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Relations Between Paternal Child-Rearing and Child Inhibited Temperament Across Infancy and Toddlerhood

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ABSTRACT

Child inhibited temperament is influenced by parenting behaviors, and vice versa. Fathers remain underrepresented in studies examining relations between parenting and temperament. The current study focused on fathers, using a three-point longitudinal design. Father-child dyads (n = 116; 56.9% Male; 88.7% White) participated in laboratory assessments at child ages 1, 2, and 3 years. Children participated in observational tasks designed to measure inhibited temperament, and fathers self-reported parenting behaviors and rated their child's temperament. Path models testing concurrent and longitudinal relations revealed that paternal nurturance, restrictiveness, and encouragement of independence were associated with observed inhibited temperament in infancy, but not with father-rated inhibited temperament. Early observed child inhibited temperament at age 1 year predicted greater levels of paternal encouragement of independence at age 2 years. Findings demonstrated evidence for both father-directed and child-directed effects, suggesting fathers and children influence each other's behavior over time. Overall, this study supports continued focus on fathers' parenting and provides insight into the nuanced impact of fathering on child temperament development.

1 | Introduction

Temperament in infancy and toddlerhood is linked to lifelong emotional development (Rothbart 2007). Although inhibited temperament-the tendency to approach that which is novel with uncertainty or cautiousness-is relatively stable across early childhood (Bornstein et al. 2015; Niditch and Varela 2018), it is also affected by parenting behaviors, such as overly restrictive, protective, or intrusive behaviors (Rubin et al. 2002). However, the majority of the literature focuses on mothers, neglecting the contributions of fathers. Similarly, although it is also known that there are child-directed effects between temperament and parenting, existing work is based largely on the mother-child dyad (N. J. Cabrera et al. 2018; Volling and Palkovitz 2021). More research into the specific relation between fathers' parenting and children's temperament is necessary to better understand the contribution of paternal parenting to child socioemotional development. Thus, the current study examined longitudinal associations among fathers' parenting behaviors, observed child inhibited temperament, and fathers' report of their children's inhibited temperament across ages 1, 2, and 3 years.

1.1 | Inhibited Temperament and Parenting

There are several ways to define and assess temperament in children. Across theories, temperament is typically considered to emerge early in development, to have a biological foundation, to be susceptible to environmental influences, and to be multidimensional in nature (Pérez-Edgar 2019). This is particularly evident in Kagan's framework, in which temperament can be understood as a set of biologically-based characteristics or psychological traits that vary across children and inform how they interact with their environment (Kagan 1989). While there are several dimensions of temperament, *inhibited* temperament is of particular relevance to the current study. Infants and children who have high levels of inhibition often react to novelty with caution and withdrawal (Fox et al. 2005). Physiologically, inhibited children often experience heightened reactivity. Reactivity can be characterized as experiencing negative emotions at a high frequency, as well as being more likely than other children to experience physiological symptoms of anxiety, such as elevated heart rate (Kagan et al. 1984). Given their predisposition toward heightened reactivity, inhibited children often solicit comfort from their parents more often than other children (Fox et al. 2005; Kagan et al. 1984). This pattern of inhibition can be assessed as early as infancy and often persists throughout development. Children who are inhibited in infancy are more likely to be fearful and cautious in middle childhood (Chronis-Tuscano et al. 2009; Robinson et al. 1992).

Though early foundations of temperament are biologically informed, its development is also influenced by the child's environment. A large contributor to a child's environment is made by their caregivers. For inhibited children, the experience of heightened reactivity to a novel stimulus may act as an impetus for a response from their parents. This parental response may then reinforce or punish the maintenance of that child's inhibition (Saudino and Micalizzi 2015). Parents' direct responses to their child's reactivity, as well as parents' own displays of inhibition, likely then contribute to the infant's socioemotional development as they learn how to navigate novelty (Rapee et al. 2009). This provides insight into why not all inhibited infants develop later emotional difficulties (e.g., anxiety). For example, as outlined in Pérez-Edgar's (2019) discussion of temperament and emotion, caregivers who respond sensitively to their child's needs provide an environment in which their child can learn to more effectively self-soothe when dysregulated. Parents who do not provide this sensitivity may not be providing an environment optimal for a children to learn adaptive regulatory skills. This may then increase this risk for later emotional difficulties in inhibited children (Pérez-Edgar 2019).

Although children's temperament is influenced by their caregivers' parenting style, it is also true that parents' behaviors are, in part, determined by their child. In Western contexts, mothers and fathers of inhibited children are more likely to demonstrate over-involved or negative parenting behaviors than parents of uninhibited children (Hudson et al. 2011). Conversely, mothers and fathers who perceive their children as inhibited may engage in behaviors such as warmth and sensitivity to soothe their children (see review: Degnan et al. 2010). The influence of environment on temperament is likely bidirectional: initial parenting behaviors can alter the likelihood of inhibited temperament development, then, infants and children who appear inhibited can elicit overprotective or anxiety-inducing behaviors from their parents, which may reinforce their inhibition. However, these inhibited children may also evoke aptly protective or nurturing responses from their parents, which could help reduce their inhibition over time (Serbin et al. 2015). In sum, there exist both child-directed and parent-directed effects, in which inhibited children and their parents reciprocally influence each other's behavior, and these influences are present as early as infancy.

Within the Western temperament literature, certain parenting behaviors have been repeatedly found to relate to inhibited temperament development. One such parenting construct is restrictive behavior, which corresponds to high levels of discipline and limits to autonomy (Deković et al. 1991; Teetsel et al. 2014). Highly restrictive parenting can be characterized as authoritarian, with strict expectations for how a child behaves and feels (Rickel and Biasatti 1982). Parents who display high levels of restrictive behaviors may be more likely to have anxious children. For example, parents who displayed high levels of restrictiveness were more likely to have children who remained inhibited over the course of toddlerhood in comparison to parents who displayed warmer behaviors (Pitzer et al. 2011). As is highlighted in Rapee's review of anxiety disorders in childhood and adolescence (2009), parents who are overly restrictive of their children's behaviors may unintentionally promote the maintenance of inhibition by sending implicit messages that children have little-to-no control over danger (Rapee 2001).

Protective behaviors are relevant to inhibited temperament. Though protection of children is often adaptive (Bakermans-Kranenburg and van IJzendoorn 2017), it is possible for parents to be overly protective. Overprotective parents tend to discourage children from trying new things, maintaining wariness toward novelty and shyness around new people. In a study of elementary school children, parents tended to engage in higher rates of overprotective parenting when their children displayed more inhibition (Coplan et al. 2009). Moreover, children who are inhibited in infancy are more likely to remain inhibited in toddlerhood when their parents are overprotective. In a study of young children followed from age 2 to age 4, the link between early inhibition and later social reticence was stronger for children who had overprotective mothers (Rubin et al. 2002). Though children may benefit from being shielded from truly harmful experiences, parental overprotection may encourage greater inhibition by reinforcing avoidance of novelty.

It is also important to consider encouragement of independence, as autonomy-encouraging behaviors are associated with desistance in inhibited temperament development. For example, encouragement of independence, or the encouragement of children to try new things and to make their own decisions, is theorized to increase positive child socioemotional development (S. Bögels and Phares 2008), such as increased autonomy and curiosity. Conversely, infants and toddlers who receive low levels of encouragement of independence are more likely to remain inhibited through toddlerhood into early childhood

(Lindhout et al. 2009). Children who receive encouragement of independence from their parents may have more opportunity to learn how to safely explore that which is novel or uncertain. This experience with safely exploring novelty could then lead to decreased inhibition over time.

Finally, nurturance has been repeatedly found to be relevant to temperament development. Nurturing behaviors are characterized by warmth and sympathy. Children of nurturing parents are more likely to be confident in social and novel situations; moreover, nurturance tends to be most impactful when displayed in the first 3 years of the child's life (DePasquale and Gunnar 2020). Though nurturance is often described as a protective factor, it should be acknowledged that children can receive too much nurturance from their parents. For example, overly high levels of nurturance may maintain inhibition and anxiety symptoms in children because it prevents children from learning self-regulation (Affrunti et al. 2014).

