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# YOUNG CHILDREN'S CHARACTERISTICS AS PREDICTORS OF CHANGE IN THEIR FATHERS' POSITIVE PARENTING

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# ABSTRACT

This thesis investigated the role of child characteristics, specifically language abilities and negative affectivity, as predictors of fathers' positive parenting over time. It was hypothesized that fathers would demonstrate a normative decrease in positive parenting but that increases in child language abilities and decreases in child negative affectivity would affect the rate of change. Additionally, it was hypothesized that the relation between child characteristics and fathers' positive parenting would be affected by the child's gender. Child characteristics and fathers' positive parenting were assessed in 106 families at child ages 18, 30, and 42 months. To assess child negative affectivity, mothers completed the Toddler Behavior Questionnaire (TBAQ-R; Goldsmith, 1996; adapted by Rothbart, 1996) at 18 and 30 months, and the Child Behavior Questionnaire (CBQ; Putnam & Rothbart, 2006) at 42 months. Child language ability was assessed by calculating the child's Mean Length of Utterances (MLU; Brown, 1973) during a naturalistic home observation. Fathers' positive parenting was also assessed during the home observation; positive parenting was a composite of fathers' observed levels of sensitivity, positive affect, and stimulation of child cognition. Multilevel models were conducted to examine the relations between child characteristics and fathers' positive parenting as well as each component of positive parenting. Results demonstrated that neither child language nor child negative affectivity influenced fathers' positive parenting. However, a small effect of the interaction between child gender and child negative affectivity on overall levels of positive parenting was found. Additionally, child language was found to slightly affect overall levels of fathers' sensitivity, but only at 42 months.

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# INTRODUCTION

The definition of fatherhood and the expectations of a father's role in the family have continued to change. As more women have moved into the workplace, fathers have become increasingly more involved in parenting and they report being more involved with, and closer to, their children than they were to their own fathers (Bonney, Kelley, & Levant, 1999; Woodworth, Belsky, & Crnic, 1996). Along with this change, child development research has increasingly called for studies that include fathers, who traditionally have been underrepresented in the literature (Cabrera, Tamis-Le-Monda, Bradley, Hofferth, & Lamb, 2000; Goeke-Morey & Cummings, 2007). The call includes examination of the factors that influence both the quantity of time and quality of interactions fathers have with their children. In addition to studying these aspects of fathering, the call includes examination of how fathers' parenting changes over time, including the influences of developmental changes, e.g. early language acquisition, in their children. The aim of this thesis was to examine two aspects of young children's early development – their language status and their temperamental disposition toward negative affectivity – as factors that influence changes in fathering quality over time, specifically in fathers' positive affect, sensitivity, and stimulation of child cognition.

The dearth of research on fathering appears to be due to several reasons, including difficulties defining fatherhood, identifying and recruiting fathers, and utilizing measures that are valid for different types of father status (i.e. stepfather and biological father; West, 2007). Furthermore, fathers appear to have limited availability to participate in studies and in general are less available and less likely to volunteer than mothers (Phares, 1992). Even if fathers are successfully recruited, their response rates are often very low (West, 2007). As a result, a majority of parenting studies have only included mothers and relied on them to report on the

quantity and quality of their husband's parenting, a potential source of bias (Goeke-Morey & Cummings, 2007; Kochanska et al., 2004). It therefore remains critical to recruit fathers and ask them to provide information about themselves (Cabrera et al, 2000).

In conceptualizing fathering and early childhood developmental changes that may influence fathering quality, this thesis was informed by Belsky's (1984) process model of parenting. Belsky identified three sets of predictors of parenting: parent characteristics, child characteristics, and contextual sources of stress and support. This model has generated evidence that fathering is determined both by individual characteristics of the father and of contextual stress and support. For example, multiple studies have demonstrated that paternal age, education, gender role ideology, the quality of the marital relationship, and work stress have differential effects on fathers' parenting practices (NICHD, 2000). Fewer studies have examined child predictors of fathering quality, the focus of this thesis.

Studies have also shown that fathers contribute, sometimes uniquely, to their children's development. Higher father involvement has been found to contribute uniquely to toddlers' problem-solving and to the quality of both child-father and child-mother relationships (Easterbrooks & Goldberg, 1984). Higher father involvement has also been associated with greater linguistic ability and literacy in young children (Cabrera, Shannon, & Tamis-LeMonda, 2007). Greater father supportiveness of a child was associated with better child cognitive, emotional, and language skills when children were 24 months old (Cabrera et al., 2007). One longitudinal study found that men who recalled a loving and stable relationship with their own fathers were more loving and attentive toward their children (Lewis & Lamb, 2003).

In sum, there is an acute need to understand fathering. There is a growing body of evidence that father characteristics and the degree of stress and support fathers have influences

fathering as well as evidence that the quality of fathering has meaningful, sometimes unique, effects on children's development. However, few studies examine how fathering changes over time, an important issue as fathers themselves are developing adults and their children and families grow and change. These changes within the family may potentially contribute to variations in the quantity and quality of fathering over time (Schacht, Cummings, & Davies, 2009; Wood & Repetti, 2004). Examination of fathering over time will allow a fuller understanding of fathering and its dynamics (Wood & Repetti, 2004).

The present study addressed the need for research on the role of child characteristics in relation to fathering changes. First, the study considered that father positive parenting may change over time. Specifically, the thesis examined whether father sensitivity, positive affect, and stimulation of child cognition were stable characteristics of fathering quality or whether they changed over the course of early childhood, when child developmental changes are rapid. Second, the study posited that if father positive parenting changes with time then such change would be due, at least in part, to changing child characteristics, particularly the increase in expressive language and the decrease in negative affectivity that occur as children move from toddler to preschool age (Belsky, 1984). Before providing the background on these predictions, the introduction first summarizes what is known about the ways father are similar to and different than mothers, to highlight their unique role. Then, the argument is made for why child language status and negative affectivity should influence change in fathering quality over the course of early childhood.

**Fathers and their Similarities and Differences from Mothers.**

**Similarities.** Mothers are typically the primary caregiver, spending considerable time with their infants, which led to an impression that mothers were more important than fathers for

the infant's development (Cabrera et al., 2000). However, evidence has indicated that mothers and fathers display similar levels of sensitivity during the first year of a child's life (Lewis & Lamb, 2003). Work by Cabrera et al. (2007) suggested that these similarities continue into early childhood; fathers and mothers demonstrated similar levels of sensitivity and intrusiveness when their children were 24 and 36 months old. Despite these similarities, it is also possible that fathers may differ from mothers.

**Differences.** Evidence also indicates that mothers and fathers differ, particularly in terms of how they interact with their young children. In general, fathers spend more of their available time in physical play with children whereas mothers spend more time caregiving (Park et al., 2005; Woodworth et al., 1996). Moreover, during physical play fathers provide children with more tactile stimulation than mothers and fathers' behavior and fathers' play style is described as more unpredictable (Lewis & Lamb, 2003).

Fathers and mothers also place different cognitive demands on their young children. Although both fathers and mothers use higher-pitched and more exaggerated voices when speaking to infants and both parents simplify and slow their speech when speaking to young children (Lewis & Lamb, 2003; Tamis-LeMonda, Shannon, Cabrera, & Lamb., 2004), the length of their utterances have different effects on child speech (Bornstein, 2002). Specifically, fathers' utterances length is not related to child speech whereas mothers' is (Bornstein, 2002). Perhaps a reason for this is that fathers of children as young as 15 months old use more cognitively complex language, elicit more complex utterances, and use more imperatives than mothers (Lindsey, Cremeens, & Caldera, 2010). Father-child interactions are described as didactic in that fathers place higher verbal demands on their children and prompt them more (Bornstein, 2002). In a study with 2- to 4-year-olds, fathers used more label and function requests than mothers and

elicited more total vocabulary from their children (Masur & Gleason, 1980). However, when both mother and father are interacting with their 36-month-old, fathers use fewer verbal utterances, fewer total words, and fewer *wh*-questions (Pancsofar & Vernon-Feagans, 2006).

The fact that fathers differ from mothers in how they communicate with their young children raises the question of how children's early language acquisition influences fathering. Fathers traditionally spend less time with their young children than mothers and may have less familiarity with the child, which then provides less of a basis for estimating their child's linguistic skills (Lamb, 2010). Young children with better developed language skills may be better able to respond to the more complex speech that fathers use, and this may be associated with more positive fathering (sensitivity, warmth, and cognitive stimulation). That is, early language acquisition differences may be a child characteristic that influences changes in positive fathering over the course of early childhood as children's language skills improve.

Evidence also indicates that fathers and mothers may react differently to child individual differences in behavior, such as problematic behavior and temperamental variations. For example, young child externalizing behaviors have been associated with greater child-related stress and less confident parenting in both fathers and mothers (Baker & Heller, 1997; Calzada, Eyberg, Rich, & Querido, 2004). Similarly, mothers of older children with Attention Deficit Hyperactive Disorder (ADHD), but not fathers, reported stress related to child inattention symptoms, but both fathers and mothers reported stress related to child defiance and aggression (Podolski & Nigg, 2010). Fathers have also been shown to be less responsive than mothers to young children's (3-to 6-year-olds) disruptive behavior (Calzada et al., 2004).

Therefore, one aim of the present study was to examine whether fathering quality changes over the period of early childhood language development, and the decline in negative

affectivity—18 to 42 months of age—and to determine if any changes in positive fathering quality are attributable to these changes in children's behavior. It was postulated that child characteristics would work independently and in conjunction with both father and family characteristics. The discussion now turns to what is known about other characteristics of young children that influence fathering.

**Characteristics of Young Children that Influence Fathering.**

In 1968, Bell asserted that a unidirectional focus of research on parent-child interactions was imprecise and that researchers needed to appreciate that children and parents continually exert bidirectional influences on one another. This assertion was echoed by Belsky (1984), whose ecological theory proposed that the relationship between a parent and child is shaped by each individual and their interactions, and that this relationship is continually developing. Similarly, in his transactional theory, Sameroff described children as actively contributing to their own development (Sameroff, 1975).

Developmental changes in the toddler years are usually viewed as contributing to parent-child conflict, but there is rarely an analysis of how parenting is changing during early childhood (Teti & Huang, 2005). Evidence suggests that a decline in positive parenting is normative, although the ages at which the decline occurs have not been specified. Both mothers and fathers have been found to be more expressive, positive, sensitive, and comforting toward infants than they are toward older children (Barry & Kochanska, 2010; NICHD, 2000). Parents have also been found to engage in higher levels of verbal stimulation with their young children until the children began talking, and then the modal response of parents to child verbal bids is ignoring (Hart & Risley, 1995).

Due to the normative decline in positive parenting it was hypothesized that fathers' positive parenting would decline across the 24 month observation period. However, the thesis aimed to contribute to the evidence of the influence that child characteristics can have on fathers' parenting over time by demonstrating that changes in specific child characteristics, including children's language skills and negative affectivity, would affect the rate of change of positive fathering. It was hypothesized that these characteristics would account for significant changes in father's positive parenting as child ages from 18 to 42 months.

**Child language.** A child's age is a marker for many developmental changes that may influence parenting quality. As a child grows parents must alter how they interact with the child usually in relation to the child's changing capabilities and needs (Teti & Huang, 2005). The development of language, for example, occurs early in childhood and changes not only the way in which the child relates to others but also the way in which parents interact with the child (Hart & Risley, 1995; Leaper, Anderson, & Sanders, 1998).

Most children acquire their first words, vocabulary, and initial understanding of grammar early in childhood. However, there is considerable within-person variability in the timing of each skill's emergence. First words are spoken as early as 9 months of age by some children but others do not speak until they are almost 3 years old; additional language achievements, such as vocabulary growth and grammatical understanding also vary considerably (Bornstein, 2002).

It is not known, however, whether individual differences in young children's ability to communicate influences the quality of fathers' interactions with the child. Potentially, a linguistic index like mean length of utterance (MLU; Brown, 1973), i.e. the child ability to utter two or more morphemes together, elicits a change in fathering quality. Growth in MLU signals the development of early sentence formation, and greater ability to communicate than single words

can. A child who is better able to communicate may contribute to father-child interaction in two ways. First, children's increasing ability to communicate should help fathers understand children's intentions, desires and reactions, which in turn could lead to more sensitive responses from fathers. Holmes and Houston (2010) found that fathers of 4-year-olds with higher language abilities than their agemates interacted more positively with the children during the first grade period. Second, a child's ability to communicate, even in short proto-sentences, may help a child sustain interaction with father, furthering opportunities for the father to enjoy the interaction and to stimulate the child's cognitive development. Thus, improvements in expressive language, such as a child's relative skill and growth in MLU, may contribute to more positive parenting. Therefore, the thesis tested the prediction that fathers of toddlers with longer MLU and greater MLU growth over early childhood would increase in their positive parenting over time relative to fathers of toddlers with shorter MLU and less MLU growth over early childhood.

