean-up task for which they received only verbal instructions

*Interaction Recording Devices*

Researchers videotaped all father-child interactions through a one-way mirror with a digital video camera. Along with recording dyadic interactions, the camera

displayed a minute and second counter. An external microphone hanging from the ceiling of the play room to allowed for better sound recording. The camera was wired to an external monitor to allow researchers recording the father-child interactions to closely observe the dyad in real time.

*Procedure*

After interested fathers were screened via a telephone interview, researchers scheduled a time for the father and child to come to the laboratory and also sent a participant package in the mail. The participant package included the Demographic Questionnaire, the PSS, the TABC-R and the informed consent pages. The package also included directions to the university campus and to the laboratory on campus. Fathers were asked to complete the questionnaires before arriving at the laboratory for their appointments.

When participating father-child dyads arrived at the on-campus laboratory, they entered the play room. While one research assistant, the father researcher, explained the study and the informed consent once again to the father, another research assistant oriented the child to the toys in the room. This research assistant, the child researcher, stayed with the child in the play room. After the father researcher finished giving the instructions to the father, he/she escorted the father into the physiology room for the physiological reactivity assessment. If the child had difficulty with the father leaving the room, the father was allowed to return to the play room to comfort the child. Once the child was comfortable with the situation, the father was once again escorted to the physiological room to begin the physiological reactivity portion of the study.

Once in the physiology room, the father sat in a reclining chair while the researcher attached the sensors for recording the father's heart rate, skin conductance level, and respiratory rate. For the first 15 fathers, the electrodermal sensors were placed on the volar surfaces of the distal phalanges of the second and fourth fingers. For the remaining fathers, the electrodermal sensors were placed on the volar surfaces of the medial phalanges of the second and fourth fingers. Researchers implemented this change with the hopes of attaining more accurate measures of skin conductance level. (For more on this and other notes on the use of the Powerlab system, see Appendix D.) The researcher gave the father final instructions and answered any further questions that the father had about this portion of the study. When all of the instructions were given, the researcher started the video and the physiological data recording program.

Researchers randomly assigned fathers to view one of two infant stimulus videotapes. The tapes were identical except for the order of the happy and crying segments. Fathers assigned to Tape 1 viewed the happy segment before viewing the crying segment, while fathers assigned to Tape 2 viewed the crying segment before viewing the happy segment. For the first 4 minutes of the physiological recording, each father sat facing a black television screen. The television was on, but only a black screen was displayed. The data collected during the fist 2 minutes of the black screen were discounted, as the father was still adjusting to the surroundings. Data collected during the second 2 minutes of black screen served as a resting baseline. The 4 minutes of black screen were followed by a 2-minute video segment of the child being quiet. This was followed by a 2-minute segment of the child either laughing or crying, depending on which tape the father was randomly assigned to view, then 2 more minutes of the child

being quiet. A 4-minute black screen identical to the first 4-minute period preceded the second sequence of stimuli segments. Just as before, only the second 2 minutes of this segment were examined. The father again observed the quiet child segment for 2 minutes before viewing either the laughing or crying child segment, whichever was not shown in the first stimuli sequence. The final 2 minutes of the video showed the child being quiet once again. Researchers used the physiological recording equipment to continuously record each father's physiological reactivity throughout the stimulus videotape. Fathers viewed the stimulus tape while sitting approximately 1.52 m from a 48.26 cm television placed at eye-level. The volume of the television was held constant for all fathers.

Having the stimulus videotapes arranged in the manner described above allowed for not only the comparison between specific segments (i.e. laughing vs. crying), but also a comparison of the transitions from one segment to the next. While the black screen segments served as resting baseline periods, each quiescent segment served as the baseline for the stimulus segment directly following. Thus, the reactivity of the fathers could be tracked as they observed a black screen, a quiet child, and then either a laughing or crying child. The quiescent segments immediately following the laughing and crying segments allowed the researchers to explore the duration of the fathers' changes in arousal after the removal of a stimulus.

The researcher remained in the physiology room with the father at all times to discretely monitor the physiological recording and to take notes on the data collection. This research assistant recorded any movements or irregular behavior of the father that might have interrupted the physiological data collection. Following the completion of this segment, the researcher detached the father from the recording apparatus and escorted

him to the hallway just outside of the laboratory. The child researcher brought the child out of the play room to meet the father in the hallway. Researchers offered a small snack to both father and child and the two had a 5-minute break before starting on the interaction tasks.

During this break, researchers arranged the toys in the play room for the clean-up task and prepared the video camera for recording the father-child interactions. While still in the hallway, the child researcher instructed the father to instruct the child to clean up the toys in the play room. The instructions were for the father to encourage the child, but not actually clean up the toys himself. Once the child researcher made sure that the father understood the instructions, the father and the child entered the play room and started on the clean-up task. This served as the first interaction task for the dyad. If the child had not yet picked up the toys at the end of 4 minutes of prompting, the child researcher entered the play room and finished cleaning up the toys.

At the completion of the clean-up task, the child researcher entered the room and delivered the instructions for the tower-building task. The child researcher answered any questions that the father had before leaving the play room. For this task, the father instructed the child on how to build a tower out of the provided wooden blocks. As with the clean-up task, the father could give instructions, but could not actually manipulate the blocks himself. The dyad worked together to try to build the tower as tall as possible. If the tower toppled, the father was to instruct the child to try to build one even taller than the first. Once 4 minutes had passed, the child researcher entered the play room, helped the child clean up the blocks, and delivered the instructions for the ball playing task. Again, the child researcher answered any questions before leaving the play room. For this

third interaction task, father and child were given an inflated rubber ball to play with. The father was instructed to play with the child in any manner that he wished, as long as it involved the rubber ball. This task was very low in structure and provided the father-child pairs with an opportunity to create their own games. This also gave the father an opportunity to engage the child in an activity that was assumed to be fairly familiar, allowing for a more naturalistic interaction. At the end of the 4-minute time limit, the child researcher entered the play room and delivered the instructions for the final interaction task, answered any questions and left the room.

The final interaction task involved the father and child passing a foam soccer ball back and forth to one another using only their chins and chests to hold the ball. Each person held the ball between their chin and chest while the other person tried to grab the ball using only their own chin and chest. This task demanded a level of physical closeness between father and child typical of more the rough and tumble play that characterizes father-child interactions (Lindsey & Mize, 2001). Once 4 minutes had passed, the researchers entered the room to notify the dyad that they had completed all of the required tasks. As payment for their participation, fathers were given $20.00, and the child was allowed to take a small toy from a treasure chest. Researchers debriefed the dyad and answered any questions that they may have had about the study.

*Behavioral Data Collection*

Independent raters watched the videotaped father-child interactions and rated eight aspects of fathering behavior using ratings of 1 to 5 (*never* to *almost constantly*) to establish each father's use of warmth and control. Fathers were rated on their positive affect (e.g. smiling, laughing or displaying positive emotions), positive feedback (e.g.

verbal praise of the child's behavior), negative affect (e.g. displaying negative emotions, demeaning the child or speaking harshly), and negative feedback (e.g. verbal disapproval of the child's behavior). Ratings on these behaviors were used to calculate each father's use of warmth (Youngblade & Belsky, 1995). Fathers were also rated on their use of control, calculated from ratings of facilitation (e.g. answering the child's questions, offering task-specific help, reminding the child of the rules or goals of the task), intrusiveness (e.g. ill-timed or excessive controlling, discouraging the child from trying her/his own way, dictating each move that the child should make), undercontrolling (e.g. not providing support or assistance when it would seem helpful to the child, allowing the child to play with toys other than those assigned for the task, lack of interest or concern in what the child is doing), and demands for self reliance (offering choices to the child, pursuing child-directed goals, allowing the child to influence the interaction) (Youngblade & Belsky, 1995).

