Angry Responses to Infant Challenges: Parent, Marital, and Child Genetic Factors Associated With Harsh Parenting

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This study examined genetic and environmental influences on harsh parenting of adopted 9-month-olds (N = 503), with an emphasis on positive child-, parent-, and family-level characteristics. Evocative gene–environment correlation (rGE) was examined by testing the effect of both positive and negative indices of birth parent temperament on adoptive parents' harsh parenting. Adoptive fathers' harsh parenting was inversely related to birth mother positive temperament, indicating evocative rGE, as well as to marital quality. Adoptive parents' negative temperamental characteristics were related to hostile parenting for both fathers and mothers. Findings support the importance of enhancing positive family characteristics in addition to mitigating negative characteristics, as well as engaging multiple levels of the family system to prevent harsh parenting.

Children have the potential to evoke strong positive and negative affective responses from parents, which then influence and organize caregiving behavior (Dix, 1991; Teti & Cole, 2011). All young children demonstrate challenging behaviors, such as prolonged crying that may be difficult to soothe, uncooperativeness with bathing or dressing, or difficulty with eating or sleeping. The degree to which parental negative emotion is evoked by these challenges and expressed in interactions with children is often characterized as harsh, negative, or over-reactive parenting. Harsh parenting is a function of a complex interplay of risk and protective factors that operate at multiple levels of the family system (i.e., characteristics of the parent, child, and family environment; Belsky, 1984; Boivin et al., 2005; Neiderhiser et al., 2004; Neiderhiser, Reiss, Lichtenstein, Spotts, & Ganiban, 2007).

The long-term maladaptive developmental outcomes associated with harsh, negative parenting during infancy (Bayer et al., 2012; Bradley & Corwyn, 2008; Lorber & Egeland, 2009) underscore the need for improved understanding of risk and protective factors associated with early harsh parenting. The current study aims to extend the
research on harsh parenting in infancy in two ways. First, although risk factors for early harsh parenting are well documented, we know little about factors that buffer parents from harsh parenting during infancy; this study examines independent and differential effects of positive and negative characteristics on harsh parenting. Second, although interest in child effects on parenting, including harsh parenting, has been present in the field for decades (Bell, 1979; Bell & Chapman, 1986; Rutter et al., 1997) we know very little about the degree to which the effects found in the literature truly reflect evocative effects of infants’ genetically influenced characteristics. The current study used an adoption design to test the hypothesis that genetically influenced temperamental characteristics of 9-month-olds would influence adoptive parents’ (APs’) harsh parenting.

Previous research has identified many correlates of harsh parenting, including negative characteristics of the parent (e.g., maternal depression; Lovejoy, Graczyk, O’Hare, & Neuman, 2000), family (e.g., marital hostility; Rhoades et al., 2011), and child (e.g., poor regulation; Bridgett et al., 2009). Yet, very little is known about how positive parent, child, and family characteristics might mitigate harsh parenting. For example, a positive marital relationship could buffer the impact of high levels of depressive symptoms on parenting, and thus have implications for prevention and intervention efforts. The current study examined positive and negative parent, child, and family factors in association with harsh parenting.

A second emphasis centered on understanding the role of infants’ genetically influenced characteristics on harsh parenting. Much of the previous work on child effects on parenting has examined child temperament. In general, child positivity is related to positive parenting, while child negativity is related to negative parenting (Putnam, Sanson, & Rothbart, 2002; Wilson & Durbin, 2012). However, the general lack of genetically sensitive designs in this research makes it impossible to determine whether these associations exist because (a) harsh parenting leads to negative child characteristics, (b) specific child characteristics evoke harsh parenting (evocative gene–environment correlation [rGE]; Plomin, Loehlin, & DeFries, 1977; Scarr & McCartney, 1983), or (c) children and parents share genes that contribute to both parenting and temperament (passive rGE). Therefore, genetically sensitive research designs are needed to disentangle these influences to understand specific mechanisms underlying the relations between child characteristics and parent behavior.

Methodological Challenges

Despite the potential for research on rGE to improve the field’s understanding of risk and the development of psychopathology, this process has not been widely studied (Knafo & Jaffee, 2013). This may be partially due to the challenges inherent in studying rGE: Because genetic and environmental influences are confounded in most biological families, special study designs must be used. Adoption designs enable researchers to distinguish evocative from passive rGE because children are raised by parents to whom they are not genetically related (if there is any contact between birth parents and adopted children, the amount of contact can be statistically controlled). Consequently, birth parents’ characteristics may be used as indices of children’s genetically influenced predispositions, while AP and family-level (e.g., marital quality) characteristics are used to assess children’s rearing environments. Relations between measures of AP characteristics, adoptive family environment, and parenting indicate environmentally mediated associations, while relations between measures of birth parent characteristics and APs’ parenting indicate evocative rGE.

