DESTINED FOR TROUBLE?: A PROSPECTIVE ANALYSIS OF THE EFFECTS OF TEMPERAMENT AND PARENTING ON CONDUCT PROBLEMS

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DESTINED FOR TROUBLE?: A PROSPECTIVE ANALYSIS OF THE EFFECTS OF TEMPERAMENT AND PARENTING ON CONDUCT PROBLEMS

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ABSTRACT

DESTINED FOR TROUBLE?: A PROSPECTIVE ANALYSIS OF THE EFFECTS OF TEMPERAMENT AND PARENTING ON CONDUCT PROBLEMS

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Researchers have suggested one developmental pathway to conduct problems in childhood from infant irritable temperament eliciting negative parenting behaviors (e.g., Bell, 1968; Paterson & Sanson, 1999; Patterson, 1986, 2002; Rothbart & Bates, 2006). Infants with an irritable temperament have been theorized to evoke more negative and hostile behaviors from parents (Patterson, 2002), and empirical evidence supports this link (e.g., Boivin et al., 2005; Van den Boom et al., 1994). Additional research suggests that negative parenting behaviors, such as inconsistent discipline, predict increases in conduct problems (Lengua & Kovacs, 2005). However, many studies assessing a transactional model of the development of conduct problems suffer limitations, including a lack of a fully prospective design. The present study improves upon previous research by using a fully prospective, sibling comparison design. The comparison of siblings allows for better control of confounding genetic and environmental variables. The present study used a subset of data from a large, nationally representative sample of mothers and
their children. I first hypothesized that infant irritable temperament would predict conduct problems in mid-childhood. Second, I hypothesized that negative parenting practices (e.g., lack of maternal warmth, lack of learning stimulation, and harsh practices) would mediate the association between infant temperament and conduct problems. Finally, I tested this mediation model both between families (i.e., population analyses) and within families (i.e., sibling comparison). Results indicated that maternal responsiveness and learning stimulation mediated the association between infant irritable temperament and conduct problems in between-family, but not within-family, analyses. Harsh parenting was not found to mediate the association between temperament and conduct problems in between- or within-family analyses. However, within families, harsh parenting predicted later conduct problems. Finally, across all models, infant irritable temperament consistently predicted conduct problems. These findings suggest that passive gene-environment correlations or unassessed environmental factors account for the effects of temperament on conduct problems believed to be mediated by parenting.
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CHAPTER I
INTRODUCTION

Irritability and frustration are a part of daily life. Yet these characteristics constitute one aspect of negative emotionality and temperament and can, at their extremes, become problematic. Temperamental irritability has been empirically linked to conduct problems (e.g., Bates & Bayles, 1988). At elevated levels, a child’s externalizing behaviors (i.e., conduct problems, impulse-control difficulties) predict problems in family functioning, peer relationships, academic outcomes, and delinquency (Rothbart & Bates, 2006). Much of the research investigating the sources of conduct problems has focused on biological causes, such as those reflected in temperament, on environmental causes, such as those reflected in parenting, and on the transaction between these two kinds of variables. For example, researchers have proposed that one pathway from irritable temperament to conduct problems is through the elicitation of negative parenting practices (Bell, 1968; Paterson & Sanson, 1999; Patterson, 1986; Rothbart & Bates, 2006). The present study seeks to empirically test this theoretical model.

Temperament

Temperament is generally defined as constitutionally-based individual differences in emotionality and self-regulation (Rothbart & Bates, 1998). However, researchers have varied in their conceptualizations of temperament, with four major theories emerging:
those of Rothbart, Thomas and Chess, Buss and Plomin, and Goldsmith. Commonalities across theories exist, including a focus on infancy for studying temperament because the link between temperament and expressed behavior is the most direct during this time (Goldsmith et al., 1987). Primary areas of contention include the extent and boundaries of the term “temperament,” the boundaries between temperament and personality, and whether the idea of a difficult temperament is valid (Goldsmith et al., 1987). Although each theory has its merits, the present study will focused on Rothbart’s theory of temperament because this theory allows for research addressing the interactions between temperament, social interactions, and social development, and recognizes that one’s expressed temperament affects the behaviors of others (Goldsmith et al., 1987).

According to Rothbart, temperament is relatively stable and primarily biologically based. Specifically, Rothbart conceptualizes temperament in a broader sense than other researchers, in that the definition includes an individual’s behavioral style, his predisposition for certain reactions, and differences in one’s experience of psychophysiological functioning (Goldsmith et al., 1987). Regarding personality, temperament is conceptualized as the basis of personality, with temperament referring more to the attention, affect, and activity level of an individual, and personality referring to a much broader range of characteristics, including thoughts, skills, and beliefs (Rothbart & Bates, 2006). An additional distinction between temperament and personality lies in their etiology: temperament is apparent in infancy, and constitutes the entirety of an infant’s personality; although temperament will remain more stable across time, infants will develop additional aspects of personality (Goldsmith et al., 1987).
Following Rothbart’s approach, temperament can be broken into two distinct aspects of functioning: reactivity (i.e., emotionality) and self-regulation, with the former being further subdivided into negative and positive emotionality (Goldsmith et al., 1987; Lengua & Kovacs, 2005). The present study will focus on a subset of negative emotional traits in an attempt to explain one developmental pathway linking temperament to risk for conduct problems.

**Negative Emotionality**

Rothbart and Bates (2006) divide negative emotionality into four dimensions during infancy – fear, frustration/irritability, sadness, and falling reactivity. They further divide it into seven dimensions during childhood – fear, shyness, frustration/irritability, resistance to control, sadness, soothability, and discomfort. As demonstrated by these various components of negative emotionality, the concept can refer to a variety of temperamental or emotional states. This variation has caused many convoluted and contradicting findings in the literature.

Research findings have been markedly variable, including findings that negative emotionality is correlated with conduct problems, with internalizing problems, with both types of problems (e.g., Bates & Pettit, 2007), or with no problems at all (e.g., Belsky, Hsieh, & Crnic, 1998). For example, negative emotionality interacts with low attention regulation to predict conduct problems (Eisenberg et al., 2000). Additionally, negative emotionality, when paired with high inhibitory control, predicts internalizing problems (Eisenberg et al., 2005). In another study, Belsky, Hsieh, and Crnic (1998) found that negative emotionality was not uniquely related to either conduct or internalizing
problems. In other words, negative emotionality was not related to behavior problems unless considered in conjunction with other factors.

The cause of the discrepancies across studies likely stems in part from the definition of negative emotionality. As previously noted, there are a variety of sub-factors subsumed under the term “negative emotionality”, each with potentially distinctive associations with adjustment and the social environment. Thus, it may be important to break apart the different facets of negative emotionality and study them separately. For example, in reviewing the temperament literature, Bates and Pettit (2007) found that irritable distress is generally associated with conduct problems, whereas fearful distress is more commonly associated with behavioral inhibition, which has been found to be inversely associated with conduct problems. The concept of temperamental irritability, also known as fussiness in infancy, was the focus of the present study.