1.2 | The Role of Fathers in Temperament Development

Historically, the temperament literature has focused on the mother-child dyad. Though comparative studies have been conducted between mothers and fathers, results are highly contradictory, with some studies suggesting mothers' and fathers' behaviors relate to their children's temperament similarly (e.g., Monzani et al. 2020), and others concluding that one caregiver is more influential in child temperament than the other (e.g., Edwards et al. 2010; Hastings et al. 2008). Studies that conclude one type of caregiver as more or less influential than another caregiver may be overlooking fathers' contributions to child development as their actions are only considered in the context of the mothers' parenting. Thus, it is important to conduct studies in which fathers are the sole parental focus, particularly because the nature of fatherhood in Western contexts is changing (N. Cabrera et al. 2000). Currently in Western contexts, there is a higher expectation for fathers to be involved in childcare. In families where fathers report higher emotional investment in their child's care, children are more likely to have positive cognitive, social, and emotional outcomes (N. Cabrera et al. 2000). Fathers may promote development through encouragement of risk-taking, learning through play, and responding sensitively to their child's needs (N. J. Cabrera et al. 2018). Though work from the early 2000s noted the importance of capturing fathers' contributions in studies of child development, they remain understudied in the temperament literature (N. J. Cabrera et al. 2018). Indeed, the call for more studies focusing on fathers is ongoing (Volling and Palkovitz 2021). Thus, the temperament literature needs to be expanded to better reflect current cultural contexts.

Fathers may contribute to children's socioemotional development in a unique manner. S. Bögels and Phares' (2008) model of fathers' role in child development, particularly child anxiety development, suggests the importance of play in infancy and toddlerhood. Beginning in early toddlerhood, fathers, mores than mothers, are likely to engage in rough-and-tumble play with their children, characterized by roughhousing and activities such as play-wrestling (J. M. St George et al. 2018). Although not explicitly labeled as such, elements of restrictiveness, overprotection, autonomy-granting, and nurturance may be relevant within this unique father-child dynamic.

When examining the father-child dynamic, an important parenting behavior to consider is that of restrictiveness. Fathers who use high amounts of discipline and set strict limits on what behaviors are acceptable may be promoting inhibition (Greco and Morris 2002). In a study of fathers and their infants, fathers who displayed higher levels of intrusive and restrictive behaviors had children who displayed higher levels of inhibition and anxiety (Möller et al. 2014b). Within the play context, fathers who are overly controlling in play are more likely to have inhibited children (S. Bögels and Phares 2008). While a moderate level of restrictiveness in infancy may be developmentally appropriate as it offers children the opportunity to cope with sudden changes in the environment (Arcus 2001), fathers who display overly high levels of restrictiveness may be denying children opportunities for age-appropriate risk taking and independent coping.

It is also important to consider the role of paternal protective behaviors. Protectiveness has traditionally been aligned with the maternal role in parenting. However, protectiveness may be relevant to the way fathers parent their children as well. For example, fathers who display appropriate levels of protectiveness-characterized by limiting exposure to risks and threat that children cannot handle independently-have children who experience decreases in inhibition over time (Majdandzic et al. 2014). However, this may not be true when fathers display overly high levels of protectiveness-characterized by minimizing children's exposure to novelty even when threat is low-which could instead promote greater inhibition as it could limit their learning (Rapee et al. 2009).

The way fathers promote autonomy-seeking behaviors in children may also play a role in child socioemotional development. Fathers who engage in rough-and-tumble play promote independence-seeking in children and are more likely to have children who are socially competent (S. Bögels and Phares 2008; J. M. St George et al. 2018). Children who engage in rough-and-tumble play with their fathers tend to have better self-regulation skills (see meta-analysis: J. St George and Freeman 2017). There is also evidence outside of the play literature demonstrating that the diverse ways in which fathers engage with their children relates to inhibition in infancy and toddlerhood. Fathers may have the ability to reduce their children's inhibition, as fathers who display appropriate autonomy restriction in infancy may have children who show reduced signs of inhibition later on (Cooper-Vince et al. 2014). However, there is also evidence that fathers' behaviors may predict an increase in their children's inhibition, especially if fathers are inhibited themselves. From an evolutionary perspective, as the role of fathers is to assess for threats, inhibited fathers may send cues that the environment is dangerous, which children then assume is true (S. M. Bögels and Perotti 2011). Further, as fathers are typically expected to encourage exploration in their children (J. M. St George et al. 2018), cues that the environment is dangerous may reduce children's willingness to explore, creating higher risk for inhibition. This aligns with Rapee's work on learning through

modeling, wherein parents who model avoidance unintentionally teach children to perceive novelty as a threat, which then increases their overall inhibition (Rapee 2001). Given fathers' role in autonomy granting, rough-and-tumble play, and age-appropriate risk taking (S. Bögels and Phares 2008; Möller et al. 2014a, 2014b), it is likely that high levels of paternal encouragement of independence in infancy and toddlerhood are important for promoting non-inhibited behaviors in children.

Lastly, how nurturing and warm fathers are toward their children may relate to their child's temperament development. Although warmth and nurturance are often associated with the role of mothering, and empirical studies demonstrate that mothers report engaging in more nurturing behaviors than fathers (Majdandzic et al. 2015), warmth may still play an important role in the father-child dynamic. In a study of mothers, fathers, and children who were followed from infancy to preschool, when fathers reported engaging in more frequent warmth while children were infants, their children displayed higher levels of prosocial behavior in toddlerhood and preschool (Daniel et al. 2016). There is some evidence that fathers higher in warmth have children who are lower in inhibition (see review: Lee et al. 2018), however, much of this evidence is cross-sectional. Thus, more studies examining nurturing behaviors in longitudinal models are needed to strengthen the field's understanding of the father-child dynamic.

Beyond needing to include fathers in empirical studies, another significant methodological gap in the temperament literature is that, although temperament can be assessed via both observation and parent report, most studies examining fathers and their children include only parent report. When studying how parents interact with their inhibited children, parents' perceptions may be particularly predictive of parenting behaviors. Parent report often focuses on typical behaviors of children, such as ability to be easily soothed, typical responses to novelty, and expressions of fear. However, parent report is not without bias, as social desirability, inaccurate memory, and mental state at the time of completing the questionnaire can impact reporting (Rothbart and Bates 2006; Rothbart and Goldsmith 1985). Laboratory observation provides a more objective measure of temperament, but also places constraints on parents' reactions to children (Rothbart and Bates 2006; Rothbart and Goldsmith 1985). Laboratory observation often involves evoking reactions from children using novel stimuli (e.g., a novel and loud toy) to determine inhibition levels. Observations often involve a series of time-limited, video recorded tasks. Using both methods in one study allows for consideration of the potential role of method-specific bias when disparate results are found. Thus, studies examining fathers should include both reported and observed measures of inhibited temperament.

In addition to combining method types in studies, it is also important to examine the father-child dynamic across developmental stages. As the S. Bögels and Phares (2008) model highlights the importance of rough-and-tumble play in the father-child dynamic, a longitudinal study that crosses developmental periods both before and after the emergence of rough-and-tumble play can provide insight into how paternal parenting changes as child physical and play development advances. Recent work has called for more studies to examine how parent-child dynamics unfold across stages of development (Ballarotto et al. 2023). Thus, more studies that span infancy and toddlerhood are needed.

1.3 | The Current Study

The current study addressed two large gaps in the father-child temperament literature. It leveraged a three-time-point longitudinal design spanning infancy and toddlerhood, with both father-reported and laboratory observation of child inhibited temperament. The study considered different parenting behaviors (restrictive, protective, encouragement of independence, and nurturing behaviors), and their relations to observed and father-reported child inhibited temperament both concurrently and longitudinally. This study exclusively examined fathers in order to provide a specific focus on the father-child link in inhibited temperament development. Given fathers' role in promoting risk taking and independence, the relation of fathers' parenting to children's inhibition was a focus of this study, as opposed to other dimensions of temperament. Lastly, this study occurred across infancy and toddlerhood, a critical period for the development of the father-child relationship (S. Bögels and Phares 2008; J. M. St George et al. 2018). This study had two sets of hypotheses, which focused on both concurrent and longitudinal parent-child relations.