Along with rating fathers' warmth and control, researchers observed and rated fathers' physical activity, spontaneous structure, and use of redirection. For physical activity, fathers earned a rating from 1 to 5 based on whether they were sitting or standing, manipulating toys, and how they moved about the room. For example, if the father was observed sitting still in a chair, talking to the child but not using his body to interact with the child or the surrounding environment, the father would receive a 1 for the observed time period. Conversely, if raters observed the father walking, crawling or otherwise moving quickly throughout the room and manipulating toys or the child, the father would receive a rating of 5 for the observed time period. Similarly, fathers earned ratings on spontaneous structure by using rules or structure beyond those imposed by the

researchers. For example, a rating of 1 indicated that a father did not impose any rules or provide any structure beyond that which was given in the directions for the interaction task. A rating of 5 indicated that a father created a rule-structured game using toys from the environment or his body as a prop (e.g. using the Hula-hoop to play basketball during ball playing task). The final rating, redirection, indicated the number of times that the father had to prompt the child to continue playing the appropriate game. Ratings ranged from 1 to 5 (*never* to *almost constantly*). Researchers established inter-rater reliability for each behavior rating prior to the scoring of the father-child interactions. The five father-child interaction raters independently watched and judged sixteen 1-minute interaction clips after being trained on the behavior ratings. The video clips were randomly sampled from all of the recorded father-child interactions. Chronbach's Alphas for the behavior ratings ranged from .827 for positive affect to .957 for physical activity. Table 1 shows the reliability coefficients for each of the 11 behavior ratings.

Table 1.
*Inter-rater Reliability Coefficients for Parenting Behavior Rating Scales*

| Behavior Rating | Chronbach's Alpha |
|---|---|
| Positive Affect | .943 |
| Positive Feedback | .827 |
| Negative Affect | ----- |
| Negative Feedback | .889 |
| Facilitation | .900 |
| Intrusiveness | .917 |
| Undercontrolling | .955 |
| Demands for Self Reliance | .885 |
| Physical Activity | .957 |
| Spontaneous Structure | .886 |
| Redirection | .879 |

*Note.* Chronbach's Alpha could not be computed for Negative Affect due to lack of variability within the raters. None of the fathers displayed behavior that the raters judged as representative of Negative Affect.

Raters recorded a value for each parenting behavior at the end of each minute of interaction. Thus, fathers were given a maximum of 16 ratings for each target behavior, one for each minute of interaction. Several fathers received fewer than 16 ratings, however, because their child finished the clean-up task in fewer than 4 minutes. The behavioral ratings for each minute were averaged for each interaction task. These obtained means were then averaged across the four tasks, yielding 11 behavior scores for each father. Fathers' warmth and control scores were calculated using these computed behavior scores. Summing the averages for positive affect, positive feedback, and the reversed scores for negative affect and negative feedback yielded a composite score for warmth. Similarly, researchers summed the averages for facilitation, intrusiveness, and redirection along with the reversed scores for demands for self reliance and undercontrolling to achieve a composite score for control. Researchers included the mean score for redirection in the calculation for control as an attempt to create a composite score indicative of a wide range of controlling behaviors. Researchers calculated medians for the warmth and control scores, and classified fathers separately as either high or low in warmth and either high or low in control.

*Physiological Data Collection*

Researchers divided all of the physiological data recorded into 15-second epochs. Calculations performed on the data yielded means for skin conductance level, heart rate and respiratory rate for each 15-second epoch. Because each video segment (e.g. crying infant) was 2 minutes long, there was a total of 8 means calculated for each physiological measure for each segment. Thus, a total of 64 means were calculated for each father on each physiological measure.

## Results

### *Demographic Characteristics*

Preliminary analyses were conducted to explore possible differences in demographic characteristics between fathers high and low in warmth and control. Due to video recording malfunction, the interaction tasks for two of the fathers could not be scored. Thus, 22 fathers were included in all analyses pertaining to warmth and control. Table 2 summarizes the demographic information collected on the households of the fathers participating in the study. For all comparisons, the alpha level was set at .05.

Table 2.
*Means (Standard Deviation) for Demographic Characteristics of Fathers Rated on Warmth and Control*

| | Warmth | | Control | |
|---|---|---|---|---|
| | High | Low | High | Low |
| Father's Age in Years | 34.82 (9.96)[a] | 36.64 (6.81)[a] | 36.42 (7.50)[b] | 34.90 (9.68)[c] |
| Mother's Age in Years | 32.73 (7.91)[a] | 34.36 (6.49)[a] | 34.50 (6.45)[b] | 32.40 (8.03)[c] |
| Child's Age in Months | 53.91 (11.92)[a] | 51.11 (6.48)[a] | 54.33 (10.17)[b] | 50.20 (8.56)[c] |
| Father's Estimated Yearly Income | $45,636 ($26,624)[a] | $39,200 ($27,639)[c] | $36,333 ($23,557)[b] | $50,888 ($29,552)[d] |
| Mother's Estimated Yearly Income | $15,363 ($16,415)[a] | $22,700 ($33,373)[c] | $18,363 ($15,603)[a] | $19,400 ($34,254)[c] |
| Number of People in Household | 3.73 (.65)[a] | 4.36 (1.29)[a] | 4.08 (1.08)[b] | 4.00 (1.05)[c] |

*Note.* All differences between groups are non-significant, $p > .05$.
[a] $n = 11$. [b] $n = 12$. [c] $n = 10$. [d] $n = 9$.

Fathers rated as high and low in warmth did not show statistically significant differences in their age, the child's age, the age of the child's mother, father's or mother's annual income, or household size. Similarly, fathers grouped as high or low in control did not show statistically significant differences on these same characteristics. Further Chi-

squared analyses showed that fathers high and low in warmth did not show statistically significant differences with regard to their ethnicity, their education level, their employment status, or the gender of the target child. These comparisons are displayed in Table 3, along with comparisons and non-statistically significant results for fathers rated as high or low in control.

Table 3.
*Number (Percentage) of Participants Rated as High and Low in Warmth and Control for Non-continuous Demographic Characteristics of the Child and the Father*

| | Warmth | | Control | |
|---|---|---|---|---|
| | High | Low | High | Low |
| Child's Gender | | | | |
| Female | 5 (22.7%) | 5 (22.7%) | 5 (22.7%) | 5 (22.7%) |
| Male | 6 (27.3%) | 6 (27.3) | 7 (31.8%) | 5 (22.7%) |
| Father's Ethnicity | | | | |
| Caucasian | 9 (40.9%) | 8 (36.4%) | 9 (40.9%) | 8 (36.4%) |
| Hispanic | 1 (4.5%) | 1 (4.5%) | 0 (0.0%) | 2 (9.1%) |
| Pacific Islander | 1 (4.5%) | 2 (9.1%) | 3 (13.6%) | 0 (0.0%) |
| Father's Education | | | | |
| High School | 4 (19.0%) | 2 (9.5%) | 4 (19.0%) | 2 (9.5%) |
| Some College | 1 (4.8%) | 1 (4.8%) | 2 (9.5%) | 0 (0.0%) |
| A.A. Degree | 2 (9.5%) | 2 (9.5%) | 3 (14.3%) | 1 (4.8%) |
| B.A. or B.S. Degree | 1 (4.8%) | 4 (19.0%) | 2 (9.5%) | 3 (14.3%) |
| Graduate Degree | 3 (14.3%) | 1 (4.8%) | 1 (4.8%) | 3 (14.3%) |
| Father's Employment Status | | | | |
| Employed | 10 (45.5%) | 10 (45.5%) | 11 (50.0%) | 9 (40.9%) |
| Unemployed | 1 (4.5%) | 1 (4.5%) | 1 (4.5%) | 1 (4.5%) |

*Note.* All differences between groups are non-significant, $p > .05$.