Temperamental irritability has been linked to a variety of negative outcomes, including conduct problems. Children exhibiting high levels of irritability as early as 3.3 months were most prone to develop psychopathology by age 10 (Thomas, Chess, & Birch, 1968). Further, irritable, frustrated outbursts, such as those demonstrated in the frustration/irritability group of negative emotionality, are primary features of oppositional defiant disorder (ODD; American Psychiatric Association, 2013). This association is especially troubling because children with ODD are at a heightened risk for conduct disorder, which is a strong predictor of adult criminality (APA, 2013). Additionally, there is evidence that anger and frustration are highly related to conduct disorder (Frick & Morris, 2004), which is correlated with, and is a prerequisite for, antisocial personality disorder. However, many factors beyond temperament are associated with risk for
conduct problems in childhood. For young children, another major contributor to risk for conduct problems is parenting.

**Parenting Effects**

The effects of parenting on child adjustment have been demonstrated even in studies that have controlled for the effects of child characteristics (e.g., Ge et al., 1996). Further, the effects of negative parenting behavior on child conduct problems have been demonstrated in genetically informed studies (e.g., Larsson, Viding, Rijsdijk, & Plomin, 2008), indicating that this effect is still significant when genetic confounds are controlled. In other words, the link between parental behavior and child conduct problems remains significant after controlling for any genetically transmitted predispositions toward conduct problems. Such a robust association demonstrates that parenting effects are an important environmental factor to consider when attempting to understand the development of conduct problems.

Similar to temperament, parenting is a heterogeneous construct with a wide range of component dimensions. “Negative” parenting behaviors are associated with an increased risk for conduct problems among children. Aspects of negative parenting which have been previously studied include inconsistent discipline (Lengua & Kovacs, 2005) and hostile reactions (Morris et al., 2002; Rothbaum & Weisz, 1994). The presence of negative parenting and an absence of positive parenting (e.g., a lack of maternal responsiveness) have been demonstrated to predict conduct problems in childhood. For example, Belsky, Hsieh, and Crnic (1998) studied the effects of positive and negative parenting on child behavior. Within their study, positive parenting was defined as the sum of scales assessing sensitivity, positive affect, learning stimulation, and the reverse
score of a detachment scale. Specifically, sensitivity was defined as the extent to which a parent adjusts his or her behavior to meet the needs of the child, and detachment was defined as the extent to which the parent seemed unresponsive to the child. Negative parenting included the sum of scales assessing negative affect and intrusiveness, defined as the extent to which a parent placed his or her agenda upon the child while disregarding the child’s needs. Increased negative and decreased positive maternal parenting was associated with increased conduct problems at 3 years of age, accounting for 8% of the variance in conduct problems (Belsky et al., 1998).

Lorber and Egeland (2011) also studied the effects of negative parenting, demonstrating that negative parenting in infancy predicts child conduct problems in kindergarten. Parental positivity and negativity were assessed by observers when infants were 3 and 6 months old. Positive and negative regard were operationalized as displays of affection and negative affect toward the infant. Lorber and Egeland (2011) demonstrated that higher levels of negativity predicted increases in negative mother-toddler interactions, as assessed in a video-taped laboratory session. Further, this negative interaction in toddlerhood mediated the association between maternal negativity toward the infant and child conduct problems in kindergarten, as assessed by mother and teacher report (Lorber & Egeland, 2011). These results further support the theory that negative parenting behaviors affect child behaviors in such a way as to predict increases in childhood conduct problems.

An important underlying assumption across these studies is that the association is primarily driven by parental behaviors. However, these findings, and the assumption on which they are based, may be misleading. Pettit and Arsiwalla (2008) suggest that parent
effects may have been exaggerated throughout previous research and are not truly as widespread or strong as previously assumed. Rather, it is possible that the various observed parent effects are in part a reflection of parental reactions elicited by child behavior and, therefore, child behavior accounts for part of the association found between parenting and behavioral outcomes (Bell, 1968).

Transactional Models

Patterson’s (1986) coercion model is perhaps the most influential social learning theory of conduct problem development. This model seeks to explain how negative parenting behaviors and child irritable temperament work together to increase risk for conduct problems. Patterson asserts that children’s conduct problems are not inherent, but rather that children’s conduct problems are the product of exposure to parents' ineffective punishment and/or inadvertent reinforcement of aversive child behaviors (Patterson, 1986). Patterson (2002) asserts that in addition to parents influencing risk for conduct problems, children shape parents’ socialization behavior. In this respect, infant temperament, as expressed through a child’s expression of emotion, has the potential to shape a parent’s response, whose action will then shape the social development of the child (Patterson, 2002). For example, due to his or her heightened tendency toward strong negative emotional reactions to disappointment and frustration, a child with an irritable temperament is thought to be more likely than other children to engage in behaviors that evoke harsh discipline, reduced sensitivity, and increased hostility from parents (Patterson, 2002). These parenting behaviors then contribute to future risk for child conduct problems.
Patterson’s theory has been foundational for many studies of children’s influence on negative parenting behaviors. Anderson, Lytton, and Romney (1986) studied the interactions of children with conduct problems with either mothers of other children with conduct problems or mothers of children without conduct problems. The children with conduct problems evoked more negative behaviors from both their own and other mothers. Further, mothers of children with conduct problems demonstrated coercive behaviors only with their own children, showing fewer signs of coercion when interacting with children without conduct problems (Anderson et al., 1986). In a similar study, mothers of children either with or without conduct problems demonstrated differing behaviors, dependent on their child interaction partner (Dumas & LaFreniere, 1993). Mothers of children without conduct problems behaved positively and reciprocally with all of the children, whereas mothers of children with conduct problems only behaved this way with other children. When with their own children, these mothers behaved coercively. Similar patterns were seen in the children, such that children with conduct problems behaved coercively with their own mothers, but not with other mothers (Dumas & LaFreniere, 1993).

These findings suggest that parents are not inherently aggressive or coercive toward their children, but rather that these tendencies may be in part a product of interacting with temperamentally irritable children. Additional studies have found that the effects of parent on child behavior and child on parent behavior tend to be the same in magnitude (Pettit & Arsiwalla, 2008), supporting the theory that children can evoke specific behaviors from parents. These findings, when considered together, suggest that children can evoke reactions and behaviors from parents, and that these parental
behaviors can influence the future behavior of the child, providing a possible mechanism by which irritable temperament is associated with future child conduct problems.

Two additional studies of infants provide further support for the validity of Patterson’s model. Van den Boom and colleagues found that irritable babies provoked more hostile reactions in mothers than did non-irritable infants (1994). Specifically, mothers of irritable infants tended to be more uninvolved with their child throughout the first year of life, demonstrating less physical contact, less responsiveness, and fewer soothing behaviors. These results suggest that early infant temperament was predictive of a pattern of maternal behavior characterized by detachment and a lack of responsiveness that may persist throughout childhood (van den Boom et al., 1994). Boivin and colleagues (2005) also addressed the phenomenon of children’s evocative behavior during infancy. These researchers found that irritable temperament was positively associated with hostile-reactive behavior from parents (Boivin et al., 2005). Although this finding is consistent with the hypothesis that child temperament evokes negative parenting, this study has a serious limitation in that all data were collected concurrently. Thus, it is unclear if temperamental irritability elicited the hostile-reactive behavior from parents, if the reverse were true, or if an unmeasured variable contributed to both.