The first set of hypotheses pertained to concurrent parent-child relations. Based on previous theory that rough-and-tumble play becomes instrumental in the toddler period (J. M. St George et al. 2018), hypothesis 1A was that, although not expected in the first year of infancy (age 1 year), significant relations between paternal behavior and child temperament would occur at age 2 and age 3. Hypothesis 1 B was that relations between paternal behaviors and child temperament would grow stronger over time. Thus, significant increases were expected in the concurrent relations between parenting behaviors and child temperament from age 1 to age 2, and age 2 to age 3.

The second set of hypotheses related to longitudinal parent-child relations. Given evidence for bidirectional effects in temperament development (Serbin et al. 2015), hypothesis 2A was that fathers' child-rearing behaviors would predict child inhibited temperament at subsequent time points. Hypothesis 2 B is that earlier child inhibited temperament would predict paternal parenting behaviors at later time points.

Given that the literature is not consistent with regard to whether each parenting construct of interest-restrictiveness, protectiveness, nurturance, and encouragement of independence-positively or negatively relates to child inhibited temperament, no specific hypotheses regarding relations among specific parenting behaviors and child inhibition are offered. All hypotheses posed among child temperament and paternal parenting remain consistent across both observed and father-reported measurements of temperament. All hypotheses were tested in path models that controlled for stability in constructs.

2 | Method

2.1 | Participants

Participants were 116 children (56.9% male) who participated in laboratory assessments across approximate child ages of 1 year (T1; $M = 14.27$ months, $SD = 1.37$ months, $n = 68$), 2 years (T2; $M = 26.85$ months, $SD = 2.08$ months, $n = 78$), and 3 years (T3; $M = 38.88$ months, $SD = 2.79$ months, $n = 68$). Attrition rates were 17% from age 1% to 2% and 20% from age 2 to 3; families newly recruited at ages 2 and 3 offset the decreases to sample size. The sample of 116 is representative of the number of dyads who participated at least once across the phases. Children came from a larger study in which they and their mothers were recruited from public birth announcements, community establishments and events, and from the Women, Infants, and Children's program in Oxford, Ohio. Once mothers were recruited, fathers were also asked to participate by completing a collection of surveys outside of the laboratory visit. Fathers were primarily White, not Hispanic/Latino (90.4%, with the racial/ethnic identities of the remaining sample as follows: 2.6% Hispanic/Latino, 4.3% Black, 1.7% Asian or Pacific Islander, 3.5% identified with one or more race[s] not listed on the demographics measure). Child participants were also primarily White, not Hispanic/Latinx (88.7%), with the racial/ethnic identities of the remaining sample as follows: 3.5% Hispanic/Latinx, 0.9% Black, 0.9% Asian or Pacific Islander, 7.8% Multiracial, 1.7% identified with one or more race[s] not listed on the demographics measure). On average, fathers reported 15.52 years of education ($SD = 2.57$, range = 12–21 years). Across families, household income ranged from $15,000 or less to $100,000 or more ($M$ = $61,000-$70,000). The 116 participants did not include unmarried, divorced, and separated fathers, as they were excluded from the current study based on being outliers on several measures. All fathers were biological caregivers of their children.

An a priori power analysis conducted using G*Power Version 3.1 (Faul et al. 2009) indicated that a sample size of 98 was required to detect medium effects (Cohen's $f^2 = 0.15$) with power of 0.80 and alpha of 0.05 in multiple regression models containing six predictors.

2.2 | Procedure

The present study was conducted according to guidelines laid down in the Declaration of Helsinki, with written informed consent obtained from a parent or guardian for each child before any assessment or data collection. All procedures involving human subjects in this study were approved by the Institutional Review Board at Miami University. Children came to the lab with their mothers at ages 1, 2, and 3 years across the years 2012–2019. Prior to the visit, fathers completed their own consent form and packet, which mothers brought to the laboratory. Mothers provided informed consent prior to in-person procedures. The experimenter then explained each episode of the battery of tasks assessing inhibited temperament (as used in Fox et al. (2001)), as well as others not included in the current study. The battery of tasks remained consistent across phases, given they have been shown to be stable measurements of inhibition in both infancy and toddlerhood (Dyson et al. 2015; Planalp et al. 2017).

In the *free play* episode, children were presented with a variety of toys in an unfamiliar room (thus, an uncertain/novel environment). The experimenter told the child they could play however they liked and then left the child in the room with the mother. After 5 min passed, the experimenter returned and asked the child and mother to clean up the toys by placing them in the bin. The experimenter removed the bin and left the mother and child in the room. Then, in the *stranger* episode, an unknown experimenter entered the room and sat quietly on the floor, making no contact with the child for 1 min. If the child approached the stranger and engaged them multiple times, the stranger acknowledged them and moved onto the next portion of the task. Next, the experimenter played with a dump truck full of blocks in front of the child. If, after 1 min, the child had not approached the experimenter, they were invited to join in the play. An additional prompt was given within the next minute. If the child still did not approach, the episode ended. Otherwise, the child was given a minute to play. In the subsequent *robot* episode, the experimenter pulled out a toy robot and invited the child to play with it, turning on the robot and moving it with a remote control. After 2 min had passed (with 2 prompts if the child did not approach), the experimenter turned off the robot and ended the episode. Lastly, in the *tunnel* task, the experimenter presented the child with a large, expandable tunnel and asked them to crawl through it. If the child refused, the experimenter placed a toy inside the tunnel and asked the child to retrieve it. If the child had not attempted to crawl through the tunnel after 3 verbal prompts and 1 min had passed, the experimenter ended the episode. Across all episodes, the child's mother was in the room. She was instructed not to prompt the child explicitly, but was welcome to respond naturally to the child's bids for attention or comfort.

2.3 | Measures and Materials

2.3.1 | Parenting Behaviors

Fathers completed the Child Rearing Practices Report (CRPR; Block 1965), which was adapted from a Q-sort into a 91-item self-report questionnaire (Block 1965), at each time point. This measure is Likert-style, with six possible answers ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). The CRPR's 91 items can be broken down into subscales that assess specific behaviors (Deković et al. 1991). Subscales were created by averaging relevant items. The current study focused on the subscales of encouragement of independence (Deković et al. 1991; T1 $\alpha = 0.477$, T2 $\alpha = 0.495$, T3 $\alpha = 0.594$; observed range = 2.86–6.00; e.g. "*I try to let my child make many decisions for themselves*"), protective behaviors (Deković et al. 1991; T1 $\alpha = 0.340$, T2 $\alpha = 0.411$, T3 $\alpha = 0.609$; observed range = 1.00–4.50; e.g. "*I try to stop my child from playing rough games or doing things where they might get hurt*"), restrictive behaviors (Rickel and Biasatti 1982; αs = 0.755–0.793; observed range = 2.18–4.70; "*I believe that scolding and criticism make a child improve*"), and nurturing behaviors (Rickel and Biasatti 1982; αs = 0.823–0.890;

observed range = 2.04–5.94; e.g. "*I encourage my child to talk about their troubles*"). As the CRPR survey was developed from a Q-sort, it is not surprising that the alphas are lower than may be typically expected for other survey measures, as each survey item was chosen to be maximally independent from the others.

The CRPR is a valid and reliable tool for measuring child-rearing practices of parents with children in early childhood (Deković et al. 1991; Lindhout et al. 2009). Additionally, reports on the CRPR have been shown to have significant relations with child temperament and, more specifically, the CRPR has been demonstrated to be a valid assessment of parenting in fathers of children as young as 12-months-old (Mezulis et al. 2004). Moreover, alpha levels are comparable to those found in other studies, suggesting it is appropriate to use (e.g. Caldera 2004; Mezulis et al. 2004).