Because of the influence of a child's mother in father-child interactions, fathers high and low in each of warmth and control were compared based on characteristics of the mother. These comparisons are presented in Table 4. Results of separate Chi-squared analyses revealed no statistically significant differences between fathers categorized as high and low in warmth or high and low in control based on the mother's ethnicity, her education, and the mother's employment status.

Table 4.
*Number (Percentage) of Participants Rated as High and Low in Warmth and Control for Non-continuous Demographic Characteristics of the Mother*

| | Warmth | | Control | |
|---|---|---|---|---|
| | High | Low | High | Low |
| Mother's Ethnicity | | | | |
| African American | 0 (0.0%) | 1 (4.8%) | 1 (4.8%) | 0 (0.0%) |
| Caucasian | 7 (33.3%) | 7 (33.3%) | 7 (33.3%) | 7 (33.3%) |
| Hispanic | 1 (4.8%) | 1 (4.8%) | 0 (0.0%) | 2 (9.5%) |
| Pacific Islander | 1 (4.8%) | 0 (0.0%) | 1 (4.8%) | 0 (0.0%) |
| Other | 2 (9.5%) | 1 (4.8%) | 3 (14.3%) | 0 (0.0%) |
| Mother's Education | | | | |
| High School | 3 (13.6%) | 2 (9.1%) | 3 (13.6%) | 2 (9.1%) |
| Some College | 1 (4.5%) | 0 (0.0%) | 1 (4.5%) | 0 (0.0%) |
| A.A. Degree | 3 (13.6%) | 2 (9.1%) | 3 (13.6%) | 2 (9.1%) |
| B.A. or B.S. Degree | 2 (9.1%) | 6 (27.3%) | 5 (22.7%) | 3 (13.6%) |
| Graduate Degree | 2 (9.1%) | 1 (9.1%) | 0 (0.0%) | 3 (13.6%) |
| Mother's Employment Status | | | | |
| Employed | 6 (46.2%) | 7 (31.8%) | 9 (40.9%) | 4 (18.2%) |
| Unemployed | 5 (55.6%) | 4 (18.2%) | 3 (13.6%) | 6 (27.3%) |

*Note.* All differences between groups are non-significant, $p > .05$.

*Physiological Reactivity*

In order to examine differences in physiological reactivity to the stimulus video between groups of fathers, it was necessary to first look for differences in baseline physiological arousal. To accomplish this, researchers compared the physiological data collected during the first 4 minutes of data collection, while the fathers watched a blank television screen that was followed by a video of a quiescent infant. These 4 minutes were identical for all fathers. Any statistically significant difference between groups observed during this time period would indicate differences in resting physiological arousal. Researchers conducted separate 2 x 16 (high/low x 15-second measurement periods) repeated measures univariate analyses of variance (RMANOVA) for warmth and control with measurement period as the repeated measure to examine the possible differences in heart rate and skin conductance level. Because Mauchly's Test of Sphericity was statistically significant for all RMANOVAs, the more conservative Greenhouse-Geisser *F* was examined and is reported unless otherwise specified. No statistically significant differences were found in heart rate between fathers high and low in warmth or high and low in control. Additionally, the tests revealed no statistically significant differences in skin conductance level between fathers high and low in warmth or high and low in control.

Because of the use of two different stimulus tapes, which differed in the order in which the video segments were presented, it was necessary to explore the effect of stimulus presentation order on the arousal of the fathers. To accomplish this, researchers employed separate 2 x 16 (presentation order x 15-second measurement periods) repeated measures analyses of variance for heart rate and skin conductance level recorded during

the first and second stimulus periods. For half of the fathers, the first stimulus period showed the infant laughing and smiling for 2 minutes. The other half of the fathers viewed the crying infant for 2 minutes for the first stimulus period. The groups of fathers later viewed either the smiling or the crying infant during the second stimulus segment, whichever they had not viewed previously. Results of the RMANOVAs show that there was not a statistically significant difference in either heart rate or skin conductance level based on the order in which the segments were presented. Because there was not a significant difference in the presentation order of the video segments, the data were recoded so that identical segments could be collapsed into a single variable (e.g. data were appropriately divided into happy or crying regardless of which segment fathers viewed first).

To test the main hypothesis of the study, that fathers categorized as either high or low in warmth and control would differ in their physiological reactivity to the child-related stimuli, researchers conducted separate 2 x 16 (high/low x 15-second measurement interval) RMANOVAs on heart rate and skin conductance level, with measurement interval as the repeated measure. These analyses compared the physiological arousal (e.g. heart rate and skin conductance level) of the fathers categorized as high or low in warmth and high or low in control across various infant stimulus video segments. Of primary interest were the happy and crying segments. Instead of only comparing the data collected between these two segments, however, researchers also examined intervals from the quiescent segments both preceding and following the happy and crying segments. Due to limited degrees of freedom, the analyses could include only 1 minute from each of the quiescent periods. Thus, the last

four 15-second intervals of the preceding quiescent segment and the first four intervals of the quiescent segment following the happy and crying segments were used. Further, to account for individual differences in resting heart rate, the last 15-second interval of the baseline period preceding the stimulus segments was entered as a covariate for all analyses of heart rate.

Results of Mauchly's Test of Sphericity was statistically significant for all eight comparisons, $p < .05$, thus the more conservative Greenhouse-Geisser $F$-statistics were examined. Across all comparisons, differences between groups (e.g. high vs. low control during the crying segment) were not statistically significant. Table 5 displays obtained $F$-values for all between-group comparisons.

Table 5.
*Comparisons of Physiological Arousal Between Fathers High and Low in Each Parenting Behavior During Happy and Crying Infant Video Segments*

| | High vs. Low | | | |
|---|---|---|---|---|
| | Warmth | | Control | |
| | *df* | *F* | *df* | *F* |
| Heart Rate | | | | |
| Happy | 6, 105 | 0.72 | 6, 106 | 0.90 |
| Crying | 2, 38 | 1.95 | 2, 36 | 0.45 |
| Skin Conductance Level | | | | |
| Happy | 2, 32 | 0.43 | 2, 33 | 1.82 |
| Crying | 2, 49 | 1.14 | 2, 49 | 1.81 |

*Note.* Reported values are from the Greenhouse-Geisser $F$ table, $p > .1$ for all comparisons.

*Fathering Behaviors, Parenting Stress and Child Temperament*

To examine the associations between parenting stress, child temperament, and observed parenting behaviors, researchers performed a series of independent samples *t*-tests and bivariate correlational analyses. Results of the *t*-test comparing the PSS scores of fathers high ($M = 31.60$, $SD = 5.62$) and low ($M = 27.00$, $SD = 4.11$) in control were statistically significant, $t(18) = -2.09$, $p = .05$, $d = .945$. The large effect size indicates that fathers who were rated as high in control reported higher levels of parenting stress than those rated as low in control. A statistically significant difference also was found for fathers' reports of their children's general inhibition between fathers rated as high (TABC-R T-score $M = 50.45$, $SD = 6.36$) and low ($M = 43.00$, $SD = 5.94$) in control, $t(19) = -2.77$, $p = .01$, $d = 1.269$. The estimated effect size, $d$, indicates a large effect. All other *t*-tests comparing high to low warmth and control fathers on measures of parenting stress and child temperament were not statistically significant. Mean scores for each group on each measure along with the obtained *t*-scores are displayed in Table 6.