Lengua and Kovacs (2005) further explored the phenomenon of children’s evocative behaviors in their study of the association between irritable temperament and inconsistent parenting on conduct problems. The researchers conducted a one-year longitudinal study of children ages 8 to 9. They found that child irritability at time 1 was positively associated with inconsistent parenting and conduct problems one year later, at time 2. They also found that inconsistent parenting at time 1 was positively associated
with conduct problems at time 2 (Lengua & Kovacs, 2005). These findings are consistent with the hypotheses that child temperament increases risk for negative parenting, and that negative parenting predicts conduct problems in children. Yet, the study also has important limitations. Primarily, the use of only two time points eliminates the ability to test a mediation model because of the concurrent measurement of parental behavior and temperament at time 1. Furthermore, the study was conducted in middle childhood, which means that child temperament may have been strongly affected by previous child-parent interactions.

There is reason, though, to expect that parenting will mediate the association between infant temperament and later conduct problems. Morrell and Murray (2003) found that negative parenting, expressed as hostile or coercive behavior, mediated the association between emotional dysregulation in infancy and later conduct problems. The researchers assessed emotional and behavioral dysregulation, operationalized as instances of distress and irritability, at 9 months of age. They also observed and rated mother-child interactions at multiple time points between ages 2 months and 5 years. During the age 5 interaction, observers rated various behaviors, including hostility, coercive behavior, and positive parenting. Hostile parenting was operationalized as increased maternal negative affect, decreased maternal acceptance, and increased physical punishment of the child, whereas coercive parenting consisted of maternal critical comments and intrusive behaviors directed toward the child. Finally, parents rated their children on conduct problems and hyperactivity at ages 5 and 8 years. For boys, emotional dysregulation predicted conduct problem symptoms at ages 5 and 8, both directly and indirectly through hostile parenting. Coercive parenting, though, was not a significant mediator. Conversely,
coercive parenting, and not hostile parenting, mediated the association between child emotional dysregulation and conduct problem symptoms for girls (Morrell & Murray, 2003). These results suggest that negative parenting practices should mediate the association between irritable temperament and conduct problems. Morrell and Murray’s (2003) study may be limited by the characteristics of its sample. Specifically, the sample included mothers with depression, but infant temperament was not assessed prior to the onset of maternal depressive symptoms. Therefore, it is possible that the findings do not generalize to mothers without depression. Additionally, this study did not control for passive gene-environment correlations, discussed below, allowing for the possibility that the observed correlations between parenting and infant temperament/behavior may be accounted for by a common genetic influence rather than the evocative effects of child temperament on parenting.

**Sibling Comparison**

An overarching weakness of existing findings studying parenting as a mediator of the irritable temperament-conduct problem link is that they fail to control for possible confounding influences. Previous studies have compared children from different families. As a result, there remain a variety of confounding variables, such as socioeconomic status or family background characteristics, which may account for between-family associations between temperament, parenting, and conduct problems. The presence of such confounding variables makes it difficult to interpret the observed associations because it is unclear if the predictor variable(s) or an unmeasured variable is driving the relationship (Rodgers, Cleveland, van den Oord, & Rowe, 2000). One way to help control for these
effects is through the use of sibling comparison designs, which greatly reduce the number of potential genetic and environmental confounds (Rodgers et al., 2000).

Genetic effects and gene-environment correlations (rGE) may confound associations found between temperament, parenting, and conduct problems. Gene-environment correlations may be passive, active, or evocative. In the context of parent and child effects on child behavior, passive rGE occurs when the correlation between the social environment (e.g., parenting) and child behavior (e.g., conduct problems) reflects the action of common genetics rather than the effects of exposure to the social environment. Thus, the social environment may be spuriously correlated with child behavior, as the child’s genotype would have put him or her at equal risk for the behavioral outcome regardless of his or her exposure to the correlated social environment (Lahey & D’Onofrio, 2010). Active rGE occurs when the correlation between the social environment and child behavior reflects the action of genetic effects that cause the child to choose a specific environment (e.g., peer groups) that places him or her at risk for the behavioral outcome (Lahey & D’Onofrio, 2010). These effects are hypothesized to influence peer group selection, but are less relevant to parent-child relations. Finally, evocative rGE occurs when the correlation between the social environment and child behavior reflects the action of the child’s genetically-influenced behavior on an environment that he or she did not select, such as the parenting environment, but alters it in such a way that exposure to this environment places the child at increased risk for the behavioral outcome (Lahey & D’Onofrio, 2010). Evocative rGE effects are consistent with Patterson’s (1986) model, the basic tenet of which is that children’s temperament
elicits a change in their social environment, which, as suggested by Lengua and Kovacs (2005), increases risk for conduct problems.

Traditionally, sibling comparison designs have been used to control for confounding genetic and environmental influences on the link between a risk factor and an outcome variable. This design automatically eliminates any environmental confounds that are shared by siblings, such as parental history of delinquency and parental education level. Such a design also completely eliminates the effects of passive rGE because parental genes are randomly distributed between offspring (Lahey & D’Onofrio, 2010) and thus cannot be passively correlated with variations in the social environment of siblings. This design does not, however, eliminate active and evocative rGE, as it is possible that genetic differences between siblings could lead to differences in child characteristics that subsequently shape the social environment in some way. Yet, this inclusion of active and evocative rGE becomes a strength when studying the effects of temperament on parenting. In such a study as the present one, the goal is to examine these evocative effects; the differences in experience stemming from the child’s temperament become the focus, rather than a hindrance, of the research.

The use of a sibling comparison design allows for an examination of the effects of infant temperament on parenting, while better controlling for family background characteristics that could confound associations between temperament, parenting, and conduct problems. The sibling comparison design is still not as strong as experimental designs, as it does not eliminate the effects of environmental confounds that are simultaneously correlated with sibling differences in temperament, sibling differences in parenting (Lahey & D’Onofrio, 2010), and sibling differences in conduct problems.
Nonetheless, it does allow for a significant reduction in the amount of confounding variables and alternate explanations (Lahey & D’Onofrio, 2010).

**The Present Study**

Thus far, researchers have tended to agree that both child temperament and parenting practices contribute to risk for childhood conduct problems. Yet, in consideration of methodological limitations in previous studies, it remains unclear to what extent associations between temperament, parenting, and conduct problems reflect a transactional process in which parenting acts as a mediator between irritable temperament and conduct problems. Those studies which have looked at the transaction between temperamental irritability and parenting, and then extended this association to its effects on conduct problems, have failed to use both prospective measures and three time points. Regarding the former, previous studies have asked parents to assess child temperament retrospectively, which means that the data could be affected by current beliefs, and/or concurrently with measures of parenting, which can confound responses on these two scales. To address these limitation, the present study used fully prospective data. This prospective methodology more rigorously tested the transactional hypothesis by establishing directionality of effects among temperament, parenting, and conduct problems. Further, the use of fully prospective data helped decrease the risk of confounding retrospective maternal perceptions of temperament with current parenting practices.