Child Genetic Characteristics as an Influence on Parenting

Although most of the previous research on evocative rGE on parenting has been conducted with older children and adolescents (Ge et al., 1996; Klahr, Thomas, Hopwood, Klump, & Burt, 2013; Neiderhiser et al., 2004; Neiderhiser et al., 2007; O’Connor, Deater-Deckard, Fulker, Rutter, & Plomin, 1998; Oppenheimer, Hankin, Jenness, Young, & Smolen, 2013), some evidence for evocative rGE on parenting during early development exists. Twin studies have shown that children’s genetically influenced characteristics predict hostile parenting in mothers of 5- and 30-month-olds (Boivin et al., 2005; Forget-Dubois et al., 2007) and use of corporal punishment with 5-year-olds (Jaffee et al., 2004). The nature of the twin design, however, does not rule out passive rGE like adoption designs can. Examination of evocative rGE from the Colorado Adoption Project (CAP) revealed a greater than chance number of statistically significant associations between birth mother (BM) characteristics (personality, IQ, and psychopathology) and various aspects of the adoptive family rearing environment (e.g., parenting, availability of developmentally appropriate toys) when infants were 12 and
24 months old (Plomin & DeFries, 1985; Plomin, DeFries, & Fulker, 1988). Deater-Deckard and O’Connor (2000) found evidence for evocative rGE on dyadic mutuality, measured as parent-child cooperation and shared positive emotion, between parents and their 3-year-olds by integrating results across twin, biological, and adoptive sibling samples. In families with slightly older children, BM attention deficit hyperactivity disorder symptoms predicted more hostile parenting with 6-year-old adopted children; this association operated through child impulsivity (Harold, Leve, Barrett, et al., 2013). There is also molecular genetic evidence for evocative rGE on early parenting: A series of papers from the Durham Child Health and Development Study show that infants and toddlers carrying the “risk” alleles of dopamine receptor polymorphisms Types 2 and 4 (DRD2 and DRD4) are associated with the receipt of less sensitive parenting from early infancy through toddlerhood (Mills-Koonce et al., 2008; Propper, Shanahan, Russo, & Mills-Koonce, 2012; Propper, Willoughby, Halpern, Carbone, & Cox, 2007). The associations between children’s DRD2/DRD4 and parenting were independent of the effect of maternal DRD2/DRD4 on parenting, confirming the presence of evocative (not passive) rGE. Hayden et al. (2010) showed similar results with a sample of preschoolers (3- to 4-year-old children with the DRD2 “risk” allele received less supportive parenting). However, because the Hayden et al. study did not control for the parents’ genotypes, their findings may have been at least partially due to passive rGE.

In sum, previous research suggests that evocative rGE operates on parenting in early childhood, but few studies test it directly. This may be due to the methodological challenges of conducting this type of work. One goal of the current study was to extend this research by examining evocative child effects on harsh parenting within the context of an adoption design. We measured associations between dimensions of BM temperament and APs’ reports of harsh parenting in response to challenges with their 9-month-old adopted infants. A statistically significant association between these birth and AP variables would suggest (a) that birth parents transmitted a genetic predisposition for a certain type of temperament to their infant, and (b) when this predisposition was expressed by infants via behavior or emotionality, it evoked specific types of responses from the APs.

As examining child rGE on parenting with this approach assumes that a measure of adult temperament (of the birth parent) is relevant to child behavior (of the adopted infant), selecting developmentally sensitive measures is important. We used Cloninger’s dimensions of temperament, which are theorized to be present in early childhood and throughout adulthood (Cloninger, Svrakic, & Przybeck, 1993). Due to our interest in identifying positive factors that might mitigate the hostile parenting of infants, we were particularly interested in examining Cloninger’s dimension of reward dependence in birth parents. Reward dependence refers to sensitivity to reward and manifests as a tendency toward social attachment, responsiveness to interpersonal signals, emotional warmth, sympathy, and an eagerness to help others (Cloninger et al., 1993). Adaptations of measures of reward dependence to youth suggest that this temperamental construct exists as early as 2 years of age and is highly correlated (r > .70) with well-validated measures of child sociability (Constantino, Cloninger, Clarke, Hashemi, & Przybeck, 2002). APs were expected to be less reactive in the context of challenging parenting situations if they perceived their baby as generally positive and interactive.

To more rigorously test the unique effect of positive characteristics on parenting, we also examined a negative characteristic. Specifically, we examined the effect of birth parent-reported harm avoidance (an estimate of genetically influenced infant negative temperament) on AP harsh parenting. Individuals high in harm avoidance are fearful, cautious, and negativistic, and tend to be inhibited and shy in social situations (Cloninger et al., 1993). In early childhood, harm avoidance is highly correlated with measures of infant negative emotionality and shyness (rs = .57 and .82, respectively; Constantino et al., 2002). We reasoned that stronger support for protective factors would be made if positive infant characteristics were predictive of harsh parenting even in the presence of negative characteristics in the model.