Table 6.
*Mean (Standard Deviation) PSS and TABC-R Scores for Fathers Rated on Warmth and Control*

| | Warmth | | | Control | | |
|---|---|---|---|---|---|---|
| | High | Low | *t* | High | Low | *t* |
| PSS | 28.19 (4.60) | 30.50 (5.99) | .328 | 31.60 (5.62) | 27.00 (4.11) | -2.10* |
| TABC-R | | | | | | |
| Inhibition | 45.20 (6.81) | 48.45 (7.35) | .307 | 50.45 (6.36) | 43.00 (5.94) | -2.77* |
| Impulsivity | 45.80 (8.73) | 47.18 (8.17) | .712 | 48.64 (7.59) | 44.20 (8.72) | .228 |

*$p \leq .05$.

Researchers explored correlations between the fathers' behavior ratings of spontaneous structure and physical activity and fathers' reports of parenting stress and child temperament. As father's computed T-scores on the impulsivity scale of the TABC-R increased, their overall physical activity during the interaction tasks significantly decreased, $r = -.44$, $p < .05$. A similar relationship also was found between T-scores on the TABC-R inhibition scale and fathers' use of spontaneous structure during the interaction tasks. As inhibition scores increased, the use of spontaneous structure significantly decreased, $r = -.49$, $p < .05$. Results from these correlation analyses are presented in Table 7.

Table 7.
*Correlations Between Fathers' Questionnaire Scores and Observational Ratings of Spontaneous Structure and Physical Activity*

| | Spontaneous Structure | | Physical Activity | |
|---|---|---|---|---|
| | *r* | $r^2$ | *r* | $r^2$ |
| PSS ($n = 20$) | .16 | | -.02 | |
| TABC-R | | | | |
| Inhibition ($n = 21$) | -.49* | .24 | -.33 | |
| Impulsivity ($n = 21$) | -.39 | | -.43* | .18 |

*$p < .05$.

*Regression Analysis*

The results of the *t*-tests comparing the PSS and the TABC-R scores of fathers high and low in control indicate that fathers high in control reported significantly higher parenting stress and significantly more inhibited child behavior than fathers rated as low in control. To examine the combined effects of parenting stress and inhibited child temperament, researchers performed a regression analysis with fathers' raw control score

(as opposed to high/low) as the dependent variable. Inhibition scale T-scores were entered into the first step of the regression and PSS scores were entered into the second step. The regression analysis is listed in Table 8. Inhibited child temperament and parenting stress accounted for a statistically significant 26% of the variance in fathers' use of controlling behaviors. Inhibited child temperament alone accounted for a marginally statistically significant 15% of the variance, $\beta = .45$, $t = 2.06$, $p = .055$. Scores on the PSS accounted for marginally statistically significant 11% of the variance over and above the influence of children's inhibition when entered into the second step, $\beta = .40$, $t = 1.87$, $p = .079$.

Table 8.
*Summary of Regression Analysis for Variables Predicting Fathers' Ratings on Control (N = 19)*

| | Variable | *B* | *SE B* | β | *p* |
|---|---|---|---|---|---|
| Step 1 | | | | | |
| | Inhibition Scale T-Score | .05 | .03 | .45 | .055 |
| Step 2 | | | | | |
| | PSS Score | .06 | .03 | .40 | .079 |

*Note.* $R^2 = .15$ for Step 1; $\Delta R^2 = .11$ for Step 2.

## Discussion

The main hypothesis of the study concerned the relationship between the physiological reactivity and the observed parenting behaviors of fathers. Researchers predicted that fathers rated as lower in warmth and those rated as higher in control would show patterns of increased arousal in response to the crying infant video segment. Although results of the RMANOVAs did not show significant differences between high and low warmth and control groups in either heart rate or skin conductance level during

the happy or crying video segments, visual examination of the resulting graphs suggests some interesting underlying trends.

Figure 1 displays the changes in skin conductance level across quiescent and happy video segments with separate lines for fathers high and low in warmth. The high warmth fathers were the ones who displayed the most positive affect and positive feedback during the interactions while displaying the least amounts of negative affect and negative feedback. Both groups of fathers showed a slight but noticeable increase in skin conductance level across the initial transition from the first quiescent segment to the happy segment. This suggests that fathers in both groups had an initial increase in arousal in reaction to the change in the infant's behavior. Overall, however, these two groups showed only minor changes in tonal skin conductance level in response to the happy infant stimulus, with patterns of change across measurement intervals very similar to one another.

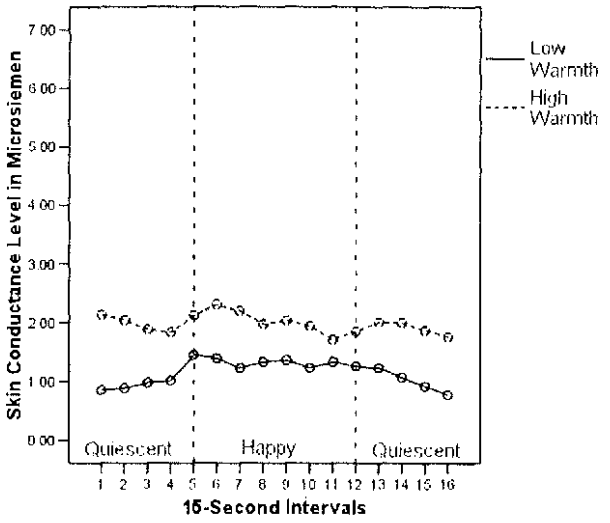


*Figure 1.* Mean skin conductance levels for high and low warmth fathers during quiescent and happy infant stimulus segments.

This between-group similarity is essentially corroborated by the heart rate data collected during the same video segments (see Figure 2). Both high and low warmth fathers showed an initial increase from the quiescent to the happy segment. After this initial increase, the low warmth group showed a fairly steady decrease, while the high warmth group maintained a nearly constant heart rate. These two figures together indicate that, when faced with a positive child-related stimulus (i.e. the happy infant), high and low warmth fathers physiologically respond quite similarly. This pattern does not hold true, however, when these same groups of fathers are faced with a presumably noxious child stimulus, the crying infant.

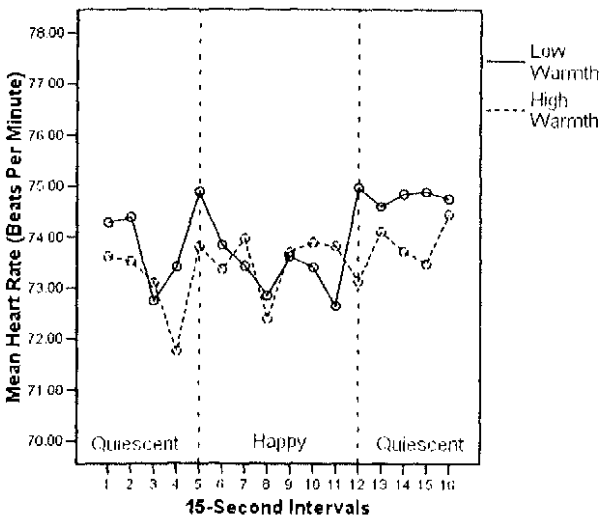


*Figure 2.* Mean heart rates for high and low warmth fathers during quiescent and happy infant stimulus segments.