As the research reviewed above demonstrates, irritable temperament has been found to have an effect on later conduct problems, as well as on parenting. Further, parenting practices do appear to affect child conduct problems, though some authors have
argued that this is not as robust an effect as previously thought (e.g., Pettit & Arsiwalla, 2008). Consistent with Patterson’s (1986) model, the present study predicted that negative parenting practices would mediate the association between infant irritable temperament and later conduct problems. The present study expanded on Lengua and Kovacs (2005) by examining effects in a younger age cohort and adding a third data collection point, which allowed for a fully prospective test of mediation. The longitudinal design of the present study also expanded on Boivin and colleagues (2005) by establishing directionality in the association between infant temperament and parenting practices. Finally, the present study used a sibling comparison design. This allowed for an examination of the effects of temperament on parenting, and of parenting on conduct problems, while controlling for the potential confounds of family background characteristics that may not be fully controlled when comparing children from different families. Therefore, the present study sought to address the methodological issues of retrospective measures, too few time points, and genetic and environmental confounds to provide further evidence for a mediated developmental pathway linking irritable temperament to conduct problems in childhood.

The hypotheses for the current study, which was tested both between and within families, are as follows:

1. Infant irritable temperament, assessed between 0 and 23 months of age, will predict future conduct problems, assessed at ages 5 and 6, before considering parenting behavior (Not shown in figure).
2. Infant irritable temperament will predict negative parenting behaviors (i.e., decreases in maternal responsiveness and learning stimulation, and increases in spanking/restraint) assessed at child age 3 and 4 (Path A).

3. Negative parenting behaviors will predict future conduct problems (Path B).

4. Negative parenting behaviors will partially mediate the association between infant irritable temperament and conduct problems (Path A*B).

A visual representation of the pathway can be seen below.

![Figure 1. Mediation model for the development of conduct problems.](image)

The hypotheses were tested both within (i.e., sibling comparison) and between families. If the between-family and within-family analyses are consistent in providing evidence for mediation of the temperament effect, it could be concluded that the effect is robust to confounding by genetic and unmeasured environmental factors. If the mediation is significant between families but not within, then it is likely that either genetic or shared environmental influences confound the mediation effect found between families.
CHAPTER II

METHOD

Participants

The study used data previously collected from the Children of the National Longitudinal Survey of Youth data set (CNLSY; Chase-Lansdale, Mott, Brooks-Gunn, & Phillips, 1991). This study consisted of the 11,508 children of women who participated in the National Longitudinal Survey of Youth, 1979 (NLSY79), funded by the Bureau of Labor Statistics. The original participants of the NLSY79 (the mothers) come from across the country and include representation from major ethnic groups. With the use of sampling weights, the NLSY79 sample is representative of the U.S. population. In the present study, 19.2% of the participants were Hispanic, 27.7% African American, and 53% white, non-Hispanic; 51% male. The average annual household income (in 1986 dollars) was $32,386, ranging from $14 to $977,585.

Measures

Infant Behavior Questionnaire. Infant temperament was assessed using the CNLSY measure of infant temperament, which is based on a subset of items from the Infant Behavior Questionnaire (Rothbart, 1981). This scale was completed by parents when children were 0-23 months old. The scale consisted of items assessed on a 5-point Likert scale: almost never, less than half the time, half the time, more than half the time,
almost always. These items assess five areas of infant temperament: activity level, positive affect, fearfulness, fussiness, and predictability of cycles and moods. The fussiness scale, which is designed to measure irritability, was used in the present study. It includes the three following items: often fussy or irritable; trouble soothing infant when crying or upset; often cries or fusses compared to most babies. Cronbach’s alpha coefficient was modest at 0.60.

**Home Observation for Measurement of the Environment – Short Form (HOME – SF).** Parenting was assessed at 3-4 years old using the Infant/Toddler Short Form of the HOME-SF (Caldwell & Bradley, 1984). The HOME-SF consists of maternal and observer ratings of the mother’s parenting and physical home environment. The Infant/Toddler HOME-SF consists of three factors: maternal responsiveness, learning stimulation, and spanking/restraint.

Confirmatory factor analysis was used to test a three-dimensional structure of the HOME-SF parenting items because previous studies using this structure (i.e., Lahey et al., 2008) had conducted their study with a slightly different age range. The recommended three-factor model of parenting items fit significantly better than the next best-fitting two-factor model (difference $\chi^2 = 368.29$, $df = 7$, $p < .001$). Fit indices for the three-factor model indicated adequate fit (comparative fit index = 0.92, root mean square error of approximation = 0.04). These three parenting dimensions were: maternal responsiveness (interviewer rating of mother speaking to child at least 2 times; interviewer rating of mother responding verbally to child’s speech; interviewer rating of mother kissing, hugging, or caressing child), learning stimulation (maternal report of the child going out often; maternal report of the number of books the child has; maternal
report of how often she reads to the child; maternal report of how often the child goes to the museum; maternal report that the child has a record player), and spanking/restraint (maternal report that she spanked the child at least twice in the past week; interviewer report that the mother slapped or spanked the child at least once during assessment; interviewer report that the mother physically restrained the child during assessment). All of these measures can be found in the HOMES-SF (Bradley, Corwyn, McAdoo, & Coll, 2001). The Cronbach’s alpha coefficients are: maternal responsiveness = 0.54; learning stimulation = 0.60; and spanking/restraint = 0.39. The low alpha value of spanking/restraint could in part be due to the low frequency of this behavior, making it less likely to have been observed by an interviewer and thereby affecting the reliability of the measure.

**Behavior Problems Inventory.** Conduct problems were assessed using the mother reported Behavior Problem Index (BPI; Peterson & Zill, 1986) when the child was between 5 and 6 years old. The conduct problems subscale, which consists of seven 3-point Likert scale items (never, sometimes, frequently), was used. The items are: breaks own or other’s things on purpose; not sorry after misbehaving; cheats or tells lies; bullies or is cruel/mean to others; has trouble getting along with teachers; is disobedient at school; and is disobedient at home. The Cronbach’s alpha for the conduct problem items assessed at age 5 and 6 was 0.71.