**Child temperament**. In addition to rapid language acquisition, toddlerhood is also a period of increased negativity followed by a decline in negativity as children progress toward the preschool years. The increase in negativity is viewed as a part of normative development. As very young children first acquire skills that support their independence—e.g. being able to move on their own accord (i.e. walking), reach and manipulate objects on their own (i.e. eye-hand coordination) and communicate their needs and interests and problems (i.e. expressive language)—they gain in autonomy. However, they often assert themselves in ways that conflict with parental rules or demands or are unsafe for the child. These occasions therefore lead to child negativity as parents begin to set limits, enforce rules, and discipline their newly autonomous youngsters (Brownell & Kopp, 2007; Caslin, Luyten, Vligen, &Meurs, 2011).

Although an increase in child negativity is regarded as normative, there are also considerable individual differences in the speed, intensity, and responsiveness to soothing of children's negative affectivity. These individual differences are construed as an aspect of temperament (Rothbart & Bates, 2006). Temperament, defined as biologically-based differences in emotional reactivity, behavioral reactivity, and self-regulatory skill, may be associated with differences in parenting (Rothbart & Bates, 2006). There is some limited and mixed evidence regarding how child temperament interacts with fathering.

On the one hand, higher levels of child negative affectivity have been associated with less supportive and more controlling parenting, though the direction of this effect is unclear (Kiff, Lengua, & Zalewski, 2012; Van de Akker, Dekovic, Prinzie, &Asscher, 2010). The likelihood that child negative affectivity may lead to less positive parenting in fathers is buttressed by evidence based on studies of children and their mothers. In an experimental study examining the effects of stimulant medication on children with Attention Deficit Hyperactive Disorder (ADHD), mothers of preschool aged children were found to use fewer commands and to soften their management style as child compliance increased (Barkley, 1988). In a sample of 7 – 10 year olds with and without Conduct Disorders (CD), both mothers of CD children and mothers of children without CD made more negative responses toward CD children (Anderson, Lytton, & Romney, 1986). Similarly, mothers who interacted with a child confederate trained to be difficult were less able to assert authority if they had a lower sense of their own power (Bugental, Caporael, & Shennum, 1980). Thus, on one hand, there is evidence that child characteristics associated with negativity influence parenting.

It follows then that the quality of fathering may be detrimentally affected by interacting with a child who is often and intensely negative. A father interacting with such a child may be

pressed to set limits or find himself unable to *constantly* soothe a child who is unable to calm him or herself down. It is possible that, over time, continuously having to engage with a highly negative child may exacerbate the normative decline in positive parenting during this period. Even fathers who are generally sensitive, positive and stimulating despite a child's high level of negativity may feel less able to continuously exhibit sensitivity, positive fathering behaviors. Therefore, a child's level of negative affectivity may lead to steeper declines in positive parenting over time in fathers at least as compared to those fathers whose children are less affectively negative.

On the other hand, some studies have reported no relation between a young child's negative emotionality and fathers' behavior. One study examining father involvement with infants between the ages of 7- to 14-months found no direct relation between child temperament and the amount of time fathers were involved in childcare (Mehall, Spinrad, Eisenberg, & Gaertner, 2009). However, other studies suggest that a relation between a young child's temperament and parenting quality may depend on additional factors. For example, a longitudinal study found that infant temperament was associated with father sensitivity at child age 6 months, but subsequently unrelated (child ages 6- to 36-months; NICHD, 2000). Yet another study found that toddler boys' negative emotionality and father's skilled parenting between child ages 15- to 33-months were not related (Woodworth et al., 1996). The findings are limited however in that the relations between child temperament and fathering were measured differently at infancy and later ages.

In sum, evidence is mixed regarding the degree to which child negativity influences parenting in mothers or fathers. Moreover, the majority of studies on this topic focused on mothers, not fathers. The thesis sought to examine the effect over time of individual differences in young children's negative affectivity on fathers' positive parenting (sensitivity, positive affect,

stimulation of cognition). Specifically, the thesis aimed to address how changes in maternal reports of child negative affectivity at 18, 30, and 42 months was related to observations of fathers interacting with their children.

Child negative affectivity was assessed using two conceptually related, developmentally sensitive temperament scales using the Rothbart and Bates (2006) approach to temperament: the Toddler Behavior Questionnaire (TBAQ-R; Goldsmith, 1996; adapted by Rothbart, 1996) at 18 and 30 months and the Child Behavior Questionnaire (CBQ; Putnam & Rothbart, 2006) at 42 months. Both children's overall (averaged) level of negative affectivity across these 24 months and children's rate of the decline in negative affectivity over this period were examined as predictors of positive fathering. Specifically, higher mean levels of negative affectivity relative to other children, and a less steep decline in negative affectivity, were expected to predict declines in fathers' positive parenting over time.

**Child gender.** Multiple studies have found that traditionally, fathers spend more time overall with sons than daughters, both in play and caregiving activities (NICHD, 2000; Tamis-LeMonda et al., 2004). Beyond father involvement, child gender has been found to affect fathering behaviors in early childhood. During toddlerhood fathers behave more sensitively toward and to demonstrate better and more consistent structuring with daughters than they do with sons (Lovas, 2005). In contrast, fathers of 36 month old sons were more intrusive with sons and perceived them more negatively than (Tamis-LeMonda et al., 2004).

Fathers may exhibit different parenting behaviors towards male and female children, however, it is possible that sons and daughters are behaving differently thus eliciting different behaviors. With regard to temperament, no differences in infancy between boys and girls have been found (Rothbart, 1986); however, as children age, differences may begin to appear. A meta-

analysis of gender differences in temperament in early childhood revealed that girls were less emotionally negative, less active, and slight more regulated than boys (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006). Boys who are less regulated may exhibit more negative emotionality and more oppositional behaviors; one study found that though fathers issued twice as many prohibitions towards their 1 year old sons as compared to daughters, however, boys approached a dangerous object twice as often as girls (Snow, Jackline, & Maccoby, 1983).

Given these findings, the thesis predicted that child gender may influence fathers' positive parenting. Fathers typically spend more time with young boys and those fathers of boys who displayed more negative affectivity would most likely be engaged in fewer positive father-child interactions. Therefore, it was hypothesized that fathers of sons with higher levels of mother-rated negative affectivity would exhibit the lowest levels of positive parenting over time. In addition, fathers of girls who were rated as low in negative affectivity were expected to be rated as exhibiting the highest levels of positive parenting.

Similar to findings related to temperament, differences in language acquisition in male and female children may affect fathers' behaviors. On average girls' expressive language appears earlier than boys and girls have larger vocabularies (Lovas, 2001; Masur & Gleason, 1980; Schacter, Shore, Hodapp, Chalfin, & Bundy, 1978). However, another study reported that child gender was not related to language ability at 24 and 46 months of age (Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010). On the basis of evidence that gender may be a factor, the thesis examined the presence of gender differences in child language abilities as measure by MLU.

**Control Variables in the Current Study.**

The thesis aimed to examine if specific child characteristics, including child temperament and language development, affected fathers' parenting behaviors during early childhood. To determine if these characteristics affected fathering over and above the effect known predictors of fathering behaviors control variables were included in the present study. These control variables and their hypothesized relation with fathering are discussed below.

**Coparenting relationship.** In addition to child characteristics, Family Systems theory posits multiple, interrelated subsystems within families that influence interactions (Cook, Buckley, Schoppe-Sullivan, & Davis, 2009). One family subsystem that directly influences children's behavior, and which is likely influenced by child characteristics, is the coparenting relationship. Conceptualized as distinct from the marital relationship, the coparenting relationship focuses on the partnership of individuals sharing responsibility for raising children (Cook et al., 2009; McHale, 1997). This relationship is closely related to child outcomes and encompasses how supportive vs. how undermining partners are of each other's' parenting (Cook et al., 2009; Jia & Schoppe-Sullivan, 2012; McHale, 1997).

The coparenting relationship has been shown to affect father's involvement and quality of fathering. In particular, fathers who perceive less support from their partners may question their role as a caregiver and their own parenting competency (Isacco, Garfield, & Rogers, 2010). Fathers of infants were found to be more involved and competent with their children when the quality of the coparenting relationship and mother encouragement of father involvement were high (Schoppe-Sullivan, Brown, Cannon, Mangelsdorf, & Sokolowski, 2008). Similarly, married fathers of infants who perceived more coparental support were more involved with their children (Isacco et al., 2010).

Fathers' perceptions of the coparenting relationship were assessed using the Coparenting Scale (McHale, 1997). The scale yields four scales: Family Integrity, Disparagement (of the partner), Conflict, and Reprimand. The scale used in the thesis was the Family Integrity Scale, which was expected to reflect the degree to which fathers regarded their coparenting relationship as positive and supportive.

**Family characteristics.** Previous studies have also demonstrated that the number of children in the family (Flouri & Buchanan, 2003; Pleck, 1997) is inversely related to father's involvement with their children. Mixed results have been found for child birth order as a predictor of fathers' involvement with some studies finding no support for this relation (NICHD, 2000) and other studies reporting support for variability in father's involvement (Harris & Morgan, 1991). Both predictors were included in the multi-level model and, ultimately, only the number of children was included in analyses.

**Father characteristics.** Previous work has found that fathers with higher education reported being more involved with their young children (Coley & Hernandez, 2006). Similarly, father involvement when children were 7, 11, and 16 years old was related to his education level (Flouri & Buchanan, 2003). As a result, father's education at each child age point was included in the thesis.

**Predictions of the Current Study**

It is generally acknowledged that relationships between children and their parents are mutual and reciprocal, and that fathers contribute independently to their children's development. The thesis' aim was to examine whether individual and developmental differences in two salient child characteristics—child language development and child negative affectivity—accounted for variability in the stability of fathers' positive parenting. Because a decline in positive parenting is

typical during early childhood, it was hypothesized that child characteristics would influence the rate of decline for fathers across the 24 month period from child age 18 to 42 months.

It was expected that differences in children's negative affectivity scores and language capabilities would account for some of the variability in fathers' positive parenting. Children who were identified by their mothers as higher in NA were expected to have fathers who in positing parenting. It was also expected that this decline would be most apparent in boys. Fathers of male children with high global levels of negative affectivity were expected to have lower positive parenting ratings during the home visit than fathers of male children with lower levels of negative affect and fathers of female children.

Previous studies have demonstrated that fathers speak to children differently than mothers and are more linguistically demanding of their children. Because of this, it was hypothesized that male and female children who exhibited more complex language earlier in their development would have fathers who were rated as more positive than males and females who developed language slower. Further, it was also expected that there would be a gender by mean language of utterances (MLU) interaction that favors girls with higher language abilities in predicting fathers' positive parenting.

In sum, the present study aimed to contribute to the literature on parenting by examining how individual differences between children and intra-individual within children over time predicted the general decline in fathers' positive parenting during early childhood. The study had three specific aims and associated hypotheses.

**Aim 1:** To confirm that positive parenting declines in early childhood among fathers in the current sample.

**Hypothesis:** It was hypothesized that, on average, the level of fathers' positive parenting would decline between child ages 18 to 42 months. To test this hypothesis, the mean level of positive parenting across all fathers was examined using Multilevel Modeling (see Appendix A for statistical model).

**Aim 2:** To determine if two child characteristics—child language skills and child negative affectivity—predicted differential declines in fathers' positive parenting.

**Hypothesis 2a:** Main effects of both child language skills and temperament on the trajectory of change in fathers' positive parenting were predicted. Again, Multilevel Modeling was used to test whether these child characteristics predicted change in fathers' positive parenting.

**Hypothesis 2b**: In addition to studying individual differences in child language skills and temperament, within child change in temperament over time was also tested as a predictor of fathers' positive parenting.