Examination of Figure 3 shows an apparent difference in skin conductance levels for high and low warmth fathers during the crying infant video segment. Unlike during the happy infant video, during the crying segment, fathers who displayed high warmth showed a visually dramatic increase in skin conductance levels, while low warmth fathers showed little change. This trend is generally echoed by the heart rate data collected for

these two groups during the crying segment (see Figure 4). Fathers high and low in warmth showed drastically different patterns across the transition from the first quiescent segment to the crying segment. Similar to the pattern observed for skin conductance levels, high warmth fathers experienced an increase in heart rate during the first four measurement intervals of the crying segment. The plot for low warmth fathers shows a sharp decrease in heart rate that spans the first five measurement intervals of the crying segment.

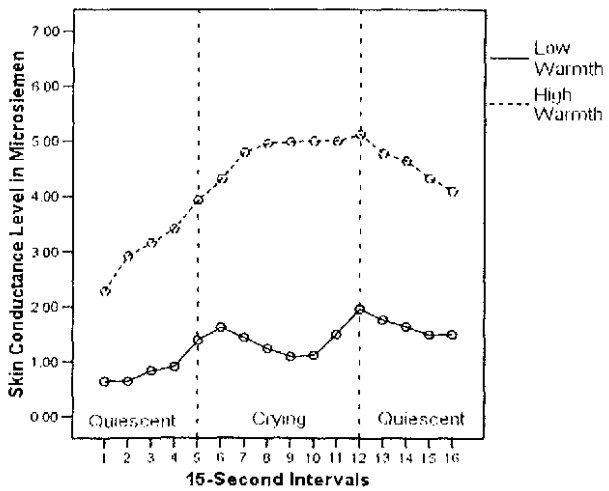


*Figure 3.* Mean skin conductance levels for high and low warmth fathers during quiescent and crying infant stimulus segments.

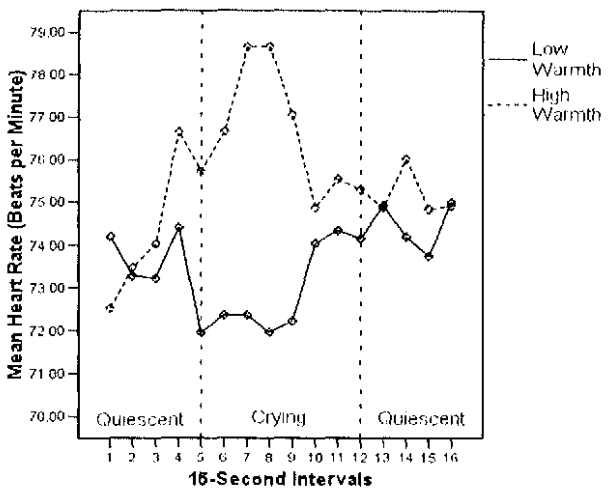


*Figure 4.* Mean heart rates for high and low warmth fathers during quiescent and crying infant stimulus segments.

The divergent patterns of physiological arousal for fathers high and low in warmth during the crying video segment suggest a trend that may be related to the observed parenting behaviors. This pattern, however, generally moves in a direction opposite from that hypothesized. Previous research comparing the physiological arousal of groups of parents in response to a crying infant suggests that parents who have a history of abusing their child or who are high-risk for abuse (according to responses on questionnaires) show the highest levels of physiological arousal in response to the stimulus (Frodi & Lamb, 1980, McCanne & Hagstram, 1996). The results of the current study, however, indicate that it is the fathers who showed higher levels of warmth during the interaction tasks who experienced the greatest physiological arousal in response to the crying infant.

Similar to the comparisons made between fathers high and low in warmth, comparisons of fathers high and low in control revealed statistically non-significant differences between the groups. However, visual inspection of the data points to yet another apparent trend. Figure 5 depicts changes in skin conductance levels for fathers high and low in control during quiescent and happy video segments. Each group showed only a slight change in reaction to the behavior change of the infant. Correspondingly, the plot of heart rates recorded for these fathers shows an increase in arousal at the initial presentation of the happy infant followed by a slight decline for high control fathers and a general leveling off for low control fathers (see Figure 6). Aside from the increase in heart rate between the quiescent and happy segments, neither high nor low control fathers showed a distinguishable pattern of change in physiological arousal in response to the happy infant stimulus.

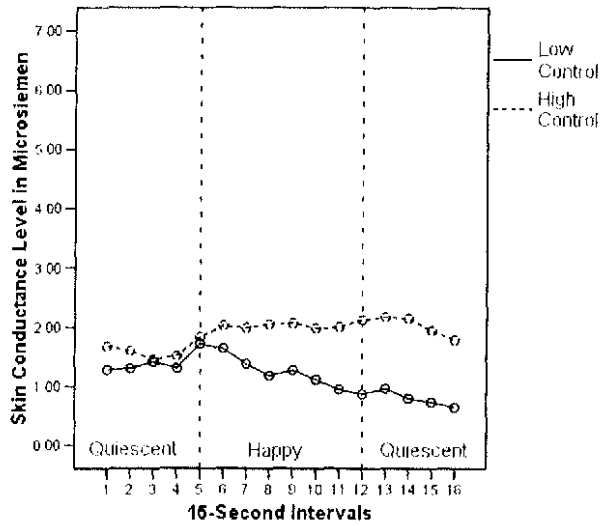


*Figure 5.* Mean skin conductance levels for high and low control fathers during quiescent and happy infant stimulus segments.

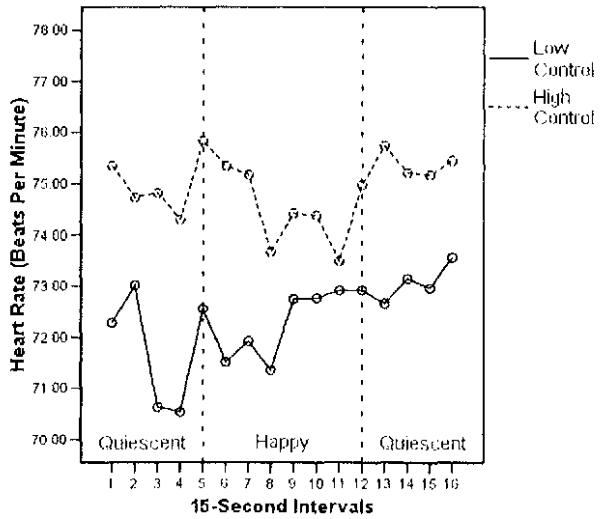


*Figure 6.* Mean heart rates for high and low control fathers during quiescent and happy infant stimulus segments.

In contrast, Figure 7 shows that the skin conductance levels of low control fathers were dramatically higher than those of high control fathers during presentation of the crying infant video segment. Further, comparing the skin conductance levels of the low control fathers between the happy and crying video segments, it is apparent that these

fathers were much more aroused by the crying infant than the happy infant. Conversely, high control fathers experienced only a small increase in skin conductance level from the quiescent to the crying segments, with levels for crying and happy segments differing only slightly.

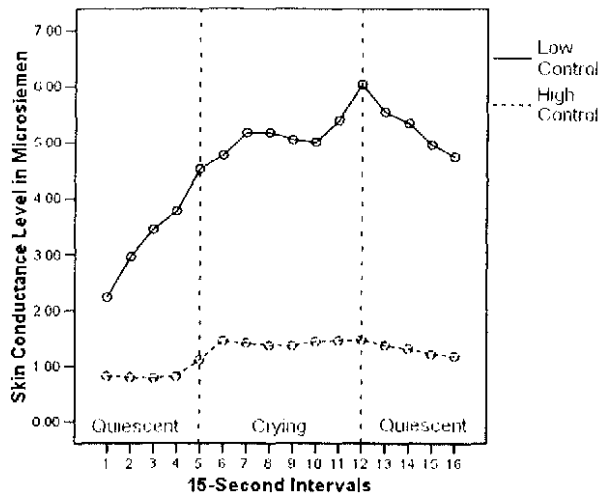


*Figure 7.* Mean skin conductance levels for high and low control fathers during quiescent and crying infant stimulus segments.