**Family and child-specific covariates.** Analyses included several demographic and family covariates that might confound the associations between temperament, parenting, and conduct problems. Family covariates included: maternal delinquency, maternal intelligence, family income in 1986 adjusted for inflation, and mother’s race-
ethnicity, coded as Hispanic, African American, or non-African American/non-Hispanic. Child-specific covariates included: child sex, CNLSY siblings’ birth order, and maternal age at the birth of each child. Mothers’ intelligence was assessed in 1980 using the Armed Services Vocational Aptitude Battery of intellectual assessments. Maternal delinquency was assessed between ages 15 and 22 using 12 items from the Self-Reported Delinquency (SRD) interview (Elliot & Huizinga, 1983).
CHAPTER III
RESULTS

The hypotheses were tested using multilevel path analysis in Mplus. Maternal responsiveness, learning stimulation, and harsh parenting (i.e., spanking/restraint) were tested in separate models. Further, the models estimated the within-family (sibling comparison) and between-family (population estimates) effects simultaneously. Sampling weights were used so that estimates from analyses could be generalized to the original nationally-representative NLSY79 sample. Missing data were addressed using full information maximum likelihood (FIML) estimation. FIML estimation allows for inclusion of all participant data, whether complete or partial, and produces less biased estimates than those produced when using listwise deletion (Shafer & Graham, 2002).

Preliminary Analysis

The means, standard deviations, and ranges of all variables are summarized in Table 1.
Table 1

Means, Standard Deviations (in parentheses), and Ranges for Demographic Variables, Infant Temperament, Parenting, and Conduct Problems

<table>
<thead>
<tr>
<th>Variable</th>
<th>M (SD)</th>
<th>Minimum</th>
<th>Maximum</th>
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</thead>
<tbody>
<tr>
<td>Conduct problems</td>
<td>0.33 (0.33)</td>
<td>0.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Irritability</td>
<td>0.00 (1.00)</td>
<td>-1.59</td>
<td>4.41</td>
</tr>
<tr>
<td>Maternal responsiveness</td>
<td>0.81 (0.27)</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Learning stimulation</td>
<td>0.71 (0.28)</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Harsh parenting</td>
<td>0.26 (0.30)</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Maternal delinquency</td>
<td>0.00 (1.46)</td>
<td>-1.50</td>
<td>9.00</td>
</tr>
<tr>
<td>Maternal IQ</td>
<td>36.63 (27.31)</td>
<td>1.00</td>
<td>99.00</td>
</tr>
<tr>
<td>Hispanic(a)</td>
<td>0.19 (0.39)</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>African American(a)</td>
<td>0.28 (0.45)</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Family income</td>
<td>32,386.88 (74,520.63)</td>
<td>13.93</td>
<td>977,585.31</td>
</tr>
<tr>
<td>Birth order</td>
<td>1.96 (1.15)</td>
<td>1.00</td>
<td>11.00</td>
</tr>
<tr>
<td>Sex(b)</td>
<td>0.49 (0.50)</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Maternal age(c)</td>
<td>25.21 (5.94)</td>
<td>10.00</td>
<td>50.00</td>
</tr>
</tbody>
</table>

\(a\)Hispanic Americans and African Americans assessed in comparison to European Americans. \(b\)Sex: 0 = male, 1 = female. \(c\)Maternal age is maternal age at birth of each child.

Preliminary analyses were conducted to assess for possible confounding variables. Child birth order, child sex, maternal age at childbirth, maternal IQ, family income, race, and maternal delinquency were identified as potential confounding variables based on their potential associations with parenting and child conduct problems. Zero-order correlations were calculated between these variables and child temperament, child conduct problems, and the parenting variables. Results, summarized in Table 2, support the potential confounding effects of the identified demographic variables. Therefore, these variables were controlled for in path model analyses.
Table 2

Zero-order Correlations among Measures of Mother-rated Conduct Problems at 5-6 Years, Mother-rated Irritability at 0-23 Months, Parenting Variables, and Demographic Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conduct problems</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Irritability</td>
<td>0.14*</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. MR</td>
<td>-0.10*</td>
<td>-0.12*</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Learning stimulation</td>
<td>-0.19*</td>
<td>-0.17*</td>
<td>0.24*</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Harsh parenting</td>
<td>0.07*</td>
<td>0.09*</td>
<td>-0.06*</td>
<td>-0.11*</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Maternal delinquency</td>
<td>0.08*</td>
<td>0.05*</td>
<td>-0.06*</td>
<td>-0.04*</td>
<td>0.03</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Maternal IQ</td>
<td>-0.09*</td>
<td>-0.20*</td>
<td>0.23*</td>
<td>0.43*</td>
<td>-0.09*</td>
<td>-0.09*</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Hispanic&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.01</td>
<td>-0.01</td>
<td>-0.01</td>
<td>-0.16*</td>
<td>-0.02</td>
<td>-0.07*</td>
<td>-0.21*</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. African American&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.05*</td>
<td>0.18*</td>
<td>-0.16*</td>
<td>-0.23*</td>
<td>0.07*</td>
<td>0.05*</td>
<td>-0.36*</td>
<td>-0.30*</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Family income</td>
<td>-0.06*</td>
<td>-0.07*</td>
<td>0.08*</td>
<td>0.15*</td>
<td>-0.05*</td>
<td>-0.04*</td>
<td>0.21*</td>
<td>-0.02</td>
<td>-0.09*</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Birth order</td>
<td>0.04*</td>
<td>0.08*</td>
<td>-0.04*</td>
<td>-0.18*</td>
<td>-0.07*</td>
<td>0.00</td>
<td>-0.14*</td>
<td>0.08*</td>
<td>0.07*</td>
<td>-0.11*</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Sex&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-0.11*</td>
<td>-0.03†</td>
<td>-0.00</td>
<td>0.04*</td>
<td>-0.02</td>
<td>0.00</td>
<td>-0.02</td>
<td>-0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>13. Maternal age&lt;sup&gt;c&lt;/sup&gt;</td>
<td>-0.03*</td>
<td>-0.09*</td>
<td>0.23*</td>
<td>0.25*</td>
<td>-0.34*</td>
<td>-0.06*</td>
<td>0.27*</td>
<td>0.02†</td>
<td>-0.11*</td>
<td>0.22*</td>
<td>0.39*</td>
<td>-0.01</td>
<td>--</td>
</tr>
</tbody>
</table>

*Note. MR = maternal responsiveness.

<sup>a</sup>Hispanic Americans and African Americans assessed in comparison to European Americans. <sup>b</sup>Sex: 0 = male, 1 = female. <sup>c</sup>Maternal age is maternal age at birth of each child.

†<i>p < .05</i>, *<i>p < .01</i>
Results of Path Models

Maternal responsiveness. The results for the multivariate model in which maternal responsiveness was tested as a mediator of the association between infant irritability and conduct problems yielded varying results. In between-family comparisons, infant irritable temperament predicted later conduct problems, $b = 0.04, p < .001$, and predicted later maternal responsiveness, $b = -0.02, p < .01$. Further, maternal responsiveness predicted later conduct problems, $b = -0.09, p < .01$. A test of the indirect effect indicated that maternal responsiveness significantly mediated the association between infant irritable temperament and later conduct problems, $b = 0.002, p < .05$. For standardized coefficients, see Table 3.