Parent- and Family-Level Influences on Parenting

Even when focusing on evocative child effects on parenting, it is critical to remember that parents’ own characteristics affect the family system. Belsky’s (1984) classic paper on the determinants of parenting behavior emphasized parent characteristics and environmental sources of stress and support, in addition to child characteristics, as critical contributors to parenting behavior. Parent personality is one characteristic noted by Belsky as an important influence on parenting quality, and a wealth of empirical work supports this expectation. A meta-analysis (Prinzie, Stams, Dekovic, Reijntjes,
& Belsky, 2009) of 30 studies examining the links between Big Five personality traits and parenting behavior concluded that higher levels of parent agreeableness and openness and lower levels of neuroticism were associated with greater parental warmth, behavioral control, and autonomy support. Additionally, higher levels of extraversion and conscientiousness were associated with greater warmth and behavioral control (Prinzie et al., 2009). Although the meta-analysis spanned families in infancy to the late teenage years, it showed that the associations between agreeableness, neuroticism, and warmth were stronger for younger than older children (Prinzie et al., 2009). Consistent with this finding, studies of families with toddlers have shown that parental extraversion and neuroticism are associated with greater parent responsiveness (Wilson & Durbin, 2012) and greater intrusive/directive parenting (Smith, 2010), respectively, while higher levels of extraversion and openness to experience are related to greater use of symbolic play (Bornschein, Hahn, & Haynes, 2011). As for harsh parenting in particular, a recent meta-analysis showed that more hostile-coercive parenting of infants, preschoolers, and school-aged children was associated with greater parental neuroticism/trait negative affect and less parental extraversion/trait positive affect (Rueger, Katz, Risser, & Lovejoy, 2010). To examine the effects of APs’ own personality on their angry responses to infants, we examined adoptive mothers’ (AMs’) and fathers’ (AFs’) self-reports of reward dependence (comparable to extraversion and trait positive affect examined in previous studies of parent personality) and harm avoidance (comparable to neuroticism and trait negative affect). In accordance with previous research, we expected higher levels of harsh parenting to be associated with greater harm avoidance and lower reward dependence.

Another important contributor to parenting behavior is the quality of the marital relationship. Regardless of child age, more harmonious marriages are associated with more sensitive and developmentally appropriate parenting, while strained spousal relationships are likely to co-occur with parenting that is intrusive, insensitive, and ineffective (see Erel & Burman, 1995; Krishnakumar & Buehler, 2000, for meta-analyses). Based on research demonstrating differential impact of the marital relationship on parenting by parent gender (Harold, Leve, Elam, et al., 2013; Krishnakumar & Buehler, 2000; Stroud, Durbin, Wilson, & Mendelsohn, 2011), we expected its association with harsh parenting to be greater in magnitude for AFs than for AMs.

Hypotheses

Using the adoption design, we examined three sources of influences on APs’ harsh parenting: (a) child-based evocative effects on parenting (indexed by birth parent temperament characteristics: reward dependence and harm avoidance), (b) APs’ own temperament, and (c) APs’ marital quality. We had three main hypotheses:

1. There will be evidence for multiple sources of influence on APs’ harsh parenting, including:
   a. rGE/child effects: Greater AP harsh parenting will be predicted by greater BM harm avoidance and lesser BM reward dependence.
   b. Parent characteristics: Greater AP harsh parenting will be associated with each AP’s own greater harm avoidance and lesser reward dependence.
   c. Family environment characteristics: Greater AP harsh parenting will be associated with lesser AP marital warmth and greater marital hostility, but these associations will be stronger for AFs than for AMs.

2. Positive influences (birth parent and AP reward dependence and marital warmth) will show unique variance in harsh parenting, even when negative influences (birth and AP harm avoidance and marital hostility) are included in the model.

3. Evocative rGE will be mediated by infants’ tendency to express positive emotion and negative emotion in social situations.

Method

Participants

Data used in the current analyses were drawn from a prospective, longitudinal adoption study consisting of 561 “linked sets,” or, adoption triads (adopted child, APs, birth parents; Leve et al., 2013). Families were recruited through adoption agencies in the Northwest, Midwest, Southwest, and Mid-Atlantic regions of the United States. The mean infant age at adoption placement was 6.2 days. Exclusionary criteria included: relative or international adoptions, placement after 3 months of age, major medical illnesses in the adoptive child, and birth and/or AP reading ability below an eighth-grade level. Refusal rates for the study were low: 2% of BMs, 8% of birth fathers (BFs), and 20% of adoptive families declined to participate.
when contacted by study staff (after being successfully recruited by adoption agencies). However, the total number of BFs who participated \((N = 208)\) was lower than the number of BMs \((N = 554)\). Therefore, the current analyses used only BM measures as an index of the genetic contribution to infant characteristics.