Comparisons of heart rates between high and low control fathers during the crying segment confirm the trend apparent in skin conductance levels for these groups (see Figure 8).

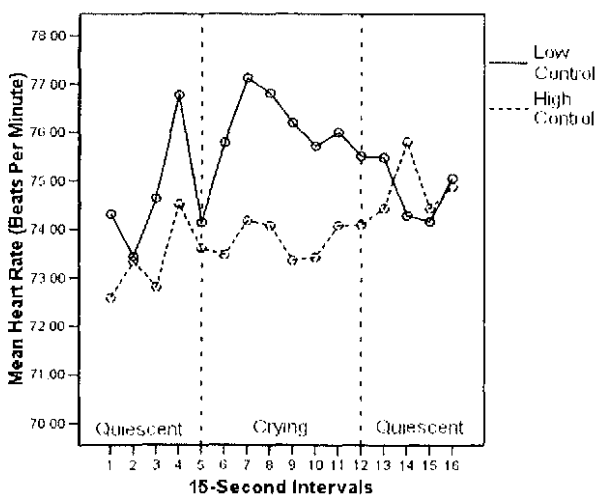


*Figure 8.* Mean heart rates for high and low control fathers during quiescent and crying infant stimulus segments.

High control fathers maintained a fairly steady heart rate throughout the crying segment, whereas the low control fathers showed initially elevated then declining rates. This trend suggests that fathers low in control experienced an increase in their physiological arousal in conjunction with observing the crying, but not the happy, infant video segment.

In the current study, fathers rated as low in control were those who showed the least amounts of facilitation, intrusiveness and redirection while displaying more demands for self reliance and undercontrolling behaviors during the interaction tasks. These were the fathers who gave the fewest directions and allowed the child the most freedom throughout the interaction. Interestingly, these fathers showed physiological reactivity quite similar to that showed by the high warmth fathers, who displayed the most affection and positive feedback.

Missing from the current investigation's interpretation of increased physiological arousal is a measure of the fathers' affective responses to the video segments. Thus, researchers cannot discern whether the increases in arousal signify positive or negative emotional responses to the stimuli. Previous research suggests that physiological arousal in response to similar stimuli is associated with increases in negative emotions. Male and female participants have reported increased feelings of hostility, sadness and distress during a crying infant stimulus (Brewster et al., 1998). Comparisons between high- and low-risk for abuse mothers have shown that low-risk mothers reported increases in empathy while high-risk mothers show no change in empathy (Milner et al., 1995). Further, high-risk mothers reported more sadness, distress, unhappiness and less quietness after viewing a video of a crying infant while low-risk mothers reported no

changes (Milner et al., 1995). Because all fathers in the current study reported being non-abusive, and differential increases in arousal occurred only in response to the crying infant stimulus, it can be assumed that the observed increase in arousal accompanied at least a sense of negative emotionality. Had the high warmth and low control fathers responded to the happy video with the same changes in arousal, this assumption would be discredited. However, these fathers showed the arousal pattern in question only in response to the crying infant.

The hyperreactivity model of child abuse posits that abusive parents respond to noxious child-related stimuli with increased arousal that in turn increases the likelihood for aggression toward the observed child (Knutson, 1978). In the current study, two groups of non-abusive fathers were identified as showing increased arousal while viewing a video of a crying infant. Although potential for child abuse or maltreatment was not explored as a correlate of the fathers' observed increase in arousal, this arousal may have contributed to the differences in general fathering behaviors observed during father-child interactions. It can be argued that both of these more responsive groups, high warmth and low control fathers, displayed parenting strategies designed to avoid or lessen the potential for an aversive reaction from the child.

Fathers high in warmth may have displayed greater amounts of positive affect and positive feedback during the interactions with the aim of keeping their child happy. Through experience, these fathers perhaps demonstrated knowledge that interactions based on caring and affection are less likely to result in negative child behaviors such as pouting and throwing a tantrum. Likewise, fathers low in control, in a similar attempt to avoid noxious child behavior, provide less structure, give their children greater

opportunity to influence the interaction, and essentially give the child fewer opportunities to not follow directions by giving overall fewer directions. The data collected on the fathers' parenting stress may somewhat support these claims.

Fathers low in control reported significantly less parenting stress than fathers high in control. This lower level of stress associated with the parenting role may stem from these fathers' reluctance to enforce explicit control. Results showed that parenting stress was not significantly associated with the father reports of child temperament, thus the lower parenting stress reported by low control fathers did not stem from having a child with an "easier" temperament. However, temperament characteristics of the child were significantly associated with fathers' use of control. Low control fathers rated their children as significantly lower on the inhibition scale of the TABC-R than did the high control fathers. Lower inhibition scale scores indicate that a child is less likely to withdraw in social or novel situations, less likely to overreact to mild punishments, and less likely to feel lonely or isolated (Martin & Bridger, 1998). Fathers of children lower in inhibition, thus, may not need to exert as much control during interactions because the child is more comfortable than a more inhibited child would be.

In addition to predicting fathers' use of control, fathers who rated their children as less inhibited showed more spontaneous structure during the interactions. These fathers turned the interactions into more structured games by imposing rules or goals beyond those imposed by the task. Fathers with less inhibited children were significantly more likely to strike up an impromptu game of basketball or soccer during the ball-play task than were fathers of more inhibited children. The lack of inhibition on the part of the child allowed the fathers to create interactions potentially more exciting than the assigned

task. The child's inhibition was the only variable that significantly influenced the fathers' use of spontaneous structure.

The second child temperament scale, impulsivity, significantly predicted the physical activity level of the father during the interactions. Fathers who rated their children as higher in impulsivity showed significantly lower levels of physical activity. The impulsivity scale is derived from fathers' ratings of the child's activity level, negative emotionality and lack of task persistence. Fathers of more impulsive children perhaps limited their physical activity to keep the child on task. Conceptually, too much physical activity might have caused a more impulsive child to become overexcited. These fathers then, knowing the temperamental tendencies of their children, showed less physical activity to maintain a sense of control during the interactions.

The results of this study collectively point to the potential interactive influences of fathers' physiological reactivity, parenting stress, and child temperament on the normal range of fathering behaviors. This exploration has perhaps identified new topics for the growing field of fathering research. Methodologically, future studies of fathering behaviors may benefit from exploring behaviors beyond those measured in mothering research. Measures more sensitive to the subtle differences between fathers, like spontaneous structure, physical closeness, playfulness, and emotional distance, may provide researchers with a more accurate tool for assessing father-child interactions.

Several limitations of the current investigation are related to the small sample size. Statistically, increasing the number of father-child pairs would increase the power for finding significant trends both between and within groups of fathers. Further, a larger sample would contribute to more normal distributions and fewer violations of statistical

assumptions. Theoretically, increasing the sample size would allow for more specific and complex comparisons between father-child pairs. Fathers of older girls, for example, may show parenting behaviors different from those displayed by fathers of younger boys. Further, increasing the diversity of the sample would allow researchers to explore the effects of religious affiliation, socioeconomic status and cultural background on the observed fathering behaviors. With this in mind, researchers will continue with the current line of investigation after the completion and defense of this thesis.