In within-family comparisons, infant irritability predicted higher levels of later conduct problems, $b = 0.27, p < .01$, and predicted lower levels of maternal responsiveness, $b = -0.02, p = 0.05$. The association between maternal responsiveness and conduct problems, however, was non-significant, $b = -0.04, p = 0.36$. Finally, maternal responsiveness did not significantly mediate the association between infant irritability and later conduct problems, $b = 0.001, p = 0.42$. For standardized coefficients, see Table 3.
Table 3

Standardized Estimates of Linear Associations between Irritability, Maternal Responsiveness, and Conduct Problems in the Population (top) and in Within-Family Sibling Comparisons (below) Conducted in the Full Sample

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Predicting maternal responsiveness</th>
<th>Predicting conduct problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta$ (SE) $z$</td>
<td>$\beta$ (SE) $z$</td>
</tr>
<tr>
<td>Estimated associations between families (population estimates)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td>-0.09 (0.03) -3.13**</td>
<td>0.23 (0.04) 5.38***</td>
</tr>
<tr>
<td>Parental responsiveness</td>
<td>-0.15 (0.05) -3.25***</td>
<td></td>
</tr>
<tr>
<td>Maternal delinquency</td>
<td>-0.03 (0.02) -1.09</td>
<td>0.15 (0.04) 3.78***</td>
</tr>
<tr>
<td>Maternal IQ</td>
<td>0.18 (0.02) 7.25***</td>
<td>-0.04 (0.05) -0.79</td>
</tr>
<tr>
<td>Hispanica</td>
<td>-0.02 (0.02) -1.38</td>
<td>0.00 (0.03) 0.13</td>
</tr>
<tr>
<td>African Americanb</td>
<td>-0.09 (0.02) -3.94***</td>
<td>0.01 (0.03) 0.27</td>
</tr>
<tr>
<td>Family income</td>
<td>0.05 (0.02) 2.19*</td>
<td>-0.16 (0.04) -3.89***</td>
</tr>
<tr>
<td>Estimated associations within families (sibling-comparison)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td>-0.06 (0.03) -1.96*</td>
<td>0.05 (0.02) 2.67**</td>
</tr>
<tr>
<td>Parental responsiveness</td>
<td>-0.02 (0.02) -0.92</td>
<td></td>
</tr>
<tr>
<td>Birth order</td>
<td>0.07 (0.02) 4.18***</td>
<td>0.01 (0.02) 0.60</td>
</tr>
<tr>
<td>Sexb</td>
<td>-0.00 (0.02) -0.19</td>
<td>-0.11 (0.02) -7.47***</td>
</tr>
<tr>
<td>Maternal agec</td>
<td>0.05 (.01) 4.12***</td>
<td>0.02 (.02) 0.77</td>
</tr>
</tbody>
</table>

*Hispanic Americans and African Americans assessed in comparison to European Americans. bSex: 0 = male, 1 = female. cMaternal age is maternal age at the birth of each child.

*p $\leq .05$ **p $\leq .01$ ***p $\leq .001$

**Learning stimulation.** The results for the multivariate model in which learning stimulation was tested as a mediator of the association between infant irritability and later conduct problems were varied. At the between-family level, infant irritability predicted later conduct problems, $b = 0.04, p < .001$. Infant irritability also predicted learning stimulation, $b = -0.03, p < .001$. Further, learning stimulation predicted later conduct problems, $b = -0.22, p < .001$. A test of the indirect effect indicated that learning stimulation mediated the association between infant irritability and conduct problems, $b = 0.01, p < .001$. For standardized coefficients, see Table 4.
At the within-family level, infant irritability predicted later conduct problems, $b = 0.03$, $p < .01$, but did not significantly predict learning stimulation, $b = 0.01$, $p = 0.19$. Further, the association between learning stimulation and conduct problems was not significant, $b = -0.02$, $p = 0.76$. The test of the hypothesized mediation effect was not significant, $b = 0.00$, $p = 0.76$. For standardized coefficients, see Table 4.

### Table 4

*Standardized Estimates of Linear Associations between Irritability, Learning Stimulation, and Conduct Problems in the Population (top) and in Within-Family Sibling Comparisons (below) Conducted in the Full Sample*

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>Predicting learning stimulation $\beta$ (SE)</th>
<th>z</th>
<th>Predicting conduct problems $\beta$ (SE)</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Estimated associations between families (population estimates)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td>-0.10 (0.02)</td>
<td>-4.53***</td>
<td>0.21 (0.04)</td>
<td>5.21***</td>
</tr>
<tr>
<td>Learning stimulation</td>
<td></td>
<td></td>
<td>-0.33 (0.04)</td>
<td>-8.88***</td>
</tr>
<tr>
<td>Maternal delinquency</td>
<td>-0.00 (0.02)</td>
<td>-0.07</td>
<td>0.15 (0.04)</td>
<td>3.82***</td>
</tr>
<tr>
<td>Maternal IQ</td>
<td>0.27 (0.02)</td>
<td>12.47***</td>
<td>0.03 (0.05)</td>
<td>0.64</td>
</tr>
<tr>
<td>Hispanic$^a$</td>
<td>-0.13 (0.02)</td>
<td>-8.33***</td>
<td>-0.04 (0.03)</td>
<td>-1.46</td>
</tr>
<tr>
<td>African American$^a$</td>
<td>-0.15 (0.02)</td>
<td>-7.69***</td>
<td>-0.03 (0.03)</td>
<td>-0.83</td>
</tr>
<tr>
<td>Family income</td>
<td>0.16 (0.02)</td>
<td>7.48***</td>
<td>-0.13 (0.04)</td>
<td>-3.17**</td>
</tr>
<tr>
<td><strong>Estimated associations within families (sibling comparison)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td>0.03 (0.03)</td>
<td>1.32</td>
<td>0.05 (0.02)</td>
<td>2.69**</td>
</tr>
<tr>
<td>Learning stimulation</td>
<td></td>
<td></td>
<td>-0.01 (0.02)</td>
<td>-0.31</td>
</tr>
<tr>
<td>Birth order</td>
<td>0.05 (0.02)</td>
<td>3.13**</td>
<td>-0.01 (0.02)</td>
<td>-0.52</td>
</tr>
<tr>
<td>Sex</td>
<td>0.06 (0.02)</td>
<td>3.58***</td>
<td>-0.11 (0.02)</td>
<td>-7.38***</td>
</tr>
<tr>
<td>Maternal age$^c$</td>
<td>0.05 (0.01)</td>
<td>4.51***</td>
<td>0.04 (0.02)</td>
<td>1.70</td>
</tr>
</tbody>
</table>

$^a$Hispanic Americans and African Americans assessed in comparison to European Americans. $^b$Sex: 0 = male, 1 = female. $^c$Maternal age is maternal age at birth of each child.

* $p \leq .05$ ** $p \leq .01$ *** $p \leq .001$

**Harsh parenting.** The results for the multivariate model in which harsh parenting was tested as a mediator of the association between infant irritability and later conduct
problems were varied. At the between-family level, infant irritable temperament predicted increased levels of both conduct problems, \( b = 0.39, p < .001 \), and harsh parenting, \( b = 0.03, p < .001 \). Further, harsh parenting predicted conduct problems, \( b = 0.05, p < .05 \). However, the hypothesized mediation was not significant, \( b = 0.001, p = 0.08 \). For standardized coefficients, see Table 5.