2.3.2 | Father-Reported Inhibited Temperament

To assess fathers' perceptions of child inhibited temperament, fathers completed the Infant-Toddler Social Emotional Assessment (ITSEA; Carter and Briggs-Gowan 2000) at each time point. This is a 166-item inventory in which fathers answered Likert-style questions about how they perceive their children, with possible answers ranging from 0 (*not true/rarely*) to 2 (*very true/often*). The ITSEA comprises four behavioral domains, each of which contains subscales created by taking the mean of relevant items. The current study used only the five-item Inhibition to Novelty subscale within the internalizing domain, as it related the most closely to inhibited temperament (αs = 0.707–0.776; observed range: 0.00–2.00). The five items on the inhibition to novelty subscale are as follows: *my child takes a while to speak in unfamiliar situations, my child takes a while to feel comfortable in new places (10 min or more), my child is shy with new adults, my child is shy with new children,* and *my child is quiet or less active in new situations*. The ITSEA is a reliable and valid measure of parental perceptions of children for both infants and toddlers (Briggs-Gowan and Carter 2007; Carter et al. 2003).

2.3.3 | Observed Child Inhibited Temperament

An inhibited temperament composite was derived from scores of behaviors across the stranger, robot, and tunnel episodes to assess inhibited temperament. Previous studies have found these episodes to be a reliable and valid estimate of temperament in this age group reliable (Buss and Goldsmith 2000; Fox et al. 2001). Results of principal component analyses within this sample indicated that behaviors in the free play episode did not relate to displays of inhibited temperament in the other episodes (Kiel et al. 2021; see Online Supplement for additional details).

All episodes of the inhibited temperament battery were audio and video recorded for behavioral coding. Coders received intensive training and established initial reliability (% agreement > 0.90) with a primary coder. Behaviors were scored as present or absent on a continual frame-by-frame basis using INTERACT software (Mangold 1989-2011). The primary coder double scored at least 20% of cases throughout coding to prevent coder drift. Inter-rater reliability was assessed as the intraclass correlation coefficient (ICC; reported below in parentheses) on latency (in seconds, from beginning of episode to instance of first behavior), frequency (count), and duration (in seconds) parameters. Available behaviors were then analyzed through a series of principal components analyses (PCAs), which identified 16 behaviors across the Stranger (S), Robot (R), and Tunnel (T) tasks that hung together. See the Online Supplement for details of the PCAs for each wave of data collection. Variables included in the final composite included duration of time spent in proximity to the mother while not playing (0.97; S, R, T), frequency of non-distressed vocalizations (reversed; 0.92; S), duration of play in proximity of the stranger (reversed; 0.91; S, R), latency (in seconds) to approach the stranger/stimulus (0.95; S, R), duration of freezing (0.85; S, R), duration of vigilant staring (0.95; S, R, T), latency to touch the stimulus (0.99; S, R) and duration of touching the stranger/stimulus (0.99; R). Behaviors were reversed (if indicated), standardized as Z-scores, and averaged to create the final variable. To remain consistent, the same composite was used for all three time points ($\alpha = 0.92$, 0.91, and 0.93 for ages 1, 2, and 3, respectively).

2.4 | Data Analysis Plan

As the purpose of this study was to determine both concurrent and longitudinal parent-child relations, the analysis plan was as follows. First, missing data across variables and phases were addressed. Comparisons between participants who had missing data on certain variables or who were lost to attrition and participants who had no missing data were conducted. The likely pattern of missing data was analyzed using Little's missing completely at random (MCAR) test in SPSS Version 27 (IBM Corp 2017). Missing values were then handled by using full information maximum likelihood (FIML) model estimation in MPlus Version 7.3 (Muthén and Muthén 1998-2017). Descriptive statistics were also examined to determine if variables were normally distributed. Given the precedent set in Kline (2015), variables with a |skew| < 3.00 and |kurtosis | < 10.00 were considered as not severely deviating from a normal distribution.

A series of four path analysis models were conducted in MPlus Version 7.3 (Muthén and Muthén 1998-2017). One path model was conducted for each parenting construct of interest (restrictiveness, protectiveness encouragement of independence, and nurturance). Paths were examined for within-time relations between paternal parenting and inhibited temperament (Hypothesis 1A). Fisher's r to z transformations were then conducted on the correlational values across ages to test whether correlational values strengthened over time (Hypothesis 1B). Path analyses also examined how early parenting behaviors predicted later child temperament, as well as how early child temperament predicted later parenting behaviors (Hypotheses 2A and 2B, respectively). Because we exerted this control, analyses would yield conservative tests of hypotheses. We also had a moderately sized sample. For these two reasons, rate of Type II error was expected to be high. Thus, corrections for multiple comparisons were not conducted to prevent additional probability of Type II error.

3 | Results

3.1 | Data Screening and Descriptive Statistics

Due to the nature of both longitudinal research designs and fathers being recruited as a secondary parent for larger study from which these data were derived, all variables of interest had missing values. However, Little's MCAR test was not significant (χ^2 = [263] = 276.522, p = 0.271), suggesting that the data did not differ from an MCAR pattern. Chi-square and t-tests indicated that participants with missing data did not differ significantly from other participants based on demographic variables, including race, ethnicity, paternal education, and paternal income (all ps > 0.05). As such, no demographic variables were included as controls in models examining relations among child inhibited temperament and paternal restrictiveness, encouragement of independence, nurturance, or protectiveness.

No variables exhibited severe deviation from normal distributions based on skewness (all |skew| < 3.00), and most variables did not exhibit severe deviation from being normally distributed based on kurtosis (|kurtosis| < 10.00). However, two variables displayed abnormally high kurtosis. Paternal nurturing at T2 (kurtosis = 10.45) and paternal nurturing at T3 (kurtosis = 11.60) displayed levels of kurtosis that suggested they were non-normally distributed. To account for these, the T2 and T3 nurturance variables were subjected to a square root transformation, which reduced kurtosis to acceptable levels for both the T2 (kurtosis = −1.514) and T3 (kurtosis = −2.015) nurturance variables. The transformed variables were then used for analysis (see Table 1 for descriptive statistics for all primary variables). Bivariate correlations among primary variables are presented in Tables 2 and 3. To determine if square-root transformation of variables impacted results, the nurturance model was conducted once with the transformed variables, and once with the original, non-transformed variables. Both models yielded similar results. Details of the model conducted with non-transformed variables can be found in the online supplement.

3.2 | Path Models

Across models, each parenting behavior demonstrated intra-variable stability across all time points. Father-reported inhibited temperament demonstrated stability across at least two time points in each of the models. Lastly, observed inhibited temperament only demonstrated stability from time 2 to time 3,

TABLE 1 | Descriptive statistics of primary variables.

	Time 1			*Time 2*			*Time 3*		
Variable	***n***	***Mean (SD)***	***Range***	***n***	***Mean (SD)***	***Range***	***n***	***Mean (SD)***	***Range***
Obs. IT	70	0.02 (0.64)	−1.16–1.57	84	0.04 (0.65)	−0.97–1.58	79	0.06 (0.72)	−1.02–1.94
Perc. IT	62	0.62 (0.47)	0.00–2.00	75	0.73 (0.47)	0.00–2.00	66	0.72 (0.49)	0.00–2.00
Prot.	64	1.99 (0.66)	1.00–3.33	73	2.03 (0.68)	1.00–3.33	65	2.08 (0.75)	1.00–4.33
Nurt.	64	5.17 (0.43)	3.89–5.94	72	5.11 (0.56)	2.11–5.83	57	5.06 (0.58)	2.06–5.72
Rest.	63	3.44 (0.51)	2.23–4.45	73	3.45 (0.59)	2.18–4.70	57	3.44 (0.49)	2.27–4.50
Enc.	64	4.55 (0.55)	3.17–5.71	74	4.47 (0.55)	3.00–6.00	65	4.46 (0.56)	2.86–5.80

Note: Descriptive statistics for observed inhibited temperament (Obs. IT), perceptions of inhibited temperament (Perc. IT), protectiveness (Prot.), nurturance (Nurt.), restrictiveness (Rest.), and encouragement of independence (Enc.). Descriptives are shown for variables before any transformations.

TABLE 2 | Bivariate correlations between parenting behaviors, concurrently and longitudinally.

Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1.T1 Prot.	—											
2.T1 Nurt.	−0.39**	—										
3.T1 Rest.	0.36**	−0.03	—									
4.T1 Enc.	−0.32**	0.51**	−0.13	—								
5.T2 Prot.	0.46**	−0.22	0.03	−0.14	—							
6.T2 Nurt.	−0.49**	0.61**	−0.09	0.24	−0.47**	—						
7.T2 Rest.	0.20	0.13	0.63**	0.02	0.24*	−0.10	—					
8.T2 Enc.	−0.16	0.24	−0.04	0.49**	−0.33**	0.52*	0.08	—				
9.T3 Prot.	0.35*	0.00	0.15	−0.08	0.56**	−0.33*	0.34*	−0.28**	—			
10.T3 Nurt.	0.09	0.09	0.63**	−0.12	0.19	0.88**	−0.25†	−0.04	0.43**	—		
11.T3 Rest.	−0.46**	0.60**	−0.15	0.45**	−0.48**	−0.10*	0.86**	0.44**	−0.37**	−0.14	—	
12.T3 Enc.	−0.27	0.30†	0.16	0.36*	−0.31*	0.44**	0.11	0.56**	−0.12	0.61**	0.14	—

*Note:*Variables: protectiveness (Prot.), nurturance (Nurt.), restrictiveness (Rest.), and encouragement of independence (Enc.).
† p < 0.10, *p < 0.05, **p < 0.01.

and only within two models. Taken together, this suggests that fathers behaved somewhat consistently throughout their children's early development and that their perceptions of their children's inhibition were somewhat stable over time; however, children's observed inhibition changed across development, which may reflect the malleable nature of temperament development. The path model for protectiveness yielded no significant paths, and thus is only reported in the Online Supplement. Models for restrictiveness, encouragement of independence, and nurturance are presented in Figures 1–3, respectively.

In the restrictiveness model (Table 4, Figure 1), there was no evidence to support hypothesis 1A, as there were no significant concurrent relations between paternal restrictiveness and inhibited temperament (all $p > 0.05$). Similarly, there was no evidence for hypothesis 1B, as correlations did not strengthen over time (all Zs < 2.56; all ps > 0.05). There was partial evidence to support hypothesis 2A, with paternal restrictiveness at T2 predicting lower observed inhibited temperament at T3 over and above all other predictors in the model ($b = -0.55$, SE = 0.23, $p = 0.019$), meaning that fathers who showed higher restrictiveness at T2 had children who displayed lower levels of inhibited temperament at T3 than stability would predict. No evidence for hypothesis 2B existed in this model; earlier temperament did not predict later restrictiveness.

TABLE 3 | Bivariate correlations of measures of inhibited temperament, concurrently and longitudinally.

Variable	1	2	3	4	5	6
1.T1 Obs. IT	1.00					
2.T1 Perc. IT	0.24†	1.00				
3.T2 Obs. IT	0.16	0.22	1.00			
4.T2 Perc. IT	0.16	0.31*	0.00	1.00		
5.T3 Obs. IT	0.25†	0.38*	0.30*	0.02	1.00	
6.T3 Perc. IT	0.31*	0.30†	−0.01	0.62**	0.52**	1.00

Note: Variables: observed inhibited temperament (Obs. IT), perceptions of inhibited temperament (Perc. IT).
† $p < 0.10$, *$p < 0.05$, **$p < 0.01$.

In the encouragement of independence model (Table 5, Figure 2), there was support for hypothesis 1A, as paternal encouragement of independence significantly related to observed inhibited temperament at T3 ($r = 0.331$, $p = 0.002$). This suggested that fathers who were highly encouraging of independence at T3 had children who were also highly inhibited. As expected, this relation was not significant in infancy. There was no support for hypothesis 1B as relations did not strengthen over time (all Zs < 2.56; all ps > 0.05). There was no support for hypothesis 2A, as early encouragement of independence did not predict later inhibited temperament. However, there was partial support for hypothesis 2B; observed inhibited temperament at T1 positively predicted later encouragement of independence at T2 above and beyond all other T1 predictors in the model ($b = 0.25$, SE = 0.10, $p = 0.014$). Thus, children who were observed to be highly inhibited at T1 were more likely to have fathers who were highly encouraging of independence at T2.

In the nurturance model (see Table 6, Figure 3), there was partial evidence for hypothesis 1A. Nurturance and observed inhibited temperament were significantly related at T1 ($r = 0.280$, $p = 0.045$) and at T3 ($r = 0.199$, $p = 0.010$). This indicated that fathers who were more nurturing at T1 and T3 were likely to have children who were more inhibited at those same time points. As predicted, there were significant relations

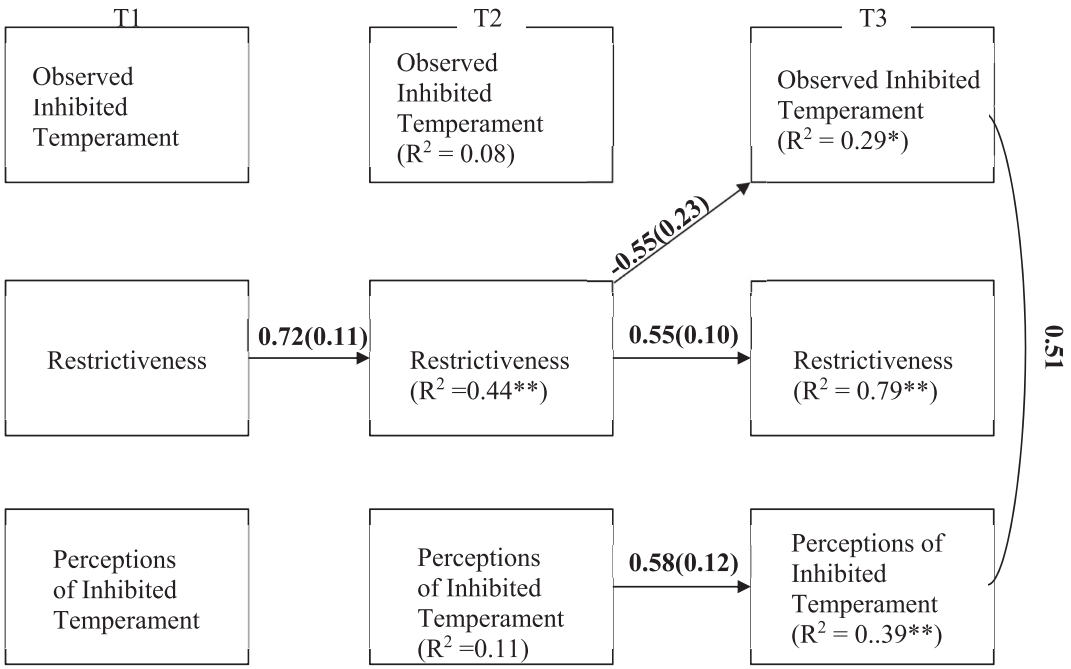

FIGURE 1 | Path Model of Restrictiveness, Perceptions of Inhibited Temperament, and Observed Inhibited Temperament. Only significant paths ($p < 0.05$) are shown, though all possible paths were tested. Concurrent relations represented by Pearson's r, longitudinal by the unstandardized b coefficient and standard error. *$p < 0.05$, **$p < 0.01$.