# METHOD

## Participants

Data for the present study were taken from a larger longitudinal study, The Development of Toddlers Study (DOTS). For the larger study, data were first collected when the target child was 18 months old. Children and at least one parent were seen every six months up to age 48 months. A goal of the larger study was to examine individual differences in language and their relation to child emotion regulation in a sample of rural and semi-rural economically strained families. The inclusionary criteria were: 1) annual family income greater than U.S. government defined poverty level but lower than the national median income for the family's size, 2) target child age 18 months (+/- 2 weeks) at Time 1, and 3) child lived with the family since at least three months of age and had no history of condition such as hearing loss or developmental delay.

Initially 128 families enrolled in the study; of these three did not meet income eligibility after further evaluation and one family withdrew before data collection began. Families were asked to complete four home visits and four lab visits in addition to parents completing a number of questionnaires each year. The present study used home visit and questionnaire data. Of the remaining 124 families, 120 completed at least six of these eight visits. Of the 120 families, 106 fathers provided usable data; of the remaining 14 families, six fathers had been uninvolved with the child and eight were absent for more than one home visit. In addition, there was a different number of participating fathers for each wave of data collection as some could not be present for a home visit and others, though present, did not interact with the child: there were 99 fathers with usable data at child age 18 months, 102 at child age 30 months, and 97 at child age 42 months. Father and child demographics are presented in Table 1.

## Measures

**Positive parenting.** Fathers were observed interacting with their children during home visits that occurred when the target child was 18, 30, and 42 months old. The home visits were scheduled at a time when all family members would be present and that was convenient for the family, usually in the late afternoon or early evening.

Trained graduate assistants and project staff (research assistants) were the home visit observers. The entire observation was audio recorded; children were given a vest with a microphone so that their verbalizations could be heard more clearly. Families were instructed to behave in a natural manner and to ignore the research assistant. The research assistant, who followed the child throughout the visit, was trained to not engage with the child if he or she attempted to speak to or interact with the assistant during the observation.

For each home visit, the research assistant observed the child and the parents who were interacting with the child for one hour; the assistant observed for 10 minutes and then recorded ratings for each person and each dyad pair for 5 minutes four times using the Parent-Child Interaction Rating System (PCIRS; Belsky, Woodworth, & Crnic, 1996).

The PCIRS employs six rating scales for each person (three positive qualities, three negative qualities). The Positive Parenting scale used in the present study comprised the three positive parenting quality scales: Sensitivity, Positive Affect, and Stimulation of Child Cognition. The three other scales, which were not used in the present study, were Negative Affect, Intrusiveness, and Detachment. The definition of each parenting scale is presented in Appendix B. Each scale was rated on a 1 (not at all) – 5 (predominantly) Likert scale.

To create a Positive Parenting composite score, two steps were taken. First, for each scale (Sensitivity, Positive Affect, and Stimulation of Child Cognition), the individual ratings from

each 10-minute period were summed and divided by the number of periods (some fathers were not present for every 10-minute period), yielding three mean scale scores for each time point (child ages 18, 30, and 42 months). Second, these means were summed and divided by the number of scores to create a composite mean Positive Parenting score for each visit.

**Language development.** MLU was derived from digital audio records made during the 18, 30, and 42 month home visits. Home visit data provide an ecologically valid assessment of children's early ability to form sentences (Bacchini, Kuiken, & Schoonen, 1995). Audio records were transcribed using the CHAT method from the Child Language Data Exchange Program (CHILDES; MacWhinney, 2000). This procedure provides a standardized method of transcribing conversations into a format that can then be analyzed by computer using the CHILDES Computerized Language Analysis (CLAN) procedure (MacWhinney, 2000). The CLAN procedure was then used to determine each child's MLU by dividing the number of morphemes by the number of utterances, using 100 utterances (Brown, 1973). If the utterance criterion was not met in the first two epochs transcribed, subsequent epochs were used until 100 utterances were reached (or never reached) as is standard practice (Brown, 1973; Schachter et al. 1978). Words were marked as unintelligible when the transcriber was unable to hear or understand what the child had said. The first 100 unique, spontaneous utterances were used to calculate MLU.

**Child temperament.** Child temperament was assessed using the Toddler Behavior Assessment Questionnaire (TBAQ-R; Goldsmith, 1996; adapted by Rothbart, 1996) when the child was 18 and 30 months old. The TBAQ-R is a 105-item measure that asks the primary caregiver to rate the frequency of specific behaviors within the past month on a Likert scale (1 = Never, 7 = Always). The TBAQ comprises eight scales that have been found to be "largely independent, thus supporting the TBAQ's discriminant validity" (Goldsmith, 1996, p. 223):

Activity Level, Pleasure, Social Fear, Interest, Anger, Sadness, Inhibitory Control, Falling Reactivity, and Soothability. For each scale, the values for each item are summed and divided by seven to yield a mean score. The standard procedure is then to use these values to construct scores for the larger order scales that have been reliably found in factor analytic studies (Goldsmith, 1996). The Negative Affectivity (NA) scale has 40 items. An NA score was created by summing the Sadness, Anger, Social Fearfulness, and reverse-coded Soothability mean scores and dividing the sum by 4. Internal consistency at age 18 months was $\alpha = .81$ and at age 30 months $\alpha = .86$.

Child temperament at 42 months was assessed using the Child Behavior Questionnaire (CBQ; Putnam & Rothbart, 2006). The CBQ is related to the TBAQ and is modified to be developmentally appropriate for children over 36 months of age. The CBQ is a 94-item measure that assesses how frequently children engaged in a particular behavior in the previous six months using a 1 -7 Likert scale (1= extremely untrue of your child, 7 = extremely true of your child). Sample items include (my child) *gets angry when told he/she has to go to bed* and (my child) *cries sadly when a favorite toy gets lost or broken.*

The Negative Affectivity score was obtained in the same way as reported above for the TBAQ-R (sum of scale scores for Discomfort, Anger/Frustration, Sadness, Fear, and reverse-coded Soothability and dividing the sum by five (Rothbart, Ahadi, Hershey, & Fisher, 2001). For the present sample, internal consistency at 42 months $\alpha = .74$.

**Coparenting**. Fathers' perceptions of their coparenting relationship were assessed using the Coparenting Scale (McHale, 1997). The Coparenting Scale is a 24-item measure that asks respondents to rate a) the frequency of specific parenting behaviors and b) the frequency that these behaviors occur in front of the child on a Likert scale (1=Absolutely never, 7= Almost

constantly). The Coparenting Scale comprises four scales that show high cross-time stability (McHale, 1997): Family Integrity, Disparagement (of the partner), Conflict, and Reprimand. For each scale, the values for each item are summed and divided by the number of items in the scale to yield a mean score.

The present study used the Family Integrity scale as an index of the quality of the marital partnership as it pertains to parenting. The Family Integrity scale is significantly correlated with marital satisfaction (McHale et al., 2000). The Family Integrity scale has seven items describing overt and covert examples of coparenting that estimate the degree to which a partner feels united with the other parent and the family (McHale et al., 2000). Internal consistency for the Family Integrity Factor Score was $\alpha = .83$ at child age 18 months, $\alpha = .88$ at child age 30 months, and $\alpha = .86$ at child age 42 months.

Bivariate correlations (Pearson's r) were conducted to assess the relation between Family Integrity and Positive Parenting. Fathers' Family Integrity scores were correlated with the overall Positive Parenting scores at all child ages: 18 months, $r(93)= .431$, $p < .001$, 30 months ($r(95)= .249$, $p<.007$), and 42 months old ($r(92)=.199$, $p<.027$). The Family Integrity Factor score was included as a control variable in the model.

**Procedure**

The study was approved by the Pennsylvania State University Institutional Review Board (#990642). Participants were recruited from rural and semi-rural communities in central Pennsylvania, identified through census tract data as living in tracts that had high densities of (a) families with very young children and (b) income within the study's target range. The methods of recruitment included a) contact with local community liaisons and distributions of flyers at their agencies, b) identification of families in the target communities via birth announcements

published in local papers, and c) word of mouth referrals. Informed consent was obtained from all families at Time 1.

During the course of the study, families were asked to complete four home observations and four lab visits. Additionally, mothers completed questionnaires at various times during the study. Each home visit was conducted by a trained graduate assistant when the target child was 18, 30, and 42 months old. The 18 month visits were scheduled within two weeks of the families' first visit to the DOTS lab. The child temperament questionnaires were mailed in advance of the home visit and the completed questionnaires were collected at the home visit.

**Data analysis plan.** Multilevel Models (MLM) were conducted using SAS 9.3 to examine individual differences in the mean level and change in Positive Parenting over time. MLM is a statistical method of studying data collected at multiple time points and allows for an examination of relations between different levels of data (Luke, 2004). The first level of the model is an individual growth model and "represents the change we expect each member of the population to experience during the time period under study" (Singer & Willett, 2003, p. 49). This level answers questions related to within-person changes (Singer & Willett, 2003). The second level of MLM describes differences in the trajectory of change according to level two predictors; the second level of the model answers questions related to between-person differences in change (Singer & Willett, 2003). Higher-level predictors are included within the model to help explain differences in intercepts and slopes in lower-level predictors (Tabachnick & Fidell, 2007).

In the current study two levels were included in the MLM (see Figure 1 in Appendix A). The first level of the MLM included time-varying characteristics of the father, child, and contextual variables that were unique to each father. These characteristics included Time, which

also served as a proxy for child age, the Number of Children living in the home, the fathers' Family Integrity Score, child characteristics including MLU and NA, and the resulting interactions between these variables. As fathers are nested within the father-child dyad, and are hypothesized to be influenced by their children, the second level of the model included time-invariant child characteristics including child Gender, the mean level of NA, and the mean level of MLU across child age points. It was expected that the level two predictors would help to account for variance in fathers' positive parenting and that the inclusion of these predictors would affect the relationship between level one predictors and fathers' positive parenting. Interactions between level one and level two predictors were also considered.

# RESULTS

## Descriptive statistics

Fathers participated in most of the three home visits used in the present study (M = 2.81, SD = .39). Table 2 reports the mean levels of fathers' Positive Parenting at each time point, and of the component scales that comprised Positive Parenting (Sensitivity, Positive Affect, and Stimulation of Child Cognition), language skills (MLU at home visit) and temperament (mother-rated NA). At the group level, fathers showed modest levels of positive parenting with variability within group.

To evaluate the stability of fathers' Positive Parenting Pearson correlations were conducted between fathers' Positive Parenting composite scales (Sensitivity, Positive Affect, and Stimulation of Child Cognition). These results are presented in Table 3. The correlations demonstrate stability within and across time of fathers' Positive Parenting characteristics.

Pearson correlations between fathers' Positive Parenting variables, child MLU and NA are presented in Table 4. Only three correlations were significant. At 18 months, child NA was correlated with father Stimulation of Cognition, $r(96) = -.207$, $p<.05$ and child MLU correlated with father Positive Affect, $r(84) = .192$, $p<.04$. At 30 months, child MLU was related to father Sensitivity, $r(83) = .192$, $p<.04$.

Pearson correlations among child variables revealed modest stability in child MLU between 18 months and 30 months, $r(74) =.275$, $p<.01$, but not between child ages 30 and 42 months, $r(72) = .046$, $p<.70$ (see Table 5). Child NA was stable between all pairs of adjacent ages (18 and 30 months, $r(98) =.687$, $p<.0005$, 30 and 42 months, $r(97) = .551$, $p<.0005$). Finally, of six possible correlations between NA and MLU, one was significant; child NA at 18 months was inversely related to child MLU at 42 months, $r(83) = -.199$, $p <.05$.

Child gender differences in MLU and NA were examined using independent samples *t*-tests. No significant effect of gender was found for NA at 18 months, all *t* values < 1. Also, gender was not related to child MLU at 18 months, $t(90)=-.320$, $p<.750$. However, girls had longer MLU at both 30 months, $t(86)$, = -3.10, $p<.003$ (girls M=2.04, SD=.52 boys M=1.74, SD=.39), and 42 months, $t(83)=-2.24$, $p<.03$; (girls M=2.94, SD=.72, boys M=2.62, SD=.62).

**Covariates**

To determine whether potential covariates should be included in the analyses, Pearson correlations were conducted within and across time for father Positive Parenting scores and variables for constructs hypothesized to influence positive parenting. Correlations between the Family Integrity score and father Positive Parenting were significant within and across time (Table 6). The Family Integrity Factor Score was correlated with fathers' Sensitivity at all child ages and with Stimulation of Child Cognition at 18 and 42 months; however, the Family Integrity score was only correlated with fathers' Positive Affect at 18 months. The Family Integrity Factor score was included in the multilevel models.