Birth parents and APs identified themselves as White or Caucasian \((\text{BM} 70\%; \text{AM} 92\%; \text{AF} 90\%)\), Black or African American \((\text{BM} 13\%; \text{AM} 4\%; \text{AF} 5\%)\), Asian \((\text{BM} 2\%; \text{AM} 0.9\%; \text{AF} 0.5\%)\), Hispanic or Latino \((\text{BM} 7\%; \text{AM} 2\%; \text{AF} 2\%)\), Native Hawaiian or Pacific Islander \((\text{BM} 0.2\%; \text{AM} 0\%; \text{AF} 0.5\%)\), American Indian or Alaskan Native \((\text{BM} 3\%; \text{AM} 0.2\%; \text{AF} 0\%)\), or more than one race \((\text{BM} 5\%; \text{AM} 0.9\%; \text{AF} 1\%)\). On average, BMs had completed high school or obtained a GED and AMs and AFs had completed college. Median annual household income was less than $15,000 for BMs and greater than $100,000 for adoptive families. At the first assessment, parents’ average age was: BMs 24; AMs 38; AFs 39. On average, APs had been married 18 years. Fifty-seven percent of infants were male.

Of the 554 adoptive families that completed the 9-month assessment, 41 had two parents of the same gender \((\text{two-mother families } n = 18; \text{two-father families } n = 23)\) and 10 were single-mother families. Because hypotheses regarding parenting and the marital relationship were based on research examining two-parent families in which one parent was male and one was female, only separate-gender, two-parent families were included in the following models, bringing the sample size to 503 families.

**Procedure**

All participants completed in-person interviews, and mailed and computer-assisted questionnaires. Assessment included a wide variety of domains including temperament, psychosocial adjustment, life events, family relationships, and adoption-specific issues. All interviews were audio- or video-recorded and feedback was provided by a trained evaluator for at least 15% of the interviews to ensure adherence to interview protocols. Further details on study recruitment procedures, sample, and assessment methods can be found in Leve et al., (2013). The current study uses questionnaire data from the 3- to 6-month postpartum visit of birth parents and the 9-month postpartum assessment of adoptive families.

**Harsh Parenting**

Harsh parenting was measured using the overreactivity subscale of The Parenting Scale (Arnold, O’Leary, Wolf, & Acker, 1993), which was completed separately by AMs and AFs when infants were 9 months of age. The scale was designed to index parent displays of anger, meanness, and irritability in response to child challenges (e.g., “When my baby misbehaves . . .”). Each item was designed so that responses were rated on a 7-point Likert scale anchored at one end by a purportedly adaptive parenting response (e.g., “. . . I handle it without getting upset”) and at the other end by a harsh, overreactive response (e.g., “. . . I get so frustrated or angry that my child can see I’m upset”). To make this measure (developed using a sample of parents of 18- to 48-month-olds) developmentally appropriate for parents of 9-month-olds, 3 of the original 10 items from this subscale were removed (Lipscomb et al., 2011). Internal reliabilities were good (both AMs and AFs \(\alpha = .71\)).

**Birth and AP Reward Dependence and Harm Avoidance**

As an index of infants’ inherited temperamental characteristics, birth parents completed the Temperament Character Inventory (Cloninger et al., 1993) at 3 to 6 months postpartum. APs completed this measure at infant age 9 months to provide a measure of their own temperaments. The 15-item reward dependence subscale \((\text{BM} \alpha = .63; \text{AM} \alpha = .67; \text{AF} \alpha = .70)\) and the 20-item harm avoidance subscale \((\text{BM} \alpha = .83; \text{AM} \alpha = .83; \text{AF} \alpha = .83)\) were used in the current study. Reward dependence sample items include: “I like to discuss my experiences openly with friends instead of keeping them to myself,” and “If I am feeling upset, I usually feel better around friends than when left alone.” Harm avoidance sample items include: “I often feel tense and worried in unfamiliar situations, even when others feel there is little to worry about,” and “I have less energy and get tired more quickly than most people.” Items are answered as “True” or “False.”

**Marital Quality**

AM and AF marital quality was assessed during a 20-min videotaped interaction task during the 9-month in-home assessment. Parents were provided with cards that prompted them to discuss a variety of topics about their relationship, both positive and negative. After data collection, the videotaped
observations were coded based on the Iowa Family Interaction Rating Scales–Marital Interaction Codes (Melby, Conger, Ge, & Warner, 1995). Approximately 20% of the sample was double-coded to assess reliability, which was good (weighted percent agreement range = 0.89–0.99). Each partner in the dyad received a single global code on several subscales, some of which were then collapsed to create an overall Warmth/Support scale (made up of warmth/support, assertive communication, and listener responsiveness subscales) and Hostility scale (made up of hostility, antisocial behavior, angry coercion, reciprocate hostile subscales). Each global code was based on a 1–9 scale, where 1 = not at all characteristic, and 9 = mainly characteristic. In addition to the Warmth/Support and Hostility scales, we examined the Relationship Quality scale, which characterized the overall quality of the relationship (from a score of 1 for negative, and a score of 9 for positive). Ultimately, we used this scale because the overall Warmth/Support and Hostility scales were highly correlated ($r = -0.59$); the Relationship Quality code allowed us to use a variable that took into account both the warmth and hostility in the marital relationship while avoiding the problem of multicollinearity. In order to obtain dyadic measures of warmth and hostility, we averaged the scores for AMs and AFs on this scale.