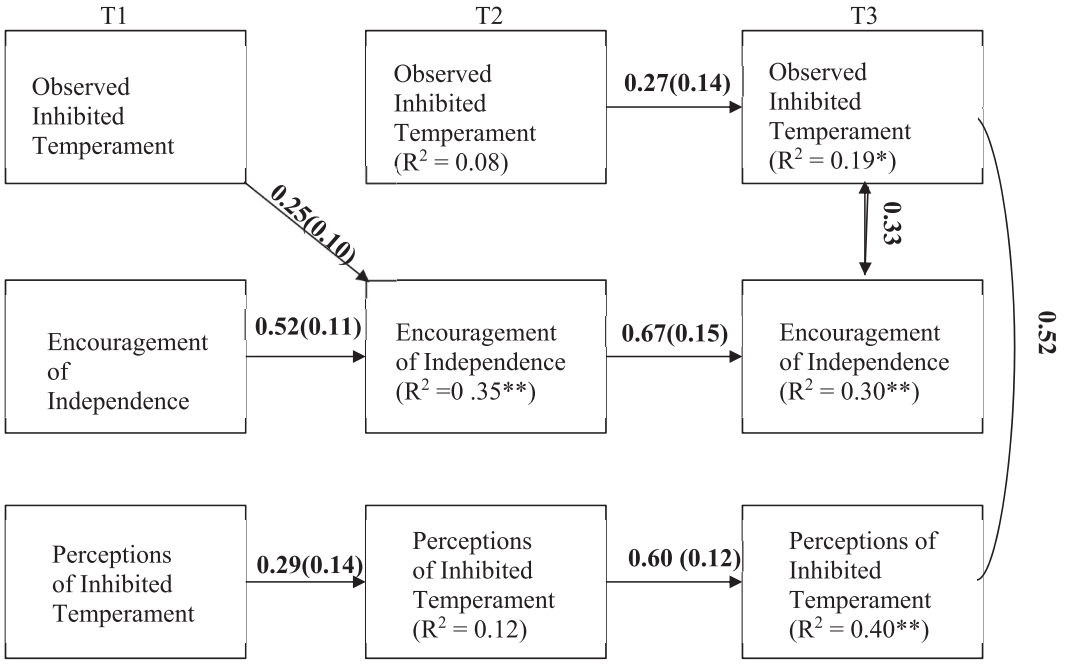

FIGURE 2 | Path Model of Encouragement, Perceptions of Inhibited Temperament, and Observed Inhibited Temperament. Only significant paths ($p < 0.05$) are shown, though all possible paths were tested. Concurrent relations represented by Pearson's *r*, longitudinal by the unstandardized b coefficient and standard error. *$p < 0.05$, **$p < 0.01$.

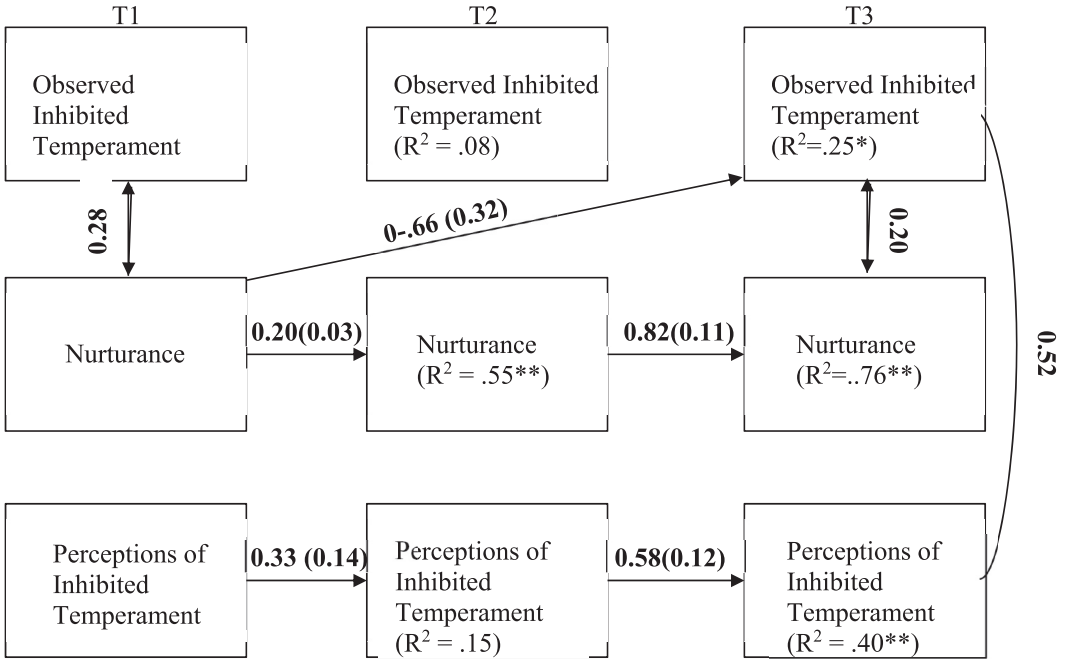

FIGURE 3 | Path Model of Nurturance, Perceptions of Inhibited Temperament, and Observed Inhibited Temperament. Only significant paths ($p < 0.05$) are shown, though all possible paths were tested. Concurrent relations represented by Pearson's *r*, longitudinal by the unstandardized b coefficient and standard error. *$p < 0.05$, **$p < 0.01$.

among variables at T3. Surprisingly, relations were significant at T1, but not T2 There was no evidence for hypothesis 1B as correlations did not strengthen over time (all Zs < 2.56; all *p*s > 0.05). There was partial evidence for hypothesis 2A, wherein nurturance reported at T1 predicted lower levels of observed inhibited temperament at T3, over and above all other predictors in the model ($b = -0.66$, SE = 0.32, $p = 0.040$). This indicated that fathers who displayed high levels of nurturance at T1 had children who were observed to be relatively less inhibited at T3 than stability would predict. This model yielded no evidence for hypothesis 2B; earlier temperament did not predict later nurturance.

TABLE 4 | Paternal restrictiveness: Path model coefficients.

Variable	*b* (*SE*)	β	*p*	95% CI (*b*)
DV = T2 observed inhibited temperament (R^2 = 0.08)				
T1 Obs. IT	0.11 (0.13)	0.10	0.41	[−0.15, 0.36]
T1 Perc. IT	0.33 (0.19)	0.23	0.09	[−0.05, 0.70]
T1 Restrict.	−0.08 (0.15)	−0.06	0.61	[−0.37, 0.22]
DV = T2 perceived inhibited temperament (R^2 = 0.11)				
T1 Obs. IT	0.06 (0.11)	0.25	0.57	[−0.15, 0.28]
T1 Perc. IT	0.25 (0.16)	0.09	0.10	[−0.05, 0.56]
T1 Restrict.	0.10 (0.12)	0.14	0.39	[−0.13, 0.34]
DV = T2 paternal restrictiveness (R^2 = 0.44)				
T1 Obs. IT	0.09 (0.11)	0.10	0.43	[−0.13, 0.30]
T1 Perc. IT	−0.02 (0.15)	−0.02	0.88	[−0.32, 0.27]
T1 Restrict.	0.72 (0.11)	0.65	< 0.01	[0.49, 0.94]
DV = T3 observed inhibited temperament (R^2 = 0.29)				
T1 Obs. IT	0.13 (0.20)	0.11	0.53	[−0.27, 0.53]
T1 Perc. IT	0.43 (0.26)	0.28	0.09	[−0.07, 0.94]
T1 Restrict.	0.39 (0.30)	0.28	0.19	[−0.20, 0.99]
T2 Obs. IT	0.22 (0.14)	0.20	0.11	[−0.05, 0.49]
T2 Perc. IT	−0.09 (0.18)	−0.06	0.63	[−0.45, 0.27]
T2 Restrict.	−0.56 (0.23)	−0.44	0.02	[−1.01, −0.09]
DV = T3 perceived inhibited temperament (R^2 = 0.39)				
T1 Obs. IT	0.08 (0.12)	0.11	0.48	[−0.15, 0.32]
T1 Perc. IT	0.04 (0.16)	0.04	0.79	[−0.26, 0.35]
T1 Restrict.	0.03 (0.17)	0.03	0.86	[−0.29, 0.35]
T2 Obs. IT	0.11 (0.09)	0.15	0.21	[−0.06, 0.29]
T2 Perc. IT	0.56 (0.12)	0.56	< 0.01	[0.35, 0.81]
T2 Restrict.	−0.13 (0.13)	−0.16	0.31	[−0.39, 0.12]
DV = T3 paternal restrictiveness (R^2 = 0.79)				
T1 Obs. IT	−0.08 (0.12)	−0.10	0.52	[−0.31, 0.16]
T1 Perc. IT	−0.07 (0.13)	−0.07	0.58	[−0.34, 0.19]
T1 Restrict.	0.26 (0.12)	0.28	0.03	[0.02, 0.49]
T2 Obs. IT	−0.05 (0.07)	−0.07	0.44	[−0.18, 0.08]
T2 Perc. IT	0.16 (0.10)	0.15	0.11	[−0.04, 0.37]
T2 Restrict.	0.55 (0.10)	0.65	< 0.01	[0.36, 0.75]

Note: Variable: observed inhibited temperament (Obs. IT), perceptions of inhibited temperament (Perc. IT), restrictiveness (Rest.).