Correlations were also conducted for child Birth Order and father Positive Parenting (see Table 6). At child age 18 months, child Birth Order was inversely related to Father Sensitivity, $r(97) = -.202$, $p<.02$, and Stimulation of Cognition, $r(97) = -.295$, $p<.002$. Similarly, at child age 30 months, Birth Order was inversely related with Sensitivity, $r(100) = -.192$, $p<.03$, and Stimulation of Cognition, $r(100) = -.195$, $p<.03$. At 42 months, Birth Order was inversely related with father Positive Affect, $r(95) = -.304$, $p<.001$, and Stimulation of Cognition, $r(95) = -.181$, $p<.04$. Similarly, the Number of Children in the home and father Positive Parenting were related within and across time (see Table 6).

In terms of child factors, Birth Order and Number of Children in the home were related to the key child characteristics being tested. Child Birth Order was related to Number of Children in the home at all age points. Additionally, Number of Children and Birth Order were related to child NA at 18 and 30 months. Child Birth Order and Number of Children were therefore included in the MLM individually to determine which variable was the stronger predictor of Positive Parenting. Due to their strong relation, only Number of Children was included in the final MLM.

Father Education was also used as a covariate. One-way ANOVAs within each time point revealed only effect at child age 42 months, $F(6, 90) = 5.16$, $p<.005$. Father education was included as a covariate in the MLM.

**Missing Data Analyses and Data Preparation**

Before conducting the main analyses, missing data analyses were conducted for child predictor variables (NA and MLU) of Positive Parenting. Child NA data for all three child age points were available for 92.5% of the children in the sample (n=98); 6.6% of children (n=7) had NA data available for two child age points. One child had NA data at only one age point.

Missing data analyses for child MLU revealed that 62 (58.5%) children provided three MLU observations, 35 (33%) children had two MLU observations, and nine (8.49%) had only one MLU observation. In a majority of the missing cases, MLU data was lost due to equipment failure. Figure 2 shows mean MLU, at each age point, for children that provided three MLU observations compared to those who only provided two observations. Independent sample *t* tests were conducted to test for significant differences in language ability between children who provided different amounts of MLU data. No significant differences were found in at 18 months, $t(84) = -.334$, $p<.739$, 30 months, $t(81)= -.376$, $p<.708$, and 42 months, $t(79)= -.049$, $p<.961$.

Similarly, independent samples *t*-tests demonstrated that there were no significant differences between children who provided only one observation when compared to those who provided three at 18 months, $t(62)=-.735$, $p<.465$, 30 months, $t(61) = 1.06$, $p<.292$, and 42 months, $t(60)= -1.13$, $p<.265$.

**Multiple imputation**. Multiple imputation (MI) was used to address missing data, and was performed in SAS 9.2 using the PROC MI and PROC MIZNALYZE. Though SAS 9.3 is able to tolerate missing data, smaller sample sizes decrease power to detect effect sizes (Tabachnick & Fidell, 2007); as the current sample was composed of 106 families insuring that cases were not deleted during analyses was important. MI was chosen over single imputation methods, such as mean substitution. Single imputation may lead to invalid results as the variability of the missing data may be underestimated (Sinharay, Stern, & Russell, 2001). In contrast, PROC MI creates *m* imputed data sets in which the missing data are filled in *m* times with plausible values (Yuan, SAS Institute). PROC MI first runs an EM algorithm; this algorithm uses the data that is present to produce maximum likelihood estimates for the missing data (Graham, 2009). The final product of the EM algorithm is a variance-covariance matrix and vector of means for the data set (Graham, 2009). Following this step, a Monte Carlo Markov Chain is conducted (Graham, 2010). The results of MI are *m* number of plausible values for all missing data.

PROC MI assumes that data used in the imputation model are normally distributed. To examine this in the data set skewness and kurtosis were examined for each variable. At all ages, father Positive Parenting skew was 1 or less. Further examination of the variables that compose Positive Parenting demonstrated that Stimulation of Cognition was positively skewed at all three time points. The Stimulation of Cognition variable was log transformed but remained skewed

and kurtotic due to low levels of Stimulation of Cognition at each time point. Therefore, Stimulation of Cognition was not transformed for the imputation model.

PROC MI also assumes that data are either missing at random (MAR) or missing completely at random (MCAR) (Yuan, SAS Institute). Prior to imputation Little's MCAR test was used to examine patterns of missingness in the data. In Little's MCAR test, the null hypothesis is that the data are MCAR at the .05 level; significance values less than .05 indicate that the data are not MCAR. When the MVA analysis was conducted for the entire data set $\chi_2$ was 439.6 ($p < .19$) indicating that when the entire data set was taken into account the data were considered missing at random. MVA analyses were then conducted for child MLU. Little's MCAR test $\chi_2 = 4.78$ ($p<.853$) for child MLU data indicated that the MLU data was missing at random. Similar results were found for child Negative Affectivity, Little's MCAR test $\chi_2 = 2.849$ ($p< .899$)

When comparing fathers who provided two positive parenting observations versus those who provided three positive parenting observations no significant differences in mean levels of positive parenting were found at 18 months, $t(95)=.160$, $p<.873$, 30 months, $t(98)=.93$, $p<.355$, and 42 months, $t(93)=0.862$, $p<.391$. Little's MCAR test in SPSS found $\chi_2 =12.066$, $p<.061$. However, similar analyses in SAS 9.2 using Fisher's exact test for independence found a significant correlation between fathers' positive parenting missing data and fathers' education level such that fathers' with lower education were more likely to have missing values for positive parenting.

Due to the missing values of positive parenting three methods for multiple imputation were considered. Case-wise deletion, in which fathers with missing Positive Parenting data were deleted, raised concerns regarding the potential loss of power to detect an effect of child

characteristics on fathers' Positive Parenting. The use of a multiple imputation method for data that are not missing at random (NMAR) was then considered however these procedures can be very complicated and may be "problem specific" (Sinharay et al., 2001, p. 321). Selection models and pattern-mixture models were also considered. Pattern-mixture models assume that the pattern of variable X is "conditioned on the missing data pattern M" (Little, 1993, p. 125). After considering MI methods for data that is NMAR it was determined that the PROC MI procedure in SAS would be used. Fathers who were missing during the home observations may have been at work however multiple fathers were present in the home and were simply not interacting with the child.

PROC MI was conducted with SAS producing five imputed data sets. Three to five imputed data sets are recommended as sufficient when there is not a large amount of missing data in a data set (Sinharay et al., 2001; "Multiple Imputation in SAS"). In the current data set 5% of the raw data was missing. Graham, Olchowski, and Gilreath (2007) suggested that 40 imputations be conducted when 50% of the data are missing to prevent large power falloff and to increase the relative efficiency of the imputations. If 10% of data is missing, 20 imputations are recommended (Graham, et al., 2007). When 10% of data are missing the MI efficiency estimate for five imputations is estimated to be 98% efficient (PROC MI, SAS). In the current analyses five imputations were performed as less than 10% of the data were missing. Additionally, a ROUND = statement was not included in the PROC MI procedure as rounding imputed values may cause biased estimates (Horton, Lipsitz, & Parzen, 2003).

As recommended, the PROC MI statement included all variables that would be included in later MLM procedures (Yang, SAS Institute). Before PROC MI was conducted specific steps

were taken to prepare the data. Level 1 variables were group mean centered to allow for easier interpretation of the results and child gender was recoded as boys = 0 and girls = 1 (Hox, 2002).

Time was centered by subtracting 18 from each time point (18, 30, 42 months) allowing for easier interpretation of results; by centering time on the first wave of data collection the predicted intercept became each individual fathers' "true initial status" (Singer & Willet, 2003, p. 52). Additionally, each explanatory variable was group-mean centered allowing for the intercept to be interpreted as predicted level of Positive Parenting when all other variables are held at 0 (Hox, 2002).

The interaction terms used in the Level One and Level Two models were also created prior to the PROC MI analysis. Including interaction terms in the imputation model insures that the relation between the interaction and the dependent variables is not "suppressed toward 0" (Graham, 2009, p. 562). When creating the interaction terms, time was recoded as zero, one, and two due to the equal amount of months between each observation. Interaction terms were then created by multiplying MLUxNegative Affectivity, MLUxFamily Integrity Factor, TimexNegative Affectivity, and TimexMLU at each age point. These variables were included in the MI analysis and subsequent models using the imputed data.

Father Positive Parenting, including its three components Sensitivity, Positive Affect, and Stimulation of Cognition, were included in the PROC MI procedure. The dependent variable was included in the imputation model to maintain the same relation between independent and dependent variables. The final PROC MI script was:

```
PROCMIdata = mimasters_allnimpute = 5SEED = 45792simpleout = procmi;
      em; mcmc plots=trace plots=acf;
      var

      NAMNmeancentered18 NAMNmeancentered30 NAMNmeancentered42
      Avg_NAMN
      NAMNtime18m NAMNtime30m NAMNtime42m
      GxNAMN18 GxNAMN30 GxNAMN42
```

```
MLUmeancentered18 MLUmeancentered30 MLUmeancentered42
Avg_MLU
MLUtime18m MLUtime30m MLUtime42m
Child18minteraction Child30minteraction Child42minteraction

GMC_NChildren18 GMC_NChildren30 GMC_NChildren42
GMC_birthorder

FamImeancentered18 FamImeancentered30 FamImeancentered42
MLU_FamInteg18 MLU_FamInteg30 MLU_FamInteg42

M_FSEN18 M_FSEN30 M_FSEN42
M_FSC18 M_FSC30 M_FSC42
M_FPA18 M_FPA30 M_FPA42
FPOS18 FPOS30 FPOS42;
```

Following the PROC MI procedure, variables were reconverted into a long format so that the mixed models could be executed. Each subsequent model included a "BY _Imputation_" statement so that the mixed model would be conducted on each imputed data set ($m$ =5). Following PROC Mixed, the PROC MIANALYZE procedure in SAS produced inferential statistics about parameters estimates and covariance and variance estimates that had been combined for the five data sets (Yuan, SAS).

**The Multilevel Model**

**Null model.** All models were performed using PROC MIXED in SAS 9.2, which uses the restricted likelihood method (REML). To evaluate model fit, the data models were compared using the Akaike and Bayesian Information Criterion values (AIC/BIC). Lower AIC/BIC values indicate better fitting models (Luke, 2004).

The unconditional means model, which omitted all predictors, was conducted first. This model provides a baseline for comparison with more complicated models (Singer, 1998). The results from the null model of the imputed data are presented in Table 8. The significant intercept in this model indicated that the average predicted Positive Parenting score for fathers at Time 0 was 2.11 ($p$< .0001).The results of the null model were also used to calculate the Intraclass

Correlation (ICC), a measure of the ratio of between group variance to within group variance at the second level of the model (Tabachnick & Fidell, 2007). The ICC helps to provide evidence regarding whether or not a multilevel model is appropriate and necessary for the data (Luke, 2004). The null model is used to calculate the ICC as it provides variances at both levels. To calculate the ICC (ρ) the following equation was used (Luke, 2004):

$$\rho = \frac{\sigma^2_{u0}}{(\sigma^2_{u0} + \sigma^2_{r})}$$

$\rho = .131/ (.131+.551) = .239.$

An ICC of 24 indicates approximately 24% of the variance in father Positive Parenting was due to differences among fathers. Additional null models were conducted in which the intercept and each Level One predictor were included as random effects. In each case, the additional random effect failed to converge resulting in a lack of a covariation estimate. Due to this, the following models included only the intercept as a random effect.

Following the null model the Unconditional Growth Model (UGM) was conducted. Time was entered as the only predictor of father Positive Parenting as well as a random effect. Time was a significant predictor of change in Positive Parenting (estimate = -.019, $p<.0001$) indicating that for each increase in Time father Positive Parenting was predicted to decline .019.

**Level one model.** A standard bottom-up approach was utilized to determine the best fitting model. Fit statistics including the Akaike and Bayesian Information Criterion value (AIC/BIC) were created by averaging the AIC and BIC value across results from the five imputed MLM. Level One predictors of Positive Parenting were Time, Family Integrity factor score, Education Level, Number of Children, and Child Birth Order. Each variable was included sequentially in the mixed model and AIC and BIC levels were compared for each model. Child Birth Order was not a significant predictor of Positive Parenting; the AIC and BIC values for the

model including Birth Order were higher than the values for the model without the child birth order variable. This variable was excluded from subsequent models.