**Infant Temperament**

To assess APs’ perception of infants’ temperaments, the Infant Behavior Questionnaire (IBQ; Rothbart, 1981) was completed separately by AMs and AFs when infants were 9 months old. The current analysis used three subscales. The 15-item smiling and laughter subscale, which indexes the amount of positive emotion typically expressed by infants during general caretaking and play situations (AMs $\alpha = .83$; AFs $\alpha = .86$), was thought to reflect a developmentally analogous measure of reward dependence (based on Matheny, Riese, & Wilson, 1985). The 20-item distress to limitations subscale (AMs $\alpha = .85$; AFs $\alpha = .85$) and the 16-item distress to novel stimuli subscale (AMs $\alpha = .73$; AFs $\alpha = .71$), both representative of infant temperamental negative affectivity, were used as developmentally appropriate proxies of harm avoidance. AM and AF reports of these variables were averaged.

**Demographic and Perinatal Control Variables**

Demographic characteristics, such as the degree of openness in the adoption, infant gender, and AP age were controlled for in major analyses. Additionally, the McNeil–Sjöström Scale for Obstetric Complications (McNeil, Cantor-Graae, & Sjöström, 1994) was used to create an index of perinatal risk (e.g., maternal pre-eclampsia, perinatal substance use, prematurity, low birth weight) based on self-report of pregnancy and neonatal events. Although self-report was retrospective, recall was assisted via use of a Life History Calendar (Caspì et al., 1996) adapted for the perinatal period. Events meeting a minimum threshold of being at least potentially harmful/relevant to infant outcome were summed to form a total score. The total score was used as a covariate in analyses to prevent the misinterpretation of perinatal influences as genetic effects.

**Results**

**Descriptive Statistics and Correlations**

Descriptive statistics and bivariate correlations are reported in Tables 1 and 2. Square root transformations were used to normalize the distributions of AMs’ and AFs’ hostile parenting, which were positively skewed. The untransformed data for APs’ observed relationship quality was used despite being somewhat negatively skewed, because square root and log transformations worsened the distribution.

**Structural Equation Models**

Structural equation modeling (SEM) was used to test hypotheses. Prior to the SEM analysis, each variable of interest was regressed onto the demographic and perinatal variables with which it was at least marginally significantly associated (correlation coefficient $p < .10$). A separate multiple regression analysis was conducted for each variable and residuals were saved; residualized variables were then used in SEM.

SEM was conducted in Mplus 7 (Muthén & Muthén, 2012), with full information maximum likelihood estimation to handle missing data. We used the BOOTSTRAP function in Mplus to conduct all SEMs with 1,000 draws of the data. The hypothesized model fit the data very well ($\chi^2 = 3.24, df = 6, p > .10$, comparative fit index = 1.00, root mean square error of approximation = 0.00, 90% CI [0.00, 0.04]). Figure 1 shows the results for hypothesis testing (pathways that were significant at the $p < .05$ level are black; nonsignificant pathways are gray).
Hypothesis 1a

As shown in the figure, there was some evidence for evocative rGE on AP harsh parenting. AFs who rated themselves as relatively higher in harsh parenting had adopted infants whose BMs had rated themselves relatively lower in reward dependence (our index of infants’ genetically influenced sociability; $\beta = -0.13$, $p < .01$, 95% CI $[-0.22, -0.05]$). For AMs, however, this association was close to zero ($\beta = -0.02$, $p > .10$, 95% CI $[-0.12, 0.08]$). We tested the significance of the difference in the effect of BM reward dependence on harsh parenting for AMs versus AFs by testing an alternative model in which pathways between BM reward dependence and each parent’s harsh parenting were constrained to be equal. The degradation in the fit of the model ($\Delta \chi^2 = 5.77$, $\Delta df = 1$, $p < .05$) was significant, indicating that the

Table 1

<table>
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<th>Variable</th>
<th>$n$</th>
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<th>$SD$</th>
<th>Potential</th>
<th>Actual</th>
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Table 2

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<td>-0.10*</td>
<td>0.04</td>
<td>0.14**</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Marital relationship quality</td>
<td>1</td>
<td>-0.03</td>
<td>-0.11*</td>
<td>-0.06</td>
<td>0.05</td>
<td>0.00</td>
<td></td>
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</tr>
</tbody>
</table>

Note. AM = adoptive mother; AF = adoptive father; BM = birth mother. 
†$p < .10$. *$p < .05$. **$p < .01$. 