At the within-family level, infant irritability predicted later conduct problems, \( b = 0.03, p < .05 \). However, the association between irritability and harsh parenting was not significant, \( b = 0.00, p = 0.61 \). Further, harsh parenting predicted later conduct problems, \( b = 0.08, p < .01 \). The test of the indirect effect indicated that the hypothesized mediation was not significant, \( b = 0.00, p = 0.62 \). For standardized coefficients, see Table 5.
Table 5

*Standardized Estimates of Linear Associations between Irritability, Harsh Parenting, and Conduct Problems in the Population (top) and in Within-Family Sibling Comparisons (below) Conducted in the Full Sample*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Predicting harsh parenting</th>
<th>Predicting conduct problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β (SE)</td>
<td>z</td>
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<tr>
<td>Estimated associations between families (population estimates)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td>0.10 (0.03)</td>
<td>3.92***</td>
</tr>
<tr>
<td>Harsh parenting</td>
<td>-0.00 (0.02)</td>
<td>-0.16</td>
</tr>
<tr>
<td>Maternal delinquency</td>
<td>-0.07 (0.03)</td>
<td>-2.51*</td>
</tr>
<tr>
<td>Maternal IQ</td>
<td>-0.01 (0.02)</td>
<td>-0.63</td>
</tr>
<tr>
<td>Hispanic*</td>
<td>0.02 (0.02)</td>
<td>1.08</td>
</tr>
<tr>
<td>African American*</td>
<td>-0.07 (0.02)</td>
<td>-2.80**</td>
</tr>
<tr>
<td>Family income</td>
<td>-0.07 (0.02)</td>
<td>-2.80**</td>
</tr>
<tr>
<td>Estimated associations within families (sibling comparison)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td>0.01 (0.03)</td>
<td>0.51</td>
</tr>
<tr>
<td>Harsh Parenting</td>
<td>-0.12 (0.02)</td>
<td>-7.85***</td>
</tr>
<tr>
<td>Birth order</td>
<td>-0.02 (0.02)</td>
<td>-1.41</td>
</tr>
<tr>
<td>Sex*b</td>
<td>-0.11 (0.01)</td>
<td>-9.12***</td>
</tr>
</tbody>
</table>

*Hispanic Americans and African Americans assessed in comparison to European Americans. bSex: 0 = male, 1 = female. cMaternal age is maternal age at birth of each child.

*p ≤ .05 **p ≤ .01 ***p ≤ .001
CHAPTER IV
DISCUSSION

The goal of this study was to improve upon previous research (e.g., Boivin et al., 2005; Lengua & Kovacs, 2005) in testing the hypothesized mediating effects of parenting on the link between irritable temperament and risk for conduct problems. Specifically, this study used a fully prospective design and sibling comparisons, allowing for better control of confounding genetic and environmental influences as compared to previous studies. Between families, maternal responsiveness and learning stimulation each mediated the association between infant irritability and later conduct problems, whereas harsh parenting did not. Within families, no mediational processes were significant. These results suggest that mediation effects found in between-family analyses may be confounded by unmeasured family background characteristics that simultaneously contribute to irritable temperament, parenting, and child conduct problems.

In the between-family (i.e., population) analysis, infant irritable temperament predicted both a lower level of maternal responsiveness and a higher level of later conduct problems. Further, maternal responsiveness mediated the association between infant irritable temperament and later conduct problems. However, when siblings in the same family were compared, more irritable siblings still evoked lower levels of responsiveness from parents, but siblings who received lower levels of responsiveness
did not show higher levels of conduct problems. These results suggest the presence of an evocative effect of temperament on parenting, in that infant irritability does appear to predict reduced responsiveness in mothers, even after controlling for family background characteristics that siblings share in common. The finding of a within-family association between irritable temperament and maternal responsiveness is consistent with Patterson’s model, in that an irritable child is likely to evoke negative parenting behaviors (Patterson, 1986). This finding is also consistent with Van den Boom and colleagues’ (1994) findings that mothers of infants with irritable temperaments tend to show lower amounts of physical affection and responsiveness. However, the non-significant within-family effect of maternal responsiveness on conduct problems and non-significant mediation effect suggest that parental responsiveness does not account for the link between irritable temperament and risk for conduct problems. Rather, the within-family analyses provided evidence that temperament has a direct effect on later risk for conduct problems.

Regarding learning stimulation, a significant mediation effect was found between families, such that learning stimulation mediated the association between irritability and conduct problems. Further, infant irritable temperament predicted both conduct problems and learning stimulation. Learning stimulation also predicted levels of conduct problems, such that children receiving high levels of learning stimulation showed lower levels of conduct problems. These findings would suggest that infants with more irritable temperaments would receive lower levels of learning stimulation and, through this, show higher levels of conduct problems. However, when siblings in the same family were compared, the mediation effect was completely eliminated, and neither the association between temperament and learning stimulation nor the association between learning
stimulation and conduct problems were significant. These results suggest that family background characteristics may account for variation in both irritability and learning stimulation, failing to provide evidence for a causal, evocative effect on learning stimulation.

Finally, harsh parenting was not found to significantly mediate the association between infant irritability and conduct problems in either the between-family or sibling comparison analyses. However, in between-family analyses infant irritable temperament predicted harsh parenting and harsh parenting predicted conduct problems. When siblings were compared, infant irritable temperament did not predict harsh parenting. These findings are inconsistent with the evocative role of an irritable temperament previously demonstrated by Boivin and colleagues (2005), Lengua and Kovacs (2005), and Morris and Murray (2003). Instead, these findings suggest that passive gene-environment correlations or family-level environmental risk factors account for significant variation in this association. For example, it is possible that irritable parents are more likely to be harsh and to pass on genes linked to irritability in their offspring. Notably, however, sibling comparisons showed that harsh parenting was significantly associated with later conduct problems, suggesting that harsh parenting has a negative effect on child behavior that is not confounded by family background characteristics. Thus, although the lack of an evocative effect contradicts some previous research, the negative effects of harsh parenting confirm previous findings. These results support the findings from Morrell and Murray (2003) that hostile parenting is predictive of later conduct problems. They also are consistent with Lengua and Kovacs’s (2005) finding that inconsistent discipline
practices are predictive of later conduct problems, although the present study assessed harsh, rather than inconsistent, methods of discipline.