Statistics for the Level One model when father characteristics were added next (see Table 8). The average predicted score for father Positive Parenting, with all Level One model predictors held constant, was 2.35 ($p$<.0001). Significant main effects were found for Time, Number of Children Family Integrity Score, and Education Level. A 1 unit increase in Time predicted a decrease of .021 in father Positive Parenting. The variance components of the null and Level One models were then compared to determine the degree of variance in father Positive Parenting between times after the four predictor variables included using the following equation (Hox, 2002):

(.152-.108)/.152 = .289)

The results indicated that 29% of the variance father Positive Parenting between the occasions was accounted for by the Level One father and family characteristics.

Next child characteristics and Level One interactions were added sequentially and deleted if no effect was found. In models with interactions both variables in the interaction were also included (Hox, 2002). As shown in Table 8, no main effects of child MLU (estimate =.014, p<. 82) or child NA (estimate = -.005, $p$ < .95) were found.

Interactions between child characteristics and time were then added to assess changes over time affected father Positive Parenting. In both models, Time, Number of Children, Family Integrity, and father Education Level remained significant. However, neither the MLUxTime interaction (estimate = -.120, p<.15) nor the NAxTime interaction (estimate = .048, p<.46) reached significance as a predictor of father Positive Parenting.

Thus far, the AIC and the BIC values for Models 3 through 6 (see Table 8) failed to identify significant effects of child characteristics on the average level or on change in father Positive Parenting. Lastly, it was hypothesized that MLU may interact with child NA to affect Positive Parenting (see Model 7 in Table 8). The interaction was not significant (estimate= .099, p<.46) and the AIC/BIC values increased from previous models.

Though not initially hypothesized to affect Positive Parenting, a Family Integrity x MLU interaction was included in the final Level One model (see Table 8). The interaction was not found to be a significant predictor of Positive Parenting.

**Level two model.** For the next steps, Level Two predictors including the mean level of NA across child ages, the mean level of MLU across child ages, and child Gender. Results from the significant Level Two model are presented in Table 7.

When Mean NA was included in the mixed model, similar results to those found in the various Level One models were found. The intercept, Time, Number of Children, father Education Level, and father Family Integrity Factor score remained significant predictors of Positive Parenting. However, child mean level of NA was not a significant predictor (estimate = .038, p<.73). Similarly, mean level of child MLU averaged across time was not a predictor of Positive Parenting (estimate = -.028, *p*<.86).

Child Gender was also hypothesized to affect Positive Parenting but no effect was found (estimate = .017, *p*<.85). A model including the NAxGender interaction was then conducted. Though child Gender and NA were not significant predictors, their interaction was (estimate = .274, p<.05). The intercept variance components were then examined; the error variance in the Level One model was .108. When the GenderxNA interaction was added the error variance

decreased to .103. Thus, the addition of the interaction explained about 4% of the variance [(.108-.103)/.108 =.04] in father Positive Parenting between occasions (Hox, 2002).

Individual child differences in NA appeared to have an effect depending on the between-group composition. Figure 3 shows mean levels of father Positive Parenting of High NA girls and boys and Low NA girls and boys at 18, 30, and 42 months. In dependent samples *t* tests demonstrated that father Positive Parenting at 18 and 30 months did not differ among these four groups of children. At child age 42 months, however, the difference in mean level of father Positive Parenting for fathers of high and low NA boys was significant, $t(22)=2.54$, $p<.02$. Differences approached significance when High NA girls and High NA boys were compared, $t(21)=-2.01$, $p<.06$, and high NA girls and low NA boys were compared, $t(19)=1.79$, $p<.08$.

**Examining components of positive parenting.** Given that neither child MLU nor NA affected Positive Parenting as a composite, a set of parallel models were conducted to examine whether they affected individual components of Positive Parenting. All models included only the intercept as a random effect as models including time or child characteristics as random effects failed to produce covariance parameter estimates.

***Sensitivity.*** In the null model, the predicted level of Sensitivity at Time 0 was 2.49 ($p<.0001$). Following the bottom-up approach time, the Number of Children, father Education level, and the Family Integrity score were entered sequentially. As was found with Positive Parenting, all of the variables were significant predictors of Sensitivity (see Table 8).

When child characteristics were added, both child MLU (estimate =.013, p<.88) and child NA (estimate = .024, p<.79) failed to predict Sensitivity. However, when a TimexMLU interaction was included, the interaction was significant (estimate = -.231, $p<.05$). A median split for child MLU (see Figure 4) revealed that, at 18 and 30 months, fathers of high MLU children,

on average, displayed slightly higher levels of Sensitivity than fathers of low MLU children. At 42 months the relation reversed, fathers of high MLU children, on average, exhibited slightly lower levels of Sensitivity than fathers of low MLU children. Subsequent interactions including TimexNA, MLUxNA and GenderxNA were not significant predictors of fathers' Sensitivity.

***Positive affect.*** This approach was repeated for father Positive Affect (see Table 9). The predicted level of father Positive Affect in the null model when Time was 0 was 2.28 ($p<.0001$). As with Sensitivity, father Education Level, Family Integrity score, and Time were significant predictors. However, when Number of Children was added it did not predict Positive Affect. This variable was not included in subsequent models.

Child characteristics including MLU (estimate = .020 $p<.79$) and NA (estimate = .024, $p<.77$) were not significant predictors of father Positive Affect. The interactions of NAxTime, MLUxTime, and GenderxNA did not predict father Positive Affect (all estimates, *ns*).

***Stimulation of cognition.*** Lastly, the models were repeated for father Stimulation of Cognition (see Table 10). The predicted level of Stimulation of Cognition at Time 0 was 1.54 ($p<.0001$). When the Level One predictors including Time, Number of Children, the Family Integrity score, and father Education Level were entered sequentially, the Family Integrity score was not significant and was therefore excluded from subsequent models. When child characteristics and interactions were added to the model none were significant.

# DISCUSSION

The present study examined the question of whether two marked changes that occur in early childhood--rapid growth in children's language development and a steep decline in child negative emotionality--alter the typical decrease in positive parenting reported for fathers. The study was intended to contribute to the growing literature on fathering by adding information about child characteristics that influence fathering quality. Controlling for other determinants of fathering quality, such as a father's educational status, the number of children in his care, and his perception of his coparenting relationship with his wife, the study investigated whether child MLU, an index of early childhood language growth, and child negative affectivity, an index of a child's disposition to react negatively to situations, accounted for trajectory of positive parenting (sensitivity, positive affect, and stimulation of child cognition) in fathers during child ages of 18, 30, and 42 months. Overall, the results failed to show significant effects of these child characteristics on fathering quality or change in fathering quality. However, as discussed below, findings relating to specific components of fathers' positive parenting, as well as a trend in the predicted direction for child language, warrant discussion and suggest future directions for examining child determinants of positive qualities in fathering.

## Child Characteristics as Predictors of Fathers' Positive Parenting.

Neither child language, as indexed by child MLU, nor child negative emotionality, as indexed by maternal report of child's dispositional negative affectivity, predicted fathering quality, or change in the quality, of fathers' positive parenting. It was predicted that fathers' positive parenting behaviors would decline over time and that children's characteristics would affect the rate of this decline and the overall levels of positive parenting at each child age point. As expected, positive parenting was predicted to slightly decline, however, child language skills

and negative affectivity did not affect the rate of change or the level of overall positive parenting behaviors. Though contrary to expectations, these results may reflect the fact that child effects were the least predictive of parenting characteristics in contrast to father and family characteristics (Belsky, 1984). Indeed, in the present study, the coparenting relationship, number of children in the father's care, and father's education level control variables did relate to both the quality of positive attributes of father interactions with young children over early childhood.

**Changes in fathering quality over early childhood**. Although fathers tend to become more involved with their young children over the course of childhood, they also appear to become less sensitive toward them (NICHD, 2000; Wood & Repetti, 2004). In the present study, observing fathers when they were involved with their young children, we found that positive parenting declined, though only slightly, between 18 and 42 months.

As suggested above, this slight decline in positive parenting over time may be related to increases in children's attempts to test limits and parents' resulting need to set and enforce rules. A second explanation for this finding may be related to differences in the kinds of parenting that children of different ages require. Older children may need less direct attention and involvement from their parents as they become more capable of independently occupying themselves. Parents may be less inclined to intervene when children are behaving in an appropriate manner and may become involved only to direct the children's behavior when they are misbehaving. Additionally, as children attempt to problem solve parents may choose to allow the child more autonomy during these situations. For example, a father helping his 4 year old trying to tie his or her own shoe may allow the child more time to attempt the task independently before he steps in to help the child. The demands of parenting continue to evolve and what may appear sensitive at one child age may be different than what is considered sensitive later in children's development.

**Negative affectivity**. It was hypothesized that both stable and increasing levels of negative affectivity would affect the rate of decline in fathers' positive parenting such that those fathers of highly negative children would exhibit the lowest levels of positive parenting over time. The current study utilized maternal reports of child temperament as father reports were unavailable. Previous studies have found that mothers' and fathers' ratings of child temperament were moderately correlated (Mehall et al., 2009; Goldsmith 1996). Additionally, maternal reports may have prevented potential biases in fathers' ratings as fathers who were not particularly sensitive may have been may have been influenced by negative perceptions of their child's behaviors.

Contrary to hypotheses, no main effect of child negativity on the quality of fathers' positive parenting was found. These results were consistent with prior studies which failed to find an effect of child negative affectivity on fathering. This null finding may have resulted from the lower overall levels of negative affectivity in the current sample. It has been proposed that fathers' behaviors may be influenced by child negative affectivity but only when the child is highly dysregulated (NICHD, 2000).

Despite the lack of a main effect, when child gender was taken into account, child negative affectivity did show a small effect on fathering. At child age 42 months fathers of low negative affectivity boys, on average, showed slightly higher levels of positive parenting than those of high negative affectivity boys. This finding was consistent with similar results demonstrating that fathers were significantly more involved with boys with lower levels of externalizing behavior compared to fathers of boys with higher externalizing behaviors (Gryczkowski, Jordan, and Mercer, 2010). Boys who were exhibiting higher levels of negative affectivity at 42 months may have been drawing their fathers into fewer positive interactions.

The opposite relation between fathers' positive parenting and child negative affectivity at 42 months was found for fathers of girls. Fathers were rated as demonstrating less positive parenting with lower negative affectivity girls than fathers of high negative affectivity girls. Two hypotheses were developed to address these results. First, this finding may have been related to the relation between children's levels of negative affectivity and their self-regulatory capabilities. Higher levels of negative affectivity have been related to greater difficulties in children's ability to regulate their emotions and attention to control their behaviors. (Raikes, Robinson, Bradley, Raikes, 2007). Girls rated as lower in overall levels of negative affectivity may have also had better self-regulatory skills allowing them to better regulate their feelings resulting in fewer displays of negative emotions. Over time, the fathers of these more regulated girls may have come to perceive them as more capable of handling their own emotions and as requiring less intervention and parenting in general. Fathers traditionally spend less time with their daughters than they do with sons and those girls who are more capable of regulating their negative emotions may have elicited less fathering.

On the other hand, this finding may have been related to the emotions that girls were expressing. In a study examining young children's emotion expressions during play, girls expressed more submissive emotions (e.g. sadness, anxiety) than boys and fathers attended more to these submissive emotions in daughters than they did with sons (Chaplin, Cole, and Zahn-Waxler, 2005). Thus, difference in fathers' levels of positive parenting for high negative affectivity boys and girls may have been related to the emotions that boys and girls expressed during father-child interactions.

**Child language.** The current study also sought to examine how children's changing language capabilities, affected fathers' parenting over time. Previous studies have demonstrated

that fathers are more linguistically demanding of their children (Lindsey et al., 2010); it was therefore predicted that children's increasing abilities to communicate would help to facilitate more positive father-child interactions over time. However, a main effect of child MLU on fathers' positive parenting was not found.