Hypothesis 1a

As shown in the figure, there was some evidence for evocative rGE on AP harsh parenting. AFs who rated themselves as relatively higher in harsh parenting had adopted infants whose BMs had rated themselves relatively lower in reward dependence (our index of infants’ genetically influenced sociability; $\beta = -0.13$, $p < .01$, 95% CI $[-0.22, -0.05]$). For AMs, however, this association was close to zero ($\beta = -0.02$, $p > .10$, 95% CI $[-0.12, 0.08]$). We tested the significance of the difference in the effect of BM reward dependence on harsh parenting for AMs versus AFs by testing an alternative model in which pathways between BM reward dependence and each parent’s harsh parenting were constrained to be equal. The degradation in the fit of the model ($\Delta \chi^2 = 5.77$, $\Delta df = 1$, $p < .05$) was significant, indicating that the
association between BM reward dependence and AF harsh parenting was significantly different from that for AM harsh parenting.

**Hypothesis 1b**

As for associations between APs’ reports of their own temperaments and harsh parenting, only harm avoidance was statistically significant (for AMs, \( \beta = .26, b = .25, p < .01, 95\% \text{ CI} [0.17, 0.33] \); for AFs, \( \beta = .16, b = .04, p < .01, 95\% \text{ CI} [0.02, 0.06] \)).

AM and AF reward dependences were associated with observed marital relationship quality (for AMs, \( \beta = .10, b = .11, p < .05, 95\% \text{ CI} [0.01, 0.20] \); for AFs, \( \beta = .20, p < .01, 95\% \text{ CI} [0.11, 0.29] \)). The difference in the magnitude of AM and AF associations between reward dependence and observed relationship quality was not statistically significant (\( \Delta \chi^2 = 2.12, \Delta df = 1, p > .10 \)), suggesting that one parent’s reward dependence does not drive the quality of the marital relationship. The association between relationship quality and APs’ own harm avoidance approached significance for AFs (\( \beta = -.08, p = .08 \)), but was nonsignificant for AMs (\( \beta = .07, p > .10 \)); this difference in magnitude was not statistically significant (\( \Delta \chi^2 = 3.40, \Delta df = 1, p > .10 \)).

**Hypothesis 1c**

As predicted, marital relationship quality was inversely associated with AFs’ harsh parenting (\( \beta = -.15, p < .01, 95\% \text{ CI} [-0.23, -0.06] \)). It was not, however, associated with AMs’ parenting (\( \beta = -.04, p > .10 \)), consistent with our expectation that marital relationship quality would more strongly predict AF parenting than AM parenting. Importantly, the difference between AF and AM parenting only approached statistical significance (\( \Delta \chi^2 = 3.48, p < .10 \)), suggesting a modest difference at best.

**Hypothesis 2**

We expected that birth parent and AP reward dependence and marital warmth would predict unique variance in harsh parenting, even in the presence of birth parent and AP harm avoidance. We found support for this hypothesis for rGE in that BM reward dependence, but not harm avoidance, predicted AF harsh parenting. Furthermore, the difference in effects was significant (\( \Delta \chi^2 = 7.30, \Delta df = 1, p < .05 \)). However, for AP personality only harm avoidance (not reward dependence) was associated with harsh parenting.
Finally, we predicted that rGE between BM reward dependence and AP harsh parenting would be mediated by APs' reports of their infants' smiling and laughter (i.e., their perception of infants' positive sociability). Similarly, we predicted that the rGE between BM harm avoidance and AP harsh parenting would be mediated by APs' reports of their infants' distress to limitations and novel stimuli (i.e., their perception of infant negative emotionality). We added these infant variables into our SEM and examined both direct and indirect effects.

**Direct effects.** BM reward dependence was associated with AP report of infant smiling and laughter as predicted ($\beta = .14$, $p < .05$); however, BM harm avoidance was not associated with either measure of negative infant temperament ($\beta = -.01$ and $.01$, $ps > .10$). Infant smiling and laughter was inversely related to AMs' harsh parenting ($\beta = -.16$, $p < .01$), but not AFs' ($\beta = -.07$, $p > .10$). Infant distress to limitations was significantly associated with AFs' harsh parenting ($\beta = .15$, $p < .01$) and marginally with AMs' ($\beta = .08$, $p = .08$). Infant distress to novel stimuli was not associated with either ($\beta$s $< .06$, $ps > .10$).

**Indirect effects.** Despite some direct associations between APs reports of their parenting and their infants' temperament, none of the indirect effects were significant (all indirect effects $< |.01|$, all $ps > .10$), with the exception of BM reward dependence, infant smiling and laughter, and AM harsh parenting. Although the direct effect of BM reward dependence on AM harsh parenting was small and nonsignificant, this effect was accounted for by infant smiling and laughter ($-.02$, $p < .05$).