The generalizability of the trends discussed in this study is somewhat limited by the imposed criteria for participation. Researchers sampled from a very "normal" population of fathers. Fathers in the current sample were still married to the mother of their child, and had no history of a mental illness, arrest, or child abuse/maltreatment allegations. Inclusion of these criteria, however, helped to maintain the internal validity of the investigation. Future investigations might sample less traditional fathers, i.e. divorced fathers with joint custody, stepfathers, adoptive fathers, abusive fathers, and fathers of children with clinically significant disorders. Inclusion of these fathers and the myriad of different family characteristics they bring with them would allow researchers to explore the dynamics of differing family structures. Recruiting fathers from some of these populations would require assistance from social work and family service agencies. Additionally, it should be noted that offering monetary incentives enhanced the successful recruiting of fathers for research participation in the current investigation. In the case of "less normal" populations, the monetary incentive may need to be larger than that offered in the current study.

In contrast to the noted weakness and limitations, the current investigation had inherent strengths. Whereas previous research on parents' physiological arousal relied primarily on reports of parenting practices, the current investigation actually sampled parenting behaviors across a small variety of tasks. This provided researchers with a very real measure with which to compare the physiological data. A second strength of the study lies in the inclusion of child temperament and parenting stress as constructs. This allowed researchers to explore the association between fathers' physiological reactivity and parenting behaviors with special consideration for the typical behaviors of the child and the fathers' reports of how they perceive the parenting role. A third strength is the use of the particular infant stimulus video segments. These same segments have been used in several previous studies that note the strength of the manipulation of the infant's behavior (Brewster et al., 1998; Casanova et al., 1994; Milner et al., 1995). Finally, the equipment used for measuring the fathers' physiology allowed for precise data cleaning and examination of small segments of data.

Consistent with the multidimensional ideas of Belsky (1984), the current study points to several factors that influence the relationship and interactions between a father and his child. As discussed, the temperament of the child and the perceived parenting stress of the father each contribute to the father's behavior. In addition, the data presented suggests also that some fathers are more affected by a crying infant than are others. These fathers, though they may not be hyperreactive, may attempt to minimize the chances of having to deal with noxious child behavior by either being passive and allowing the child more freedom, or by being more nurturing and caring, praising the child with both words and actions as often as possible. In either case, aversion to the child's negative behaviors

may be at least in part driving the father's behaviors. In these dyads, the child may indirectly have more control over the interaction than the father. Essential to effective fathering, then, may be an awareness of, then perhaps control over, one's physiological arousal in the midst of various child behaviors.

Appendix A

*Informed Consent Form*

Professor Gabriel Ybarra, Ph.D. and Brian Hunter, B.S., a graduate student in the Department of Psychology at the University of North Florida, are conducting a study at the University of North Florida. The study focuses on fathers' heart rate and breathing rate and the ways that fathers play with their children. We would greatly appreciate the participation of both you and your child in this research, as it will assist in gaining more knowledge about how fathers interact with their children. The following paragraphs describe what will be expected of you and your child if you choose to participate in the study.

Should you choose to participate in the study, you will be asked to complete the 3 questionnaires included in the packet mailed to you. These short questionnaires measure child temperament, parenting stress and family demographics. These questionnaires will need to be completed by you and brought to UNF on the scheduled date and time of the study. These questionnaires will take about 30- to 45-minutes to complete.

The study consists of two parts. First, you will watch two video clips of a child. Each clip is 6-minutes long. A computer with harmless recording sensors will measure your heart rate, skin conductance and breathing rate while you watch the video clips. While you are doing this, your child will be in another room playing with toys provided by the researchers. A research assistant will be in the room to watch and play with the child. For the second part of the study, you and your child will work together on three play tasks. For the first, you will tell the child to build a tower out of small wooden blocks. You will have the child build a tower as high as he/she can until it falls over, then have him/her try to build a taller tower. In the second play task, you and your child will roll a ball back and forth on the ground. For the third play task, you and your child will pass a small ball to one another with the ball held between your chin and chest. This third game is the last task that you will be asked to complete for the study. Both parts of the research together should take about 1 hour. Researchers will answer any final questions that you may have before you leave.

Approximately 30 children and their fathers will participate in this study. As payment for participation, fathers will be paid $20.00. There are no risks to you or your child, beyond your potential discomfort while watching a video of a crying child. To ensure your confidentiality, data from the study will be coded. Your names will be kept separately and securely away from your responses. Coded data will be analyzed and reported in appropriate professional journals or professional conferences in group format only. No individual or personal data will be released. Videotapes will be stored within a locked file cabinet in a secured room. A codebook that links father/child name combinations will be kept with the videotapes. Access will be limited to Brian Hunter and Dr. Gabriel Ybarra. Upon analysis and write-up of this research study, the tapes and codebook will be destroyed.

To ensure the safety of yourself, your child, or others, we will need to break this agreement of confidentiality by notifying appropriate authorities (such as Child and Family Services or local police) if you or your child report any behaviors or intentions that may cause harm to self or others.

If you would like to receive the results of this study, please provide your name and address on the separate indicated form. This personal identifying contact information will be held in a strictly confidential manner and will be kept in a locked location separate from your other responses. After mailing this requested results summary to you, your name and address information will be destroyed.

Your participation is completely voluntary and you and your child are free to withdraw from the experiment at any time and for any reason. There will be no penalty if you choose not to participate. If you or your child should decide to withdraw, the information collected up to that point would be destroyed upon your request.

If you would like to volunteer to participate in this study please contact either Brian Hunter or Dr. Gabriel Ybarra. Or, if you have any questions concerning this project, we will be happy to answer them via e-mail or phone. Please feel free to contact Brian Hunter at unffatherstudy@hotmail.com, Dr. Ybarra at gybarra@unf.edu or write Brian Hunter or Dr. Ybarra at the Department of Psychology, University of North Florida, 4567 St. Johns Bluff Rd, South, Jacksonville, FL 32224-2645. You may also leave a message with the Psychology Department at 620-2807. Dr. Hodge may be contacted for questions regarding a participant's rights as a research subject, at (904) 620-2990.

I have read and I understand the procedures described above. I have received a written and verbal explanation of this experiment. I provide permission for my child and I to participate in the experiment in a strictly voluntary manner.

_____
Parent's Name – Please Print

_____ _____
Parent's Signature Date

_____ _____
Child's Name – Please Print Date

Appendix B

*Consent for Videotaping*

I give permission to Gabriel Ybarra, Ph.D. and Brian Hunter, B.S., a graduate student at the University of North Florida to videotape observations of myself and my child for the purpose of the described research. While the tapes are used for this purpose, neither my child nor I will be identified by name nor will any other identifying date be revealed in connection with the use of the tapes. Audi- and video tapes will be stored within a locked file cabinet in a secured room. A code book that links mother/child name combinations will be kept with the audio- and video tapes. Access will be limited to the primary investigator and/or faculty advisor. Upon analysis and write-up of this research, the tapes and code-book will be destroyed.

_____
Parent's Name – Please print

_____ _____
Parent's Signature Date

_____ _____
Name of Child – Please print Date

_____ _____
Witness/Researcher Date

Appendix C

*Demographics Questionnaire*

Parent Information

Father:

1. Age:_____

2. Date of Birth (DD/MM/YY):_____

3. Highest grade completed in school:_____

4. Ethnicity:_____

5. Religious Affiliation:_____

6. Employed? (circle one) Yes No

7. Estimated yearly income:_____

Mother:

8. Age:_____

9. Date of Birth (DD/MM/YY):_____

10. Highest grade completed in school:_____

12. Ethnicity:_____

13. Religious Affiliation:_____

14. Employed? (circle one) Yes No

15. Average yearly income:_____

Target Child Information

16. Age (in years):_____

17. Date of Birth (DD/MM/YY):_____

18. Gender:_____

Family History

19. Number of people living in the household:_____

20. Number of children (under the age of 18) living in the household:_____

21. Number of children older than the target child living in the household:_____

22. Number of children younger than the target child living in the household_____

23. Number of children (under the age of 18) of either the mother or father not living in the household_____

24. Has a report ever been filed with the Department of Children and Family (DCF) on any of the children of the mother or father?