TABLE 5 | Paternal encouragement of independence: Path model coeff.

Variable	*b* (*SE*)	β	*p*	95% CI (*b*)
DV = T2 observed inhibited temperament (R^2 = 0 0.07)				
T1 Obs. IT	0.12 (0.13)	0.11	0.38	[−0.14, 0.37]
T1 Perc. IT	0.30 (0.18)	0.22	010	[−0.05, 0.66]
T1 Enc.	−0.02 (0.14)	0.12	0.90	[−0.30, 0.27]
DV = T2 perceived inhibited temperament (R^2 = 0.12)				
T1 Obs. IT	0.09 (0.10)	0.14	0.40	[−0.12, 0.29]
T1 Perc. IT	0.29 (0.14)	0.14	0.04	[0.02, 0.57]
T1 Enc.	0.05 (0.12)	0.13	0.67	[−0.18, 0.27]
DV = T2 paternal encouragement of independence (R^2 = 0.35)				
T1 Obs. IT	0.25 (0.10)	0.28	0.01	[0.05, 0.45]
T1 Perc. IT	−0.07 (0.14)	−0.05	0.65	[−0.34, 0.21]
T1 Enc.	0.51 (0.11)	0.49	< 0.01	[0.29, 0.74]
DV = T3 observed inhibited temperament (R^2 = 0.19)				
T1 Obs. IT	0.02 (0.21)	0.02	0.94	[−0.39, 0.42]
T1 Perc. IT	0.43 (0.25)	0.28	0.09	[−0.07, 0.92]
T1 Enc.	−0.16 (0.23)	−0.12	0.49	[−0.60, 0.29]
T2 Obs. IT	0.27 (0.14)	0.24	0.05	[0.00, 0.54]
T2 Perc. IT	−0.10 (0.20)	−0.06	0.63	[−0.48, 0.29]
T2 Enc.	0.17 (0.22)	0.13	0.45	[−0.26, 0.60]
DV = T3 perceived inhibited temperament (R^2 = 0.40)				
T1 Obs. IT	−0.02 (0.13)	−0.03	0.87	[−0.27, 0.23]
T1 Perc. IT	0.04 (0.13)	0.04	0.79	[−0.25, 0.33]
T1 Enc.	−0.04 (0.13)	−0.05	0.73	[−0.29, 0.21]
T2 Obs. IT	0.11 (0.09)	0.15	0.20	[−0.06, 0.28]
T2 Perc. IT	0.60 (0.12)	0.58	< 0.01	[0.36, 0.84]
T2 Enc.	0.15 (0.13)	0.18	0.020	[−0.10, 0.40]
DV = T3 paternal encouragement of independence (R^2 = 0.30)				
T1 Obs. IT	0.02 (0.16)	0.47	0.89	[−0.29, 0.33]
T1 Perc. IT	−0.14 (0.18)	0.11	0.44	[−0.48, 0.21]
T1 Enc.	0.10 (0.15)	−0.02	0.51	[−0.20, 0.40]
T2 Obs. IT	−0.02 (0.11)	0.10	0.84	[−0.23,0.19]
T2 Perc. IT	0.13 (0.16)	0.03	0.40	[−0.17, 0.44]
T2 Enc.	0.46 (0.16)	−0.11	0.01	[0.14, 0.78]

Note: Variables: observed inhibited temperament (Obs. IT), perceptions of inhibited temperament (Perc. IT), encouragement of independence (Enc.).

Overall, there was partial evidence for hypotheses that paternal parenting behaviors and observed inhibited temperament are related both concurrently and longitudinally. Specifically, early paternal nurturance and restrictiveness at child age 1 and 2 respectively were predictive of lower observed inhibited temperament later at child age 3, though nurturance displayed positive associations with temperament concurrently at child age 3. Early observed inhibition at child age 1 positively predicted later encouragement of independence at child age 2. These variables were also positively associated concurrently at child age 3. None of the parenting behaviors of interest significantly related to father-reported inhibited temperament either concurrently or longitudinally.

Post hoc models separated out measures of temperament (i.e., survey measure and laboratory observation) to determine if lack of findings surrounding father-reported temperament were caused by shared construct variance. No model revealed new effects (see Online Supplement).

TABLE 6 | Paternal nurturance: Path model coefficients.

Variable	*b* (*SE*)	β	*p*	95% CI (*b*)
DV = T2 observed inhibited temperament (R^2 = 0.08)				
T1 Obs. IT	0.14 (0.13)	0.14	0.28	[−0.11, 0.40]
T1 Perc. IT	0.29 (0.18)	0.21	0.12	[−0.05, 0.46]
T1 Nurt.	−0.13 (0.17)	−0.10	0.42	[−0.33, 0.014]
DV = T2 perceived inhibited temperament (R^2 = 0.15)				
T1 Obs. IT	0.09 (0.10)	0.12	0.38	[−0.15, 0.40]
T1 Perc. IT	0.33 (0.14)	0.33	0.02	[0.07, 0.59]
T1 Nurt.	−0.13 (0.13)	−0.13	0.33	[−0.38, 0.13]
DV = T2 paternal nurturance (R^2 = 0.55)				
T1 Obs. IT	0.02 (0.02)	0.11	0.34	[−0.11, 0.32]
T1 Perc. IT	−0.02 (0.03)	−0.06	0.61	[−0.27, 0.16]
T1 Nurt.	0.20 (0.02)	0.70	< 0/01	[0.55, 0.86]
DV = T3 observed inhibited temperament (R^2 = 0.25)				
T1 Obs. IT	0.17 (0.19)	0.16	0.35	[−0.17, 0.48]
T1 Perc. IT	0.34 (0.27)	0.22	0.21	[−0.12, 0.56]
T1 Nurt.	−0.66 (0.32)	−0.42	0.04	[−0.82, −0.03]
T2 Obs. IT	0.23 (0.14)	0.20	0.10	[−0.03, 0.44]
T2 Perc. IT	−0.13 (0.19)	−0.08	0.50	[−0.33, 0.16]
T2 Nurt.	1.82 (1.03)	0.33	0.08	[−0.03, 0.16]
DV = T3 perceived inhibited temperament (R^2 = 0.40)				
T1 Obs. IT	0.12 (0.12)	0.17	0.32	[−0.15, 0.46]
T1 Perc. IT	−0.05 (0.16)	−0.05	0.764	[−0.36, 0.26]
T1 Nurt.	0.01 (0.19)	0.01	0.96	[−0.36, 0.37]
T2 Obs. IT	0.15 (0.09)	0.20	0.10	[−0.04, 0.43]
T2 Perc. IT	0.58 (0.12)	0.57	< 0.01	[0.36, 0.77]
T2 Nurt.	−0.16 (0.64)	−0.04	0.80	[−0.39. 0.30]
DV = T3 paternal nurturance (R^2 = 0.76)				
T1 Obs. IT	−0.01 (0.02)	−0.03	0.78	[−0.26, 0.20]
T1 Perc. IT	−0.02 (0.03)	−0.06	0.57	[−0.25, 0.14]
T1 Nurt.	0.02 (0.03)	0.07	0.53	[−0.16, 0.31]
T2 Obs. IT	−0.01 (0.02)	−0.04	0.65	[−0.20, 0.12]
T2 Perc. IT	0.00 (0.03)	0.01	0.91	[−0.17, 0.19]
T2 Nurt.	0.82 (0.11)	0.88	< 0.01	[0.62, 1.03]

Note: Variable: observed inhibited temperament (Obs. IT), perceptions of inhibited temperament (Perc. IT), nurturance (Nurt.).

4 | Discussion

The current study examined the link between inhibited temperament and paternal parenting behaviors using a three-time-point longitudinal design spanning infancy and toddlerhood. The study contributes to efforts in the literature to focus more on fathers, and not just in comparison to mothers. Results indicated that certain paternal behaviors and child inhibited temperament were concurrently and longitudinally related across the infant and toddler periods. Specifically, it appeared that the link between the two may be more fully developed in toddlerhood compared to infancy, with more concurrent relations being found between variables across models at age 3 than at ages 2 and 1.