Due to the unexpected direct association between AF harm avoidance and BM reward dependence, we adjusted the model so that we could test the associations from BM reward dependence → AF harm avoidance → AF parenting, to ensure that the direct association between BM reward dependence and AF harsh parenting was not simply due to shared variance with AF harm avoidance. The analyses showed that only $-.01$ of BM reward dependence's total effect of $-.14$ on AF harsh parenting was mediated by AF harm avoidance ($p = .07$).

**Model Replicability**

In addition to conducting the SEM with 1,000 bootstrapped draws of the data, we used a split-half procedure in which we divided our data set into two random halves and conducted the analysis separately with each. As shown in Table 3, the pattern of associations was consistent across different portions of the sample. Although some of the effects were no longer significant in the half-samples, it is notable that the effect sizes (0.10 and 0.11) would have been statistically significant in the full sample; therefore, the drop to nonsignificance was due to decreased $N$ rather than a truly significant decrease in effect size. Finally, it is notable that a previous examination of these hypotheses conducted with only one cohort of the current sample ($N = 361$ linked sets; Hajal et al., 2011) yielded the same pattern of results.

**Discussion**

In light of theory and research indicating that harsh parenting during infancy is associated with downstream maladaptive outcomes (Bayer et al., 2012; Bradley & Corwyn, 2008) that persist into adulthood (Lorber & Egeland, 2009), this study aimed to identify family factors that may exacerbate or buffer parents’ tendency to respond to infant challenges with anger, irritation, and hostility. We explored two specific research gaps in the area of harsh parenting during infancy. First, we examined the evocative effect of infant temperament on harsh parenting. As most studies of child effects on parenting during early childhood have not used genetically sensitive designs, this study is among the first to examine the extent to which these effects are due to genetically inherited characteristics of the child, versus passive rGE. Second, we tested the hypothesis that positive child, parent, and family characteristics would have unique and differential effects on AMs’ and AFs’ harsh parenting, over and above those of negative characteristics.

**Evocative rGE**

A primary hypothesis of the study, that BM temperament would predict APs’ harsh parenting, was supported for AFs, suggesting that fathers may be more sensitive to children’s genetically influenced temperament than AMs. The rGE for AFs was only present when considering measures of BMs’ reward dependence, not harm avoidance. This finding suggests that BMs transmit to their infants a genetic predisposition toward reward dependence (measured in this study as an index of sociability), which is expressed by the infant during the first months of life. This infant behavior then elicits
specific types of responding from AFs. In this particular case, one possibility is that AFs whose babies are higher in general sociability may perceive challenging situations with the infant (e.g., prolonged crying, fussiness) as context dependent and short-lived, thus mitigating their tendency to respond irritably. However, the infant characteristic through which we expected inherited sociability to operate (infants’ tendency to smile and laugh in everyday social contexts) was not a significant mediator. In other words, while there seems to be a real genetic effect on infant behavior operating on AF parenting for these families, that effect is not evident in our measure of smiling and laughter.

Why did the current study find rGE for AFs’, but not AMs’ harsh parenting of 9-month-olds based on infants’ inherited sociability? One explanation for these differences could be related to how inherited reward dependence expresses itself in infancy, and how that might play into mothers’ and fathers’ dissimilar affective styles with their infants. Previous research has shown that while positive affect in mother–infant play tends to be of low to medium intensity, father–infant positive play is characterized by high arousal and peaks of high-intensity emotion (Feldman, 2003). Perhaps in infancy, reward dependence is expressed as the type of high-intensity pleasure that is more characteristic of father–infant than mother–infant interaction. It is possible that our measure of BM reward dependence, but not AP-reported infant smiling and laughter, captured the high-intensity pleasure to which fathers respond. Future research should examine whether infant high-intensity pleasure, as measured by newer versions of the IBQ (Gartstein & Rothbart, 2003) mediates the relation between inherited reward dependence and AF harsh parenting.

It is also possible that inherited reward dependence was expressed earlier in infancy, contributing to interactional patterns between babies and fathers that began prior to our 9-month assessment. For example, perhaps infants with higher reward dependence showed earlier or more frequent social smiles, contributing to more positive early father–infant interactions. Future research should examine infant behaviors even earlier in development.