There are two possible explanations for the lack a main effect for MLU. First, during home observations, parents were only told to behave as they normally would; they were not instructed to engage with or to speak with their children in any particular way. As a result, fathers had varying degrees of opportunity to interact with children. As there was only one visit, the child MLU measurement may have been affected by variations in opportunity to interact with fathers. Although the use of 100 utterances on one occasion is a standard method of assessing MLU, the single visit may not have adequately captured how a child's ability to communicate relates to fathering quality. For example, some children may have been engaged in activities that did not invite conversations (e.g. watching the television) while some fathers may have also been involved in activities that did not encourage the child to speak (e.g. talking on the phone).

A second explanation is that MLU may not have been the most appropriate measure of child language by 42 months. Though MLU has been used to study children's language complexity in younger children the use of more morphemes at an older age could have captured different categories of children including those who a) actually had a more complex understanding of language and b) those who had a high MLU but did not add any substantial meaning to their utterances as they added unnecessary and/or multiple morphemes.

Previous studies have found wide variability in children's language abilities and have demonstrated that vocabulary increases from an average of 41 words at 17 months of age to around 81 words at 19 months of age (Hart & Risley, 1999). By 36 months Hart and Risley

(1999) found that the average child language included between 700 and 800 words and that the average MLU was 3.4. These data demonstrate the large gains in language that children are making during the toddlerhood years; individual differences in vocabulary may affect how much children are able to communicate regarding their needs and feelings instead of adding morphemes, which are used to "change words from singular to plural, or to indicate person and tense in verbs" (Gleason & Ely, 2001, pg. 129).

Despite the lack of findings for a main effect of child MLU related to changes in fathers' overall positive parenting, post hoc analyses demonstrated that the interaction between child MLU and time was a significant predictor of fathers' overall levels of sensitivity. At 18 and 30 months, fathers of high MLU children, on average, demonstrated higher levels of sensitivity than fathers of low MLU children. However, at 42 months, this relation changed such that fathers of high MLU children demonstrated slightly less sensitivity than those fathers of low MLU children. This finding is similar to results from another study that observed parenting behaviors in the home which reported that parents engaged in higher levels of verbal stimulation with their young children until the children begin talking; the modal response of parents to child verbal bids was then to ignore the child ignoring (Hart & Risley, 1995). When children were younger, fathers may have encouraged and attended more towards children's language; however, once children demonstrated a particular level of ability fathers may have felt that they no longer needed to encourage speech.

**Father and Family Characteristics that Affected Positive Parenting.**

The conversation now turns to the family and father characteristics that were included within the models to address how these affected fathers' positive parenting. Consistent with previous studies, the current study found support for father and family characteristics including

the coparenting relationship, number of children, and fathers' education level, as predictors of positive parenting.

**Coparenting relationship.** In the current sample, fathers' perception of the coparenting relationship was a significant predictor of positive parenting; post hoc analyses revealed that this relation was significant for both fathers' levels sensitivity and positive affect. The coparenting relationship is consistently found to be powerful predictor of fathers' involvement with their children. It has been suggested that this relation between coparenting and father's parenting may be related to the spillover hypothesis (Erel & Burman, 1995). Fathers in more supportive relationships experience more positive moods and interactions with their partner and then, as a result of these positive moods, interact more positively with their child (Erel & Burman, 1995). Fathers that perceive more support from their partner may also feel more comfortable with their parenting skills and as a result may be more involved and sensitive with the child.

**Father education level.** A significant main effect was also found for fathers' education level; increases in fathers' education predicted increases in the mean level positive parenting. This finding is consistent with previous work that found more educated fathers reported being more involved with their children (Coley & Hernandez, 2006).

**Number of children in the family.** A final control variable, the number of children in the family, also had a main effect on fathers' positive parenting. Increases in the number of children in the family predicted decreases in fathers' levels of positive parenting; post hoc analyses revealed that increases in the number of children affected both fathers' sensitivity and stimulation of cognition. This finding was consistent with previous studies that have found that fathers spend more time in child care activities as the family size increases but that each child

receives less individual attention (Aldous et al., 1998). As a fathers' attention is stretched between multiple family members he may be less sensitive to the needs of each individual child.

Despite the findings for sensitivity and stimulation of cognition, the number of children in the family was not found to affect fathers' level of positive affect. When considering positive affect it has been suggested that positive affect may be less related to child characteristics and more related to father personality. Fathers' positive mood has been related to scores on an Extraversion scale on a personality inventory and more agreeable men were found to express less negative moods (Belsky, Crnic, & Woodworth, 2006). Additionally, father's positive affect may have also been related to father's attribution styles. A study examining parents' beliefs about children's behaviors found that when the parent believed that misbehavior was intention they were more upset by and more likely to use harsher discipline (Johnston & Patenaude, 1994). Fathers who were more able to attribute their child's behavior to external cues may have been more likely to respond with higher levels of positive affect as compared to fathers who made more hostile attributions about their children's behaviors.

The present study was unable to include measures of fathers' personality and attribution style. In the future, including these measures, which have largely been excluded from studies examining the determinants of fathering (Belsky et al., 2006) will help to separate the effects of child characteristics and father's own individual characteristics.

**Limitations of the Current Study.**

As data for the current study were taken from a larger longitudinal study, a few limitations must be addressed. As previously discussed, the current study would have been strengthened had more observations of father-child dyads occurred. In particular, more observations of child MLU may provide more power to detect an effect of child language as

language is rapidly developing between 18 and 42 months. More observations may have increased the power of the multilevel model to detect effect sizes of child characteristics, particularly since the effect of child characteristics on fathers' positive parenting appeared to be very small.

Additionally, more observations may have allowed for analyses that examined variance in slopes for fathers' positive parenting. Random effects included in the Multilevel Model allow for the examination of variance in intercepts and slopes between groups (Hox, 2002). Models always include at least one random effect, the residual $r_{ij,}$ and in the present study the intercept was included as a random effect so that the variance in fathers' overall levels of positive parenting could be examined in each model conducted. However, when additional random error terms were added to the MLM, PROC Mixed was unable to provide parameter estimates for the variance in slopes. Due to this, all models that were conducted included only the intercept as a random effect. This lack of random effects meant that analyses in the present study were unable to examine how predictor variables accounted for variance in fathers' trajectories of positive parenting. Instead, the present study focused on fathers' overall levels of positive parenting at each child age point.

**Conclusion.** The present study did not find significant effects of child MLU or child negative affectivity on fathers' positive parenting. However, trends in the data related to the effect of child language over time as a predictor of positive parenting and an effect of the interaction between child gender and negative affectivity indicate that future work is needed to examine potential child characteristics that are affecting the quality of fathers' parenting and to further examine the relationship between child language and temperament and fathers' positive parenting.

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# APPENDIX A.

Table 1. *Father and Child Demographics at child age 18, 30, and 42 months old.*

| | Father Demographics | | |
|---|---|---|---|
| | Wave 1 | Wave 2 | Wave 3 |
| Self-Identity | | | |
| Caucasian | 95 | 100 | 97 |
| Other | 4 | 0 | 0 |
| Parental Identity | | | |
| Biological father | 96 | 99 | 95 |
| Adopted/foster father | 2 | 3 | 1 |
| Other | 1 | 0 | 1 |
| | M (SD) | M (SD) | M (SD) |
| # of Children | 1.82 (.75) | 2.00 (.84) | 2.22 (.92) |
| Annual income | $30,140 ($13,906) | $34,111 ($14,933) | $36,737 ($17,608) |
| Range of income | $0.00 - $65,000 | $0.00 - $85,000 | $0.00 - $95,000 |
| | Child Demographics | | |
| | Wave 1 | Wave 2 | Wave 3 |
| Self-Identity | | | |
| Caucasian | 95 | 98 | 94 |
| Other | 4 | 4 | 3 |
| Gender | | | |
| Male | 56 | 58 | 57 |
| Female | 43 | 44 | 40 |
| | N = 99 | N = 102 | N = 97 |

*Note: M = Mean. SD = Standard Deviation. Demographic information presented for all fathers that participated in the current study (n=106). Wave 1, 2, and 3 correspond to child ages 18 months, 30 months, and 42 months.

Table 2. *Means and standard deviations for father and child variables.*

| | | Child Age (in months) | | |
|---|---|---|---|---|
| | | 18 | 30 | 42 |
| | | M(SD) | M(SD) | M(SD) |
| Father Parenting | N | 99 | 102 | 97 |
| Average Positive Parenting | | 2.33 (.65) | 2.16 (.72) | 1.84 (.55) |
| Average Sensitivity | | 2.82 (.92 | 2.46 (.90) | 2.22 (.73) |
| Average Positive Affect | | 2.58 (.73) | 2.35 (.80) | 1.91 (.59 |
| Average Stimulation of Cognition | | 1.59 (.55) | 1.68 (.71) | 1.39 (.54) |
| Child Negative Affectivity | N | 105 | 101 | 103 |
| | | 3.42 (.55) | 3.53 (.52) | 3.99 (.61) |
| Range | | 2.04 – 4.51 | 2.27 – 4.96 | 2.78 – 5.48 |
| Child MLU | N | 92 | 88 | 85 |
| | | 1.44 (.29) | 1.87 (.47) | 2.76 (.68) |
| Range | | 1.00 – 2.35 | 1.04 – 3.29 | 1.56 – 4.54 |

Note: M = Mean. SD = Standard Deviation. Average Positive Parenting is the mean score of fathers' sensitivity, positive affect, and stimulation of cognition as rated during home visits when children were 18, 30, and 42 months old; the range of possible scores for each variable was 1 -5. The Child Negative Affectivity factor was derived from mother's report on the TBAQ (at 18 and 30 months) and the CBQ (at 42 months); the range of possible scores was 1-7. Child MLU was measured in the home during home visits; it is a continuous variable.

Table 3. *Correlations between fathers' Positive Parenting and Positive Parenting components.*

| | 18 months | | | | 30 months | | | | 42 months | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sen. | Pos. Affect | Stim. Cog. | Pos. Parent | Sen. | Pos. Affect | Stim. Cog. | Pos. Parent | Sen. | Pos. Affect | Stim. Cog. | Pos. Parent |
| Sensitivity 18 m | 1.00 | | | | | | | | | | | |
| Positive Affect 18 m | .793** | 1.00 | | | | | | | | | | |
| Stim. Cognition 18 m | .619** | .561** | 1.00 | | | | | | | | | |
| Positive Parenting 18 m | .941** | .904** | .782** | 1.00 | | | | | | | | |
| Sensitivity 30 m | .411** | .351** | .474** | .461** | 1.00 | | | | | | | |
| Positive Affect 30 m | .418** | .434** | .442** | .486** | .749** | 1.00 | | | | | | |
| Stim. Cognition 30 m | .323** | .304** | .438** | .391** | .706** | .612** | 1.00 | | | | | |
| Positive Parenting 30 m | .428** | .403** | .501** | .496** | .929** | .887** | .853** | 1.00 | | | | |
| Sensitivity 42 m | .203* | .194 | .221* | .231* | .441** | .370** | .341** | .433** | 1.00 | | | |
| Positive Affect 42 m | .169 | .263** | .191 | .232* | .386** | .382** | .319** | .407** | .784** | 1.00 | | |
| Stim. Cognition 42 m | .320** | .286** | .298** | .343** | .329** | .240* | .260* | .312** | .679** | .240* | 1.00 | |
| Positive Parenting 42 m | .253* | .271** | .262** | .295** | .439** | .377** | .349** | .437** | .940** | .889** | .831** | 1.00 |

Note. Sen. = Father Sensitivity, Pos. Affect = Father Positive Affect, Stim. Cog = Stimulate cognition, Pos. Parenting = Fathers' Positive Parenting , Fathers' positive parenting and subcomponents were assessed during a naturalistic home observation. * = p<.05, 2 tailed, ** = p <.01, 2 tailed.