Overall, the results of this study lend some support to an evocative model, such as Patterson’s coercion theory (1986) in that, for some parenting behaviors, infant temperament did predict differences in parenting. However, differences in parenting were not found to account for the effects of temperament on later risk for conduct problems. Rather, temperament was found to have a significant direct effect on later conduct problems. The results also suggest that genetic and environmental family background characteristics account for some of the evocative effects demonstrated in previous studies, especially those regarding the effects of infant irritable temperament on harsh parenting practices. The results also suggest that some parenting effects, such as the effects of learning stimulation and maternal responsiveness on conduct problems, may also be explained by family background characteristics. These results qualify previous findings. Belsky and colleagues (1998) suggested that lower level of positive parenting (which included responsiveness) were associated with increases in later conduct problems. The current findings might suggest that Belsky’s results were confounded by family background characteristics, and that the effect would have decreased or even disappeared had those influences been controlled. Notably, however, Belsky’s measure of positive parenting included maternal responsiveness in addition to learning stimulation, positive affect, and the inverse of detachment (1998). Given this composite variable, it is possible that the significant association between a lack of positive parenting and increases in conduct problems was actually driven by one of the other variables considered in positive parenting. When controlling for genetic and environmental confounds, some
parental actions may no longer have a predictive effect, but others may still be influential. As measures of parenting can encompass a wide variety of behaviors, caution should be used when generalizing results.

**Strengths**

As previously noted, the sibling comparison design and use of prospective measures strengthen this study. The sibling comparison allowed for greater control of genetic and environmental confounds, including the effects of genetics that are passively associated with parenting. Another particular strength of this study relates to the data set used. The CNLSY is a nationally representative data set with 11,508 participants. The large number of participants provides ample statistical power to detect even small effects. Further, the representative nature of this data set increases its external validity, such that the findings of this study can be generalized to the greater U.S. population.

The data used in the present study were collected primarily through two forms: parent ratings and observer recordings. The use of two informants in the measure of parenting variables reduced potential bias introduced by relying on the same reporter for multiple measures. These reports may be more ecologically valid and less likely to be influenced by social desirability effects, as would be the concern if they were based solely on self-report.

Another strength of the study related to the timing of the assessment of temperament. The CNLSY included measures of infant temperament administered when offspring were between 0 and 23 months old. This age of measurement is consistent with Patterson’s coercion model, in which he suggests that infant temperament, specifically
infant irritable temperament, is most likely to evoke negative parenting in early childhood (Patterson, 2002).

**Limitations**

Although this study is strengthened by the controls offered by the sibling comparison, fully prospective design, this study also has several limitations. Specifically, this study is still correlational in nature. Therefore, although the study lends more support toward causal conclusions than a between-family, cross-sectional study would, it is still not possible to draw truly causal conclusions. The findings from the sibling comparison models are susceptible to confounding by factors that differentiate siblings and are associated with temperament, parenting, and conduct problems.

The data set, while having many strengths, also limited this study, especially regarding the level of nuance and detail available in the measurement of key variables of interest. A data set as large as the CNLSY relies on a considerable amount of work from those collecting data and, due to the amount of time it takes to collect data, the measures tend to be brief. Therefore, although the CNLSY includes many measures of various parenting behaviors, the measures lacked detail and did not show high levels of reliability. For example, in the present study, infant irritable temperament, maternal responsiveness, and harsh parenting were each assessed using only three items. Although the problems with measurement did not preclude finding significant associations, a more detailed measure of infant temperament and parenting may have resulted in larger and more robust associations.

The measures also pose another limitation of the study in that infant temperament, part of the parenting behaviors, and childhood conduct problems were assessed through
maternal report. Therefore, the possibility exists that shared method variance accounts for some of the findings in the present study. Future studies would benefit from using either different informants for each measure or a combination of report and observation, as was done in the assessment of parenting behaviors.

Finally, the Cronbach’s alpha for spanking/restraint was especially low. This is possibly because spanking is a fairly rare behavior and thus it may not have been observed in home visits, even when it was reported to occur by the mother. Nonetheless, the low amount of spanking demonstrated could yield floor effects (Lahey et al., 2008). In the present study, harsh parenting definitions included maternal report of having spanked her child at least twice in the past week. This definition could have been expanded to include having spanked the child at all in the time range. However, the negative effects of spanking have been demonstrated to be a function of the extent of its use. In a study of the children of twins who experienced different discipline styles, Lynch and colleagues (2010) differentiated between milder forms of punishment, consisting of scolding, isolation, removing privileges, administering a fine, slapping, or spanking; and harsh physical punishment, consisting of using a weapon, punching, or kicking a child. The researchers found that harsh physical discipline, but not mild physical discipline, was associated with elevated risk for conduct problems after controlling for genetic confounds. This suggests that using a broad definition of harsh parenting (e.g., any corporal punishment) may under- or overestimate the negative effects of physical discipline.

The data set used in the present study focused on maternal report and maternal behavior. Future studies would benefit from including paternal ratings and behaviors as
well, as fathers play an important role in socializing children (Boivin et al., 2005). The inclusion of paternal ratings and observations of paternal behavior would allow for a more comprehensive understanding of the child’s social environment, the child’s effects on parenting behaviors, and parenting effects on child conduct problems. Including two reporters would also provide an opportunity to reduce or eliminate bias in estimates due to shared method variance.

The present study also examined only a limited number of parenting variables. Future studies should explore other aspects of parenting, such as inconsistent, rather than harsh, parenting. Previous studies have suggested that inconsistent parenting has a unique effect on the risk of child conduct problems (e.g., Lengua & Kovacs, 2005), an effect which is lost when studying only the intensity of punishment. Additionally, the effects of the identified parenting variables on the development of conduct problems are relatively small. Therefore, future studies of parenting effects on conduct problems would benefit from including a wider range of parenting behaviors.

**Implications**

Even with the limitations previously listed, the present study found evidence for evocative effects of infant irritable temperament on parenting, effects of parenting on conduct problems, and direct effects of temperament on conduct problems. That some of the effects found in between-family analyses disappeared in within-family analyses indicates that genetic and environmental effects must be controlled in studies evaluating putative environmental influences on child conduct problems. Genetically informed designs including not only sibling comparisons, but also designs including twins, cousins,
and full and half siblings would help clarify how much of a role genetics play in the development of conduct problems.

The present study also suggests that some interventions may be more effective than others for preventing the development of conduct problems. Effective interventions include working with parents to be more responsive, consistent, and nonphysical in their disciplinary interactions with their young children. Although many studies support the efficacy of parent-training interventions for reducing and preventing conduct problems (e.g., Lougheed, Hollenstein, Lichtwarck-Aschoff, & Granic, 2015; Snyder et al., 2003), the results of the present study suggest that this approach may not reduce the risk for conduct problems attributable to child irritable temperament. Therefore, addressing harsh parenting practices would reduce, but not eliminate, the risk of conduct problems.

The present study used a quasi-experimental, sibling comparison design to examine the role of an irritable temperament and parenting behaviors in the development of conduct problems. The study demonstrated that maternal responsiveness and learning stimulation mediated the association between irritable temperament and conduct problems between families but not within, whereas harsh parenting did not mediate the association between temperament and conduct problems either between or within families. These results suggest that the effects of these variables may in part be attributable to genetic or family background variables. Nonetheless, results from sibling comparisons provided evidence that temperament evokes some negative parenting behaviors, and that harsh parenting and temperament increase the risk for conduct problems in childhood. These results have various implications for future research and
clinical practice, including highlighting the importance of focusing intervention on reducing harsh parenting behaviors.
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