Table 3
Comparison of Standardized Beta Weights Across the Full Sample and Two Random Halves

<table>
<thead>
<tr>
<th></th>
<th>Full sample, N = 503</th>
<th>First half, N = 251</th>
<th>Second half, N = 252</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM RDP → Marital quality</td>
<td>.10*</td>
<td>.11</td>
<td>.10</td>
</tr>
<tr>
<td>AF RDP → Marital quality</td>
<td>.20*</td>
<td>.21*</td>
<td>.18*</td>
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<tr>
<td>AM HAV → Marital quality</td>
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<td>.02</td>
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<tr>
<td>AF HAV → Marital quality</td>
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<td>-.05</td>
</tr>
<tr>
<td>Marital quality → AM harsh parenting</td>
<td>-.04</td>
<td>-.04</td>
<td>-.04</td>
</tr>
<tr>
<td>AM RDP → AM harsh parenting</td>
<td>.04</td>
<td>.02</td>
<td>.07</td>
</tr>
<tr>
<td>AM HAV → AM harsh parenting</td>
<td>.26*</td>
<td>.29*</td>
<td>.21*</td>
</tr>
<tr>
<td>BM RDP → AM harsh parenting</td>
<td>-.02</td>
<td>-.04</td>
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<td>Marital quality → AF harsh parenting</td>
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<td>AF RDP → AF harsh parenting</td>
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<tr>
<td>BM HAV → AF harsh parenting</td>
<td>-.02</td>
<td>.02</td>
<td>.04</td>
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</tbody>
</table>

Note. RDP = reward dependence; HAV = harm avoidance; AM = adoptive mother; AF = adoptive father; BM = birth mother.
*p < .05.
The Influence of Positive Parent, Child, and Family Characteristics

Another contribution of the current study is its consideration of associations of harsh parenting with both positive and negative factors across multiple levels of the family system. Infant positive characteristics were more predictive of parenting (for fathers) than infant negative characteristics; however, the same was not true for APs’ own temperaments. For both AMs and AFs, higher harm avoidance, an index of negative emotionality, was associated with greater harsh parenting. This is consistent with other studies that have found larger effects for neuroticism or negativity than extraversion, agreeableness, or positivity on controlling, intrusive, or otherwise negative parenting (Clark, Kochanska, & Ready, 2000; Rueger et al., 2011; Smith, 2010). Taken together, these studies’ findings suggest that, for parent personality and parenting, negative is more influential than positive when predicting negative parenting.

Reward dependence, however, was related to observed marital relationship quality. It is not surprising that the measure of adult reward dependence (sociability) in parents was related to an adult social relationship (the marital relationship) rather than to parenting. It brings to the forefront the issue of what exactly reward dependence means in infancy versus adulthood, and how it might differ in relation to social relationships between two adults versus a parent–child dyad. Our findings suggest that reward dependence is present across the life span and, in an infant, evokes a certain type of fathering. Yet, it may be that an adult’s own reward dependence is more influential in his or her adult relationships than in parent–child interactions.

Although we did not expect marital relationship quality to be unrelated to AM parenting, we did expect it to be more highly related to AF parenting. That higher marital relationship quality predicted less harsh parenting for AFs is consistent with previous literature showing the importance of the marital relationship on fathers’ parenting. Overall, the results suggest that fathers who are higher in sociability are more likely to have marital relationships that are more positive, which may buffer negative responding in the face of parenting challenges. This finding underscores the importance of assessing and formally addressing the marital relationship in families seeking intervention for their children, consistent with Cowan and Cowan’s (1990) work.

Limitations

The findings reported here must be considered in the context of limitations. The AP temperament, harsh parenting, and marital relationship quality data used in this study were collected during one assessment, making it difficult to draw inferences about directionality, much less causality. This was a particular limitation for the mediation analyses, given that both mediators and outcomes were assessed at the same time. Additionally, children were assessed at 9 months of age, when stability of behavior is likely to be short-lived. It remains to be seen whether these measures will be associated with meaningful variability in parenting and child outcomes during the preschool period and beyond. Similarly, parenting roles may change as children get older and differential findings for mothers’ and fathers’ parenting may shift. Future research on this study will examine how influences on AM and AF parenting and their interactions may change over time. Finally, another significant limitation is that multiple constructs were measured via AP self-report, possibly leading to shared method variance. However, the differential associations across variables (e.g., AM harm avoidance and harsh parenting were related to one another but not to reports of negative infant characteristics) suggest that this was not a pervasive issue in our model. Future research examining early rGE and the impact of positive factors on harsh parenting should supplement self-report questionnaires with observational methods.

Conclusion

The results from the current study begin to fill gaps in our understanding of the mechanisms involved in harsh parenting of infants. Our results support a model of transactional relations among various influences on parenting, highlighting the role that positive family factors may have in preventing parents from responding angrily to challenging situations with their 9-month-olds. We provided evidence that for fathers, child effects on harsh parenting are partially driven by infants’ inherited characteristics, thus constituting true evocative child effects. Furthermore, by illuminating both similar and dissimilar ways in which AMs and AFs respond to parenting challenges, the findings offer information that can inform future research, and ultimately prevention and early intervention in at-risk families. Overall, it represents an early step in an attempt to disentangle the genetic,
environmental, and family effects on harsh parenting in infancy in order to contribute to the promotion of positive parenting practices and optimal child development.

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