Results surrounding restrictiveness are intriguing, as the S. Bögels and Phares (2008) model of the role of fathering in child anxiety and empirical evidence often suggest that higher restrictiveness leads to heightened inhibition over time (Moller et al. 2014b). However, the current study found the opposite, with early heightened restrictiveness in infancy predicting lower inhibited temperament in toddlerhood. Though results were surprising, there is previous evidence for this directionality in the literature. For example, in a longitudinal study, when mothers and fathers displayed intrusive parenting in infancy, their children later displayed *less* inhibition in toddlerhood (Park et al. 1997). This suggested that early intrusive parenting may prompt children to change their behavior, facilitating a decrease in inhibited behaviors. These findings are also supported by Arcus' (2001) theory that children with mothers who make more demands to engage in undesirable tasks end up being less inhibited over time. Strict limit-setting from parents may require children to develop better regulation strategies as they are forced to engage in something uncomfortable and uncertain. Notably, fathers in the current study reported low to moderate levels of restrictiveness, which may be why findings support Arcus' (2001) theory. Whereas very high levels of restrictiveness may predict increased anxiety and inhibition in school-aged children and adolescents (Verhoeven et al. 2012), moderate levels of restrictiveness in early developmental periods may be partially adaptive for children.

The only child-driven effect on fathers was that observed inhibited temperament at age 1 predicted encouragement of independence at age 2. It is possible that fathers are responding to their children's inhibition by encouraging them to take more age-appropriate risks in an attempt to reduce their infants' fear of uncertainty. The positive association between encouragement of independence and inhibited temperament at age 3 suggests that fathers are continuing to respond to their children's inhibition in this way and that children with encouraging fathers are still more inhibited. This continued encouragement of independence may result in parent-driven effects, including reduced inhibited temperament, at ages later than were examined in the current study (i.e., early to middle childhood), as suggested by previous work (S. Bögels and Phares 2008).

Interestingly, though early nurturance predicted lower observed inhibited temperament at a later age, it was positively associated with inhibition concurrently at both time 1 and time 3. This may be indicative of a virtuous cycle as outlined by Serbin et al. (2015). In infancy, inhibited children may express heightened distress, to which fathers may respond with more nurturance. Over time, this higher nurturance ultimately leads to *reduction* of inhibition in children, providing evidence for the virtuous cycle. The positive relations in toddlerhood may suggest that fathers continue to respond to their children's distress by being nurturing. The results provide support for other work showing that parental nurturance is especially important and influential on child development in infancy (DePasquale and Gunnar 2020). This study not only corroborates evidence from

previous studies, but also provides evidence consistent with a virtuous cycle involving paternal nurturance during the infant period, specifically.

It was surprising that none of the four paternal parenting behaviors assessed in the current study significantly related to paternal perceptions of temperament either concurrently or longitudinally. This suggests that fathers are responding to their children's temperament, but they may not be conceptualizing their children's behaviors in the way that the parent survey presented. It is also possible that the survey and observational measures captured different domains of child functioning. The survey items assessing inhibition to novelty largely related to inhibition in the context of novel social situations, whereas observational measures in the lab were not all inherently social (e.g., crawling through a tunnel). Thus, the survey may point to patterns of social inhibition specifically, whereas the observational measure captured behaviors indicative of a broader scope of inhibited temperament in different contexts. Additionally, the measure of observed temperament offers robust information about children's inhibition as it considers several behavioral indices, such as duration and frequency of behaviors. The survey is more limited in nature as the *inhibition to novelty* subscale is only five questions. The inclusion of both paternal perceptions of inhibition and observed temperament has been largely overlooked in previous studies. However, the authors found one previous study that examined both. It found that fathers' perceptions of their infant's temperament aligned with observed physicality of temperament, which may be due to the role of fathers in social play with their infants (Jones and Parks 1983). It is also possible that the survey was more valid for mothers, as early measure development included only mothers in the sample (Carter et al. 2003). It is also important to note that measures of observed temperament were conducted with mothers in the room. Thus, we cannot disentangle whether discrepancies are due to method type or due to fathers not being in the room. Future studies could use a bottom-up approach to create maximally valid temperament surveys for fathers by beginning with qualitative work to most accurately understand how fathers perceive and describe their children's inhibited temperament.

Though this study had many strengths and contributions to the knowledge base surrounding fathers and young children, it is not without limitation. First, though the models of fatherhood providing the foundation for this study (e.g., S. Bögels and Phares 2008) considered the changing nature of fatherhood in broader, contemporary communities in the Global North (North America, Europe, Oceania), it cannot address how ideals surrounding fatherhood differ across proximal communities (e.g. neighborhoods, geographical and religious communities). Additionally, both the sample and the theory supporting the study are based on White, mother-father family experiences. As such, these findings are not generalizable to other communities, including in the Global South (Africa, Asia, Latin America). Future studies should examine the father-child dyad in Global South contexts, as well as include non-mother-father couples, to understand relations between parenting and child temperament that best characterize those populations. Second, our study did not assess the extent of father involvement in child-rearing activities. Although fathers are generally more involved in child caregiving than in previous time periods (N. Cabrera et al. 2000), there is still variation across families regarding fathers' contributions and time spent with their children. It is possible that relations between paternal parenting and child temperament may be stronger in families where fathers report higher levels of caregiver involvement. Thus, future studies should measure and control for involvement for all caregivers of interest. Lastly, results may be limited due to the range of scores observed, particularly for nurturance and protectiveness. Low alpha values and resulting small correlations may be more indicative of restricted range as opposed to poor internal consistency. Future studies should determine the convergent validity of the CRPR with other measures of parenting.

This study also provides promising avenues for future research. First, future studies should examine children from late toddlerhood to preschool and school-aged periods (i.e., ages 4 through 7) to see how father-child relations change once children are farther along in development and are at an age where anxiety disorders are more likely to be diagnosed. Moreover, studies could examine the combined effect of fathers' and mothers' behaviors on temperament development, and vice versa. Though the majority of the literature focuses on mothers, and this study examined only fathers, child temperament is likely interacting with the combined behaviors from all caregivers in the home, not just the father or the mother. Studies should also include families living in non-nuclear households, as well as families in which the primary caregiver is not a biological parent (e.g., a grandfather). Lastly, future studies should use methods that allow for within-person comparisons over time in order to better understand how fathers change their parenting behaviors in response to their children's temperament as they develop.

5 | Conclusion

There is strong precedent in the temperament literature to suggest that child inhibited temperament development in infancy and toddlerhood and parenting are related. However, temperament research has largely understudied these relations in the father-child dyad. The current study found evidence for both longitudinal and concurrent relations between parenting and observed temperament across the infant and toddler developmental period. Though no hypothesis was universally supported, findings suggest father-child interactions are an important aspect of temperament development. Findings from the current study can help inform current models of fathering by highlighting the importance of the specific parenting behaviors of moderate restrictiveness, encouragement of independence, and nurturance in the father child-dynamic. Moreover, the current study also builds upon existing models of fathering by demonstrating the existence of both child-directed and father-directed effects. This study demonstrates the importance of including multi-method assessment in studies of child development, as significant associations were only found with observed temperament but not parent-rated temperament. Future studies that include fathers, as well as other caregivers, will continue to push the temperament literature forward, strengthening the depth of knowledge the field holds about child development.

Author Contributions

Nicole M. Baumgartner: conceptualization, formal analysis, investigation, visualization, writing – original draft, writing – review & editing. **Elizabeth J. Kiel:** conceptualization, funding acquisition, investigation, methodology, project administration, supervision, writing – original draft, writing – review & editing

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Data Availability Statement

The data and analytic code necessary to reproduce the analyses presented here are publicly accessible. Data and code are available at the following URL: https://osf.io/jh5d9/?view_only=7fcef9c6604f4ecea098e62b3175ff34. The surveys and observational protocols necessary to attempt to replicate the findings presented here are not publicly accessible. The analyses presented here were not preregistered.

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