Table 4. *Correlations between child characteristics and fathers' Positive Parenting.*

| | 18 months | | | | 30 months | | | | 42 months | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sen. | Pos. Affect | Stim. Cog. | Pos. Parent | Sen. | Pos. Affect | Stim. Cog. | Pos. Parent | Sen. | Pos. Affect | Stim Cog | Pos. Parent |
| Child MLU 18m | .192 | .192* | -.073 | .103 | -.083 | -.013 | -.072 | -.064 | -.034 | -.045 | .002 | -.030 |
| Child MLU 30 m | -.070 | .051 | .153 | .030 | .192* | .092 | .124 | .158 | .139 | .019 | .091 | .097 |
| Child MLU 42 m | .156 | .040 | .037 | .101 | .140 | .153 | .079 | .142 | -.084 | .002 | -.000 | -.037 |
| Child NA 18 m | -.019 | .046 | -.207* | -.050 | -.011 | .099 | -.021 | .025 | -.019 | .007 | -.161 | -.058 |
| Child NA 30 m | .009 | .022 | -.144 | -.029 | -.009 | .047 | -.036 | .002 | .013 | .013 | -.001 | .010 |
| Child NA 42 m | .009 | .022 | -.023 | .006 | .135 | .182 | .089 | .153 | .015 | -.042 | .031 | .002 |

Note. Sen. = Father Sensitivity, Pos. Affect = Father Positive Affect, Stim. Cog = Stimulate cognition, Pos. Parenting = Fathers' positive parenting, NA = mother-rate child Negative Affectivity. Child language ability was measured through MLU during a naturalistic home observation. Fathers' positive parenting and subcomponents were assessed during a naturalistic home observation. * = p<.05, 1 tailed ** = p <.01, 1 tailed.

Table 5. *Correlations between child language ability and mother ratings of child Negative Affectivity.*

| | MLU 18 m | MLU 30 m | MLU 42m | NA 18 m | NA 30 m | NA 42m |
|---|---|---|---|---|---|---|
| Child MLU 18m | 1.00 | | | | | |
| Child MLU 30m | .275* | 1.00 | | | | |
| Child MLU 42m | .046 | .108 | 1.00 | | | |
| Child Negative Affectivity 18m | .021 | -.056 | -.199* | 1.00 | | |
| Child Negative Affectivity 30m | -.147 | -.139 | .048 | .687** | 1.00 | |
| Child Negative Affectivity 42m | .019 | -.091 | -.076 | .452** | .551** | 1.00 |

Note: Summary of intercorrelations between child language abilities and mother-rated child negative affectivity. Child language ability was measured using MLU during a naturalistic home observation. * = p<.05, 1 tailed ** = p <.01, 1 tailed.

Table 6. *Correlations between child Birth Order, the Number of Children in the home, Family Integrity Factor Score, and fathers' Positive Parenting.*

| | Sen. 18 m | Pos. Affect 18m | Stim. Cog. 18 m | Pos. Parent 18m | Sen. 30 m | Pos. Affect 30 m | Stim. Cog. 30 m | Pos. Parent 30 m | Sen. 42 m | Pos. Affect 42 m | Stim. Cog. 42 m | Pos. Parent 42 m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Child Birth Order | -.202* | -.070 | -.295** | -.204* | -.192* | -.132 | -.195* | -.194* | -.152 | -.304** | -.181* | -.234* |
| # of Children 18 m | -.184* | -.111 | -.341* | -.224* | -.292** | -.284** | -.255** | -.312** | -.222* | -.347** | -.207* | -.288**` |
| # of children 30 m | -.146 | -.145 | -.313* | -.211* | -.296** | -.247** | -.300** | -.315** | -.196* | -.340** | -.151 | -.256** |
| # of children 42 m | -.032 | -.106 | -.214* | -.115 | -.291** | -.173 | -.283** | -.279** | -.133 | -.324** | -.161 | -.226 |
| FIF 18m | .443** | .384** | .279* | .431** | .276** | .142 | .262* | .254* | .224* | .142 | .262* | .209* |
| FIF 30m | .403** | .423** | .266* | .421** | .302** | .227* | .147 | .259* | .225* | .190 | .137 | .211* |
| FIF 42m | .274* | .243* | .137 | .260* | .288* | .124 | .205* | .234* | .232* | .095 | .216* | .205* |

Note. Sen. = Father Sensitivity, Pos. Affect = Father Positive Affect, Stim. Cog = Stimulate cognition, Pos. Parenting = Fathers' Positive Parenting , FIF = Family Integrity Factor, * = $p < .05$, 1 tailed **=$p < .001$, 1 tailed.

Table 7. Fixed Effects Estimates (Top) and Variance-Covariance Estimates (Bottom) for Models of the Predictors of Fathers' Positive Parenting with data that has been imputed 5 times.

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 | Model 10 | Model 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Fixed Effects | | | | | | |
| Intercept | 2.11** (.05) | 2.34** (.06) | 2.36** (.06) | 2.35** (.06) | 2.35** (.06) | 2.34** (.06) | 2.35** (.06) | 2.35** (.06) | 2.35** (.06) | 2.34** (.06) | 2.35** (.07) |
| Level 1 | | | | | | | | | | | |
| Time | | -.019** (.00) | -.020** (.00) | -.021** (.00) | -.021** (.00) | -.021** (.00) | -.021** (.00) | -.021** (.00) | -.021** (.00) | -.021** (.00) | -.021** (.00) |
| # of children | | | | -.143* (.14) | -.143* (.05) | -.143** (.05) | -.142* (.05) | -.143* (.05) | -.141* (.05) | -.139* (.05) | -.146* (.06) |
| FIF | | | | .022* (.03) | .022* (.01) | .023** (.01) | .022* (.01) | .023* (.01) | .023* (.01) | .023* (.01) | .024* (.01) |
| F. EDU | | | | .068* (.03) | .068* (.03) | .068* (.03) | .068* (.03) | .069* (.03) | .069* (.03) | .067* (.03) | .066* (.03) |
| MLU | | | -005 (.06) | | .014 (.06) | .193 (.14) | | | .023 (.67) | .027 (.06) | |
| MLU*Time | | | | | | -.120 (.08) | | | | | |
| NA | | | -.037 (.08) | | | | -.005 (.07) | -.058 (.11) | -.005 (.07) | | -.118 (.09) |
| NA*Time | | | | | | | | .048 (.07) | | | |
| MLU*NA | | | | | | | | | .099 (.13) | | |
| MLU*FI | | | | | | | | | | -.018 (.02) | |
| Level 2 | | | | | | | | | | | |
| Gender | | | | | | | | | | | .017 (.09) |
| Gender* NA | | | | | | | | | | | .274* (.14) |
| | | | | | Random Effects | | | | | | |
| Variance, intercept | .151**(.04) | .168** (.04) | .171** (.04) | .106** (.03) | .106** (.03) | .105** (.03) | .107** (.03) | .107** (.03) | .105** (.03) | .107** (.03) | .103** (.03) |
| Variance, residual | .311** (.03) | .257** (.04) | .261** (.03) | .261** (.03) | .262**(.03) | .261** (.03) | .262** (.03) | .263** (.03) | .262** (.03) | .261** (.03) | .261** (.03) |
| AIC | 633.5 | 604.6 | 610.9 | 593.1 | 596.7 | 597.1 | 596.5 | 597.8 | 600.7 | 601.0 | 599.5 |
| BIC | 639.3 | 610.5 | 618.3 | 598.4 | 602.0 | 602.4 | 601.8 | 603.1 | 605.4 | 606.4 | 604.8 |

Note: Mixed Model run with data that has been imputed 5 times using PROC MI in SAS 9.2. Unstandardized estimates and standard errors. Intercept is centered at 12 months so that time 1 is 0 months in child age. FIF = Family Integrity Factor, F Edu = Father Education. In Model 5 MLU and NAMN have been detrended to allow for more accurate interpretations of results. Model based on 3 occasions nested within 106 participants. AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, relative model fit statistics. ** p <.01, * p <.05. All models include only the intercept as a random effect.

Table 8. *Fixed Effects Estimates (Top) and Variance-Covariance Estimates (Bottom) for Models of fathers' Sensitivity with data that has been imputed 5 times.*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Fixed Effects | | | | |
| Intercept | 2.50** (.06) | 2.79** (.09) | 2.80** (.07) | 2.80* (.07) | 2.79** (.07) | 2.80** (.08) | 2.80* (.08) | 2.82**(.07) | 2.81** (.18) |
| Level 1 (Father Specific) | | | | | | | | | |
| Time | | -.025** (.00) | -.026** (.00) | -.026** (.00) | -.026** (.00) | -.026** (.00) | -.026**(.00) | -.027** (.00) | -.026** (.00) |
| # of children | | | -.166* (.06) | -.166* (.07) | -.164* (.07) | -.168* (.06) | -.167* (.07) | -.141* (.07) | -.171* (.07) |
| FIF | | | .036** (.01) | .036* (.01) | .037** (.01) | .036** (.01) | .037**(.01) | .045**(.01) | .039** (.01) |
| Father Education | | | .090* (.03) | .089* (.03) | .088* (.03) | .088* (.03) | .089* (.04) | .094* (.04) | .084* (.04) |
| Child MLU | | | | .013 (.08) | .355 (.19) | | | .025 (.09) | |
| Child MLU*Time | | | | | -.230* (.11) | | | | |
| Child NA | | | | | | .024 (.09) | -.052 (.13) | .015 (.10) | -.121 (.12) |
| Child NA*Time | | | | | | | .070 (.10) | | |
| MLU*NA | | | | | | | | .236 (.16) | |
| Level 2 | | | | | | | | | |
| Gender | | | | | | | | | -.002 (.11) |
| Gender*NA | | | | | | | | | .351 (.19) |
| | | | | | Random Effects | | | | |
| Variance, Intercept | .216** (.06) | .447** (.06) | .132* (.05) | .131* (.05) | .133* (.04) | .133* (.05) | .13* (.05) | .130* (.06) | .123* (.05) |
| Variance, Residual | .592** (.06) | .409** (.06) | .518**(.05) | .519**(.05) | .510**(.05) | .519**(.05) | .522**(.05) | .514**(.06) | .522**(.05) |
| AIC | 824.9 | 793.6 | 779.2 | 782.3 | 779.8 | 782.0 | 784.7 | 783.9 | 784.6 |
| BIC | 830.2 | 804.2 | 784.5 | 787.5 | 785.1 | 787.4 | 790.1 | 789.2 | 790.1 |

Note: Unstandardized estimates and standard errors. Intercept is centered at 12 months so that time 1 is 0 months in child age. Model based on 3 occasions nested within 106 participants. FIF = Family Integrity Factor, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, relative model fit statistics ** p <.01, * p <.05. All models run with only the intercept as a random effect.

Table 9. *Fixed Effects Estimates (Top) and Variance-Covariance Estimates (Bottom) for Models of fathers' Positive Affect with data that has been imputed 5 times.*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| | | | Fixed Effects | | | | |
| Intercept | 2.28** (.05) | 2.62** (.06) | 2.62** (.06) | 2.61**(.07) | 2.62** (.06) | 2.62** (.06) | 2.62** (.07) |
| Level 1 (Father Specific) | | | | | | | |
| Time | | -.028** (.00) | -.028**(.00) | -.028**(.00) | -.028** (.00) | -.028** (.00) | -.028** (.00) |
| # of children | | | | | | | |
| FIF | | .025** (.01) | .026* (01) | .027* (.01) | .026* (.01) | .026* (.01) | .027* (.01) |
| Father Education | | .073* (.03) | .073* (.03) | .072* (.03) | .073* (.03) | .072* (.03) | .073* (.06) |
| Child MLU | | | .020 (.07) | .261 (.16) | | | .029 (.07) |
| Child MLU*Time | | | | -.162 (.09) | | | |
| Child NA | | | | | .001 (.08) | .063 (.12) | .007 (.07) |
| Child NA*Time | | | | | | -.050 (.08) | |
| MLU*NA | | | | | | | .138 (.13) |
| Level 2 | | | | | | | |
| Gender | | | | | | | |
| Gender*NA | | | | | | | |
| | | | Random Effects | | | | |
| Variance Intercept | .137** (.04) | .130* (.05) | .129** (.04) | .128** (.04) | .131** (.04) | .1310 * (.04) | .126* (.05) |
| Variance, Residual | .443**(.04) | .355**(.04) | .357** (.04) | .353** (.04) | .356**(.04) | .356**(.04) | .359** (.04) |
| AIC | 732.8 | 677.9 | 681.3 | 680.8 | 681.2 | 683.9 | 685.5 |
| BIC | 738.1 | 683.3 | 686.7 | 686.1 | 686.5 | 689.2 | 690.8 |

Note: Unstandardized estimates and standard errors. Intercept is centered at 12 months so that time 1 is 0 months in child age. Model based on 3 occasions nested within 106 participants. FIF = Family Integrity Factor, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, relative model fit statistics ** p <.01, * p <.05. All models run with only the intercept as a random effect.