YES NO

If yes, explain briefly:

_____

_____.

25. Has a DCF report ever been filed on the target child?

YES NO

If yes, explain briefly:

_____

_____.

26. Has the mother or father of the target child ever been in jail?

YES NO

If yes, explain briefly:

_____

_____.

27. Has the target child ever been placed out of the home?

YES NO

If yes, explain briefly:

_____

_____.

28. Has the mother or father of the target child received mental health treatment since the birth of the target child?

YES NO

If yes, explain briefly:

_____

_____.

29. Has the target child ever received treatment for mental health?

YES NO

If yes, explain briefly:

_____

_____.

30. Has the mother or father of the target child received treatment for drug or alcohol abuse since the birth of the target child?

YES NO

If yes, explain briefly:

_____

_____.

31. Have the mother and father of the target child separated since the birth of the target child?

YES NO

If yes, explain briefly:

_____

_____.

[Researcher: Cut below section and return to Faculty Advisor for locked storage.]

---

If you would like to receive the results of this study, please provide your name and address on this separate indicated form. This personal identifying contact information will be held in a strictly confidential manner and will be kept in a locked location separate from your other responses. After mailing this requested results summary to you, your name and address information will be destroyed.

Name & Address: _____

_____

_____

Appendix D

*Notes on Physiological Data Collection and Cleaning Using ADInstruments Powerlab and Chart for Windows Software.*

*Data Collection*

Researchers used ADInstruments' Chart for Windows V4.1.2 for all physiological data collection and analysis. A research assistant had the Powerlab turned on and Chart set up to begin data recording before the father entered the physio room. Before the researcher attached the electrodermal sensors to the father's fingers, he or she calibrated the sensors using the "Open circuit zero" option from the GSR Input Amplifier pull down menu. This allowed the sensors to account for the humidity present in the physio room. After the open circuit calibration, the researcher attached the electrodermal sensors to the volar surfaces of the phalanges of the father's second and fourth fingers. For the first 15 fathers, the sensors were attached to the distal phalanges. After consulting with a representative from ADInstruments, however, researchers decided to attach the sensors to the medial phalanges. After the sensors were attached, the researcher calibrated the equipment using the "Subject zero" function from the GSR Input Amplifier pull down menu. Thus, all fathers started with a skin conductance level of zero.

Before starting the physiological data collection, the researcher attached the photoelectric phethsymograph to the volar surface of the distal phalange of the father's third finger and wrapped the respiratory belt transducer around the father's chest. With all sensors properly attached, the researcher started the stimulus video and the physiological data recording. For the first 15 fathers, data were recorded at 10 data points per second. Data for subsequent fathers were recorded at 200 data points per second. This change

followed the recommendations of a representative from ADInstruments. The increased points per second allowed for much more accurate cleaning of the heart rate data.

*Data Cleaning*

The data cleaning process began with the segmenting of the collected data into 15-second epochs. To accomplish this, researchers highlighted the appropriate data segment (e.g. 4:00-4:15) and used the "Add to Data Pad" function from the "Command" menu. The settings of the data pad were adjusted so that GSR data were displayed in mean μS, heart rate data were displayed in beats per minute, and respirations were displayed in respirations per minute. Along with these, the data pad also displayed the start time, end time, and duration of the selected segment.

In general, the first quiescent video segment started at the beginning of the fourth minute of data collection. For some fathers, however, the quiescent video clip actually started a few seconds late (e.g. 4:04 rather than 4:00). To compensate for these differences, researchers shifted the start and end times of the 15-second epochs. Thus, instead of the first data of quiescent 1 coming from 4:00 to 4:15, researchers examined the data from 4:04 to 4:19. This ensured that the data was parallel for all fathers, regardless of small differences in stimulus video presentation.

After each segment of data was highlighted and added to the data pad, a researcher checked for accuracy. By viewing the "Options" within the "Column Setup" window for each piece of heart rate and respiratory rate data, the researcher was able to visually examine wave cycles recorded by the physiological sensors. The Chart program calculates an estimate of beats per minute by counting the number of wave cycles in the selected period of time. By adjusting the "Noise Threshold" within the "Options"

window, the researcher can control which peaks the Chart program counts. The program indicates which peaks are being counted for a given calculation by placing a black dot on the peak. The noise threshold had to be adjusted independently for each piece of heart rate and respiratory rate data collected. This ensured that changes in heart rate or respiratory rate from one 15-second epoch to the next were not simply due to differences in the amplitude of the recorded waves. In the event that the noise threshold could not be adjusted to count all of the peaks and none of the noise in a given segment, the researcher counted the peaks then multiplied this number by an appropriate number to calculate beats per minute. For example, if a researcher counted 18 peaks within a 15-second period, the researcher would multiply 18 by 4 to estimate a heart rate of 72 beats per minute.

Due to the sensitivity of the physiological sensors, any movement by the father caused noise to appear in the data. Thus, sections of data were cut out of certain 15-second epochs according to the notes taken by the father researcher during physiological data collection. In most cases, no more than 5 seconds of data were cut out. Skin conductance level, heart rate and respiratory rate were calculated for these epochs using the remaining 10 seconds of valid data. In a few extreme cases, the entire epoch was invalid. For these, researchers calculated a mean from the epochs during the same video segment that directly preceded and followed the invalid data. Researchers entered this mean in place of the invalid data. Once all of the data was cleaned, researchers entered the data into SPSS for statistical analyses.

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Curriculum Vita

Brian D. Hunter
Biographical Information:
Date of Birth:
Place of Birth: Orlando, FL

Education:

| | | | |
|---|---|---|---|
| B.S. | Psychology | University of North Florida | 2002 |
| M.A. | General Psychology | University of North Florida | 2004 |

Professional Experience:
Aug 2003 to Jun 2004
Florida Manager
Jacksonville After-School Experiences Study - Jacksonville, FL.
May 2002 to Aug 2003
PRN Residential Counselor
daniel, Inc. - Jacksonville, FL.
Jan 2002 to May 2002
Behavioral Therapist
Private Household - Jacksonville, FL.
Jan 2000 to May 2000
Intern
Episcopal Children's Services Head Start - Orange Park, FL.

Research Experience:
Jun 2003 to May 2004
Principal Investigator
Antecedents of Aggressive Behavior in a Child and Adolescent Residential Psychiatric Program.
Aug 2002 to July 2004
Principal Investigator
Fathers' Physiological Responses to Child-related Stimuli and Observed Fathering Behavior.
Aug 2001 to May 2002
Research Assistant
Children's Letters to Santa.
Aug 2000 to May 2001
Research Assistant
Anthropometric correlates of low-income preschoolers' cognitive and motor development.

Teaching Experience:
Aug 2003 to Dec 2003
Graduate Teaching Assistant
Department of Psychology, University of North Florida - Jacksonville, FL.

Presentations:

Marcon, R., Stores, J., & Hunter, B. (2001, March). Anthropometric correlates of low-income preschoolers' cognitive and motor development. Poster session presented at the meeting of the Southeastern Psychological Association, Atlanta.

Grants:

Spring 2003

Grant in Aid of Research from Sigma Xi: The Scientific Research Society

Professional Affiliations and Honors:

American Psychological Association (Student Affiliate)
American Psychological Society (Student Affiliate)
Sigma Xi: The Scientific Research Society
Psi Chi: The National Honor Society in Psychology
Golden Key International Honour Society