Table 10. *Fixed Effects Estimates (Top) and Variance-Covariance Estimates (Bottom) for Models of fathers' Stimulation of Cognition with data that has been imputed 5 times.*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| | | | | Fixed Effects | | | |
| Intercept | 1.54** (.04) | 1.64** (.05) | 1.64** (.06) | 1.64**(.06) | 1.64**(.05) | 1.64** (.06) | 1.64** (.06) |
| Level 1 | | | | | | | |
| Time | | -.009* (.00) | -.009* (.00) | -.009* (.00) | -.009** (.00) | -.009** (.00) | -.009* (.00) |
| # of children | | -.148* (.05) | -.148* (.05) | -.148** (.05) | -.142** (.05) | -.142** (.05) | -.141** (.05) |
| Family Integrity Factor | | | | | | | |
| Father Education | | .054* (.02) | .054* (.03) | .054* (.02) | .056* (.02) | .058* (.03) | .057* (.03) |
| Child MLU | | | .008 (.06) | -.027 (.15) | | | .007 (.06) |
| Child MLU*Time | | | | .023 (.08) | | | |
| Child NA | | | | | -.073 (.07) | -.193 (.11) | -.074 (.07) |
| Child NA*Time | | | | | | .109 (.08) | |
| MLU*NA | | | | | | | .053 (.11) |
| Level 2 | | | | | | | |
| Gender | | | | | | | |
| Gender*NA | | | | | | | |
| | | | | Random Effects | | | |
| Variance, Intercept | .115** (.03) | .087* (.03) | .087** (.03) | .087** (.03) | .088** (.03) | .084** (.03) | .088* (.03) |
| Variance, Residual | .271**(.03) | .268**(.03) | .269**(.03) | .269**(.03) | .267**(.03) | .267**(.03) | .268**(.03) |
| AIC | 581.7 | 588.9 | 583.1 | 586.1 | 586.1 | 582.1 | 587.7 |
| BIC | 586.9 | 584.7 | 588.4 | 591.5 | 591.5 | 587.4 | 592.9 |

Note: Unstandardized estimates and standard errors. Intercept is centered at 12 months so that time 1 is 0 months in child age. Model based on 3 occasions nested within 106 participants. AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, relative model fit statistics ** p <.01, * p <.05. All models run with only the intercept as a random effect.

# APPENDIX B

Figure 1. *The Predicted Model of Father's Positive Parenting with Within and Between Person Predictors.*

Level 1: Time Varying Characteristics of Family

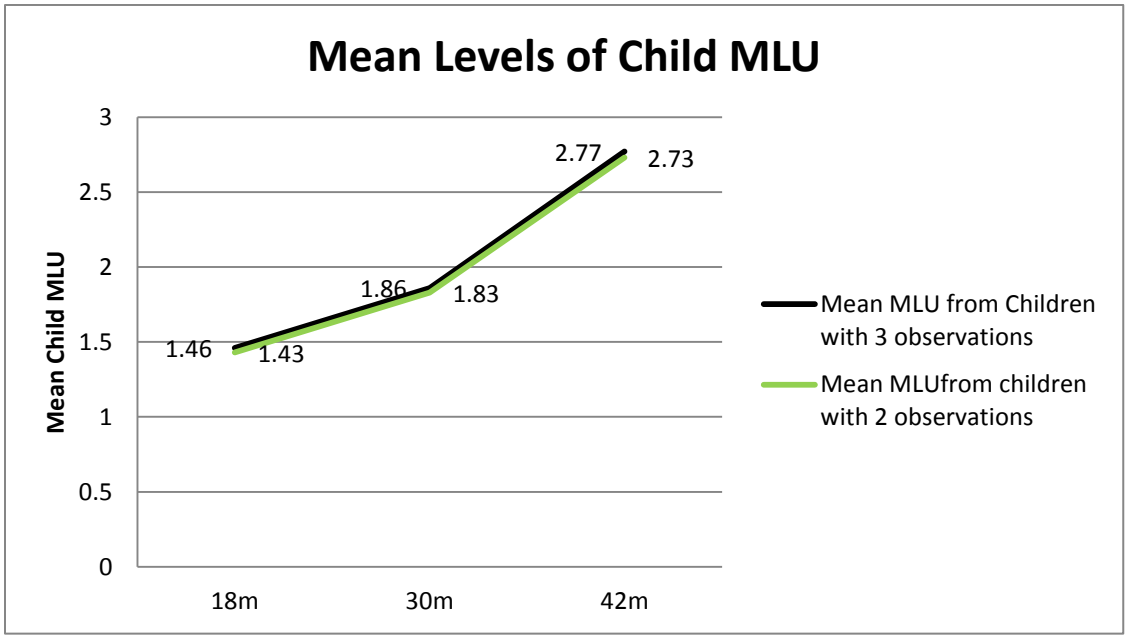
$$FPOS_{ti} = \beta_{0i} + \beta_{1i}(time)_{ti} + \beta_{2i}(\#\text{ of children father has})_{ti} + \beta_{3i}(\text{Family Integrity Factor Score})_{ti} + \beta_{4i}(\text{Father Education Level})_{ti} + \beta_{5i}(\text{Child MLU})_{ti} + \beta_{6i}(\text{Child Negative Affectivity})_{ti} + \beta_{7i}(\text{time*Child MLU})_{ti} + \beta_{8i}(\text{time*Child Negative Affectivity})_{ti} + e_{ti}$$

Level 2: Time Invariant Characteristics of Family

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\text{child Mean level Negative Affectivity})_i + \gamma_{02}(\text{child gender})_i + u_{0i}$$
$$\beta_{1i} = \gamma_{10} + u_{1i}$$
$$\beta_{2i} = \gamma_{20} + u_{2i}$$
$$\beta_{3i} = \gamma_{30} + u_{3i}$$
$$\beta_{4i} = \gamma_{40} + u_{4i}$$
$$\beta_{5i} = \gamma_{50}(\text{child gender}) + u_{5i}$$
$$\beta_{6i} = \gamma_{60}(\text{child gender}) + u_{6i}$$
$$\beta_{7i} = \gamma_{70} + u_{7i}$$
$$\beta_{8i} = \gamma_{80} + u_{8i}$$

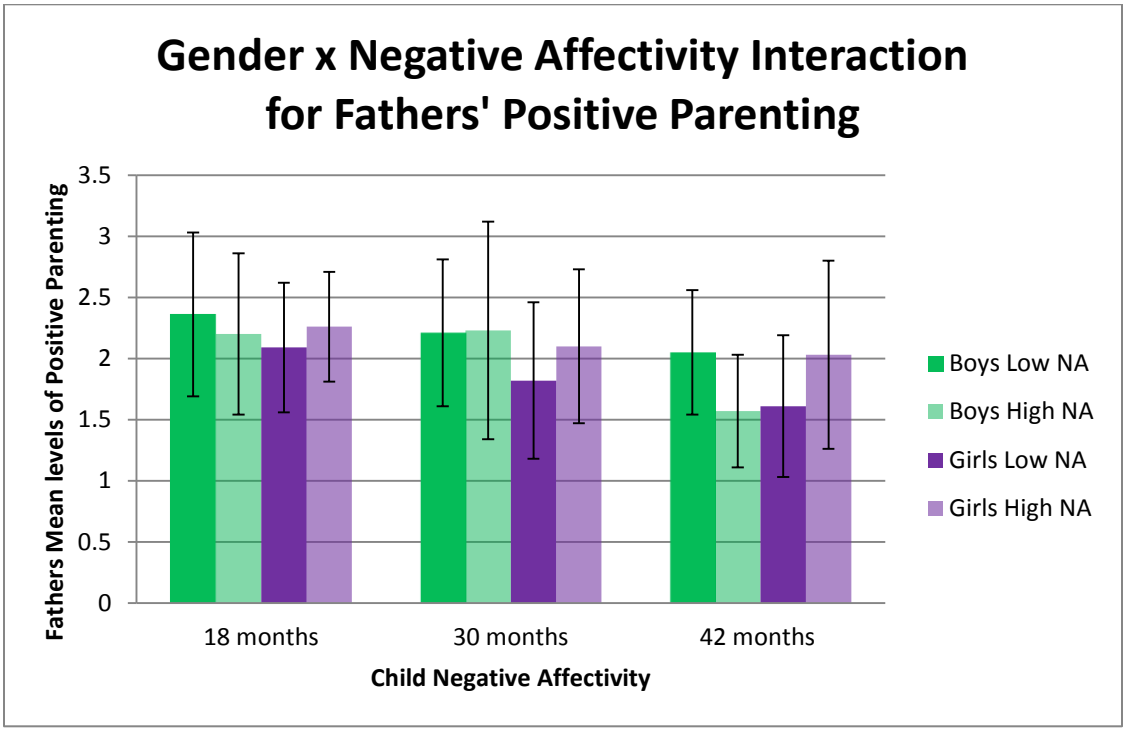
Where $FPOS_{ti}$ is the predicted value for individual i on positive parenting at a specific time point, $\beta_{0i}$ is the predicted score of positive parenting when all variables are 0, $\beta_{1i}$ is the expected change in positive parenting for a one 1 unit change in child's age, $\beta_{2i}$ is the expected change in positive parenting for a 1 unit change in the number of children in the family, $\beta_{3i}$ is the expected change in positive parenting for a 1 unit change in fathers' family integrity factor score, $\beta_{4i}$ is the expected change in positive parenting for a 1 unit change in fathers' education level, $\beta_{5i}$ is the expected change in positive parenting for a 1 unit change in child MLU, $\beta_{6i}$ is the expected change in positive parenting for a 1 unit change in child negative affectivity, and $e_{ti}$ are residuals.

Figure 2. *Mean levels of Child MLU across 18, 30, and 42 months.*



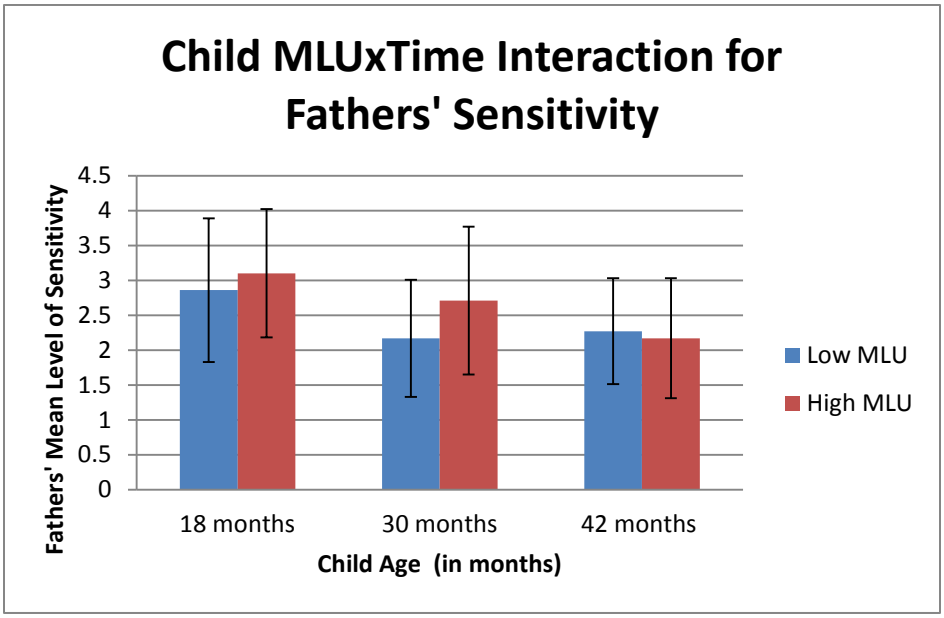

Note. Figure 2 provides the means for children who provided MLU observations at all 3 observations (n=62, black line) and those who provided data at 2 observations (n=35, green line)

Figure 3. *Interaction between Gender and Negative Affectivity as a predictor of fathers' Positive Parenting.*




Note. The high NA group is comprised of children in the highest 25th percentile of NA at 18, 30, and 42 months. The low NA represents children in the lowest 25th percentile. Fathers' mean level of Positive Parenting at 18, 30, and 42 months for children from each group is presented.

Figure 4. I*nteraction between Child MLU and Time as a predictor of fathers' Positive Parenting.*




Note. The high MLU group is comprised of children in the highest 50$^{th}$ percentile of MLU at 18, 30, and 42 months. Fathers' mean level of Positive Parenting at 18, 30, and 42 months for children from each group is presented.