

The Nature of Nurture: Disentangling Passive Genotype–Environment Correlation From Family Relationship Influences on Children’s Externalizing Problems

Gordon T. Harold
University of Leicester

Leslie D. Leve
Oregon Social Learning Center, Eugene, Oregon

Kit K. Elam
University of Leicester

Anita Thapar
Cardiff University

Jenae M. Neiderhiser
The Pennsylvania State University

Misaki N. Natsuaki
University of California, Riverside

Daniel S. Shaw
University of Pittsburgh

David Reiss
Yale School of Medicine

The relationship between interparental conflict, hostile parenting, and children’s externalizing problems is well established. Few studies, however, have examined the pattern of association underlying this constellation of family and child level variables while controlling for the possible confounding presence of passive genotype–environment correlation. Using the attributes of 2 genetically sensitive research designs, the present study examined associations among interparental conflict, parent-to-child hostility, and children’s externalizing problems among genetically related and genetically unrelated mother–child and father–child groupings. Analyses were conducted separately by parent gender, thereby allowing examination of the relative role of the mother–child and father–child relationships on children’s behavioral outcomes. Path analyses revealed that for both genetically related and genetically unrelated parents and children, indirect associations were apparent from interparental conflict to child externalizing problems through mother-to-child and father-to-child hostility. Associations between interparental conflict and parent-to-child hostility across genetically related and genetically unrelated parent–child groupings were significantly stronger for fathers compared to mothers. Results are discussed with respect to the role of passive genotype–environment correlation as a possible confounding influence in interpreting research findings from previous studies conducted in this area. Implications for intervention programs focusing on family process influences on child externalizing problems are also considered.

Keywords: interparental conflict, hostile parenting, gene–environment correlation, child externalizing

Gordon T. Harold, School of Psychology, College of Medicine, Biological Sciences, and Psychology, University of Leicester; Leslie D. Leve, Oregon Social Learning Center, Eugene, Oregon; Kit K. Elam, School of Psychology, College of Medicine, Biological Sciences, and Psychology, University of Leicester; Anita Thapar, Child and Adolescent Psychiatry Section, Institute of Psychological Medicine and Clinical Neurosciences, Cardiff University; Jenae M. Neiderhiser, Department of Psychology, The Pennsylvania State University; Misaki N. Natsuaki, Department of Psychology, University of California, Riverside; Daniel S. Shaw, Department of Psychology, University of Pittsburgh; David Reiss, Yale Child Study Center, Yale School of Medicine.

Early Growth and Development Study: This project was supported by R01 HD042608, National Institute of Child Health & Human Development (NICHD), National Institute on Drug Abuse (NIDA), and Office of Behavioral and Social Sciences Research (OBSSR), National Institutes of Health (NIH); U.S. Public Health Service (principal investigator [PI], years 1–5: David Reiss; PI, years 6–10: Leslie D. Leve). The content is solely the responsibility of the authors and does not necessarily represent the official views of the Eunice Kennedy Shriver NICHD or the NIH. Additional support was provided by P30 DA023920, R01 DA020585, and R01

MH092118. We thank the birth and adoptive parents who participated in this study and the adoption agencies who helped with the recruitment of study participants. Special gratitude is given to Rand Conger, John Reid, Xiaojia Ge, Jody Ganiban, and Laura Scaramella, who contributed to the larger study aims. Cardiff IVF study: We thank the families who participated in this study and our fertility center and clinic collaborators. We thank Dale Hay, Jacky Boivin, Marianne van den Bree of Cardiff University, Frances Rice of University College London, the late Xiaojia Ge of the University of Minnesota for assistance in the study design, and Allyson Lewis and Val Russell, also of Cardiff University, for antenatal data collection and administrative support. This study was supported by a Wellcome Trust Showcase Award and a Wellcome Trust Project grant along with a Project Grant award from the Nuffield Foundation.

Correspondence concerning this article should be addressed to Gordon T. Harold, University of Leicester, Lancaster Road, Leicester LE1 9HN, United Kingdom, or to Leslie D. Leve, Oregon Social Learning Center, 10 Shelton McMURPHEY Boulevard, Eugene, OR 97401. E-mail: gth9@le.ac.uk or lesliel@oslsc.org

The role of interparental conflict and hostile parenting practices as family level influences on children's externalizing problems is well established (see Rhoades et al., 2011). From as far back as the 1930s, it has been recognized that discord between parents has a potentially debilitating effect on children's psychological development (Towle, 1931), with contemporary evidence from cross-sectional (Grych, Fincham, Jouriles, & McDonald, 2000), longitudinal (Harold, Shelton, Goeke-Morey, & Cummings, 2004), and experimental (Cummings & Davies, 2002) studies indicating that children who witness conflict between parents that is frequent, intense, and poorly resolved are at elevated risk for a host of negative developmental outcomes including depressive symptoms, aggression, antisocial behavior problems, and deficits in academic attainment (Harold, Aitken, & Shelton, 2007). Researchers also highlight the important role that parenting practices play in accounting for family relationship influences on children (Lipscomb et al., 2011), with a noteworthy perspective purporting indirect associations between interparental conflict and negative child outcomes via parenting practices, such that the effects of conflict between parents are deemed to occur indirectly through a "spillover" of emotion from the couple relationship to the parent-child relationship (Erel & Burman, 1995; Rhoades et al., 2011). Intervention studies also highlight the role of parenting as a mediator in the link between interparental conflict and child externalizing problems (Cowan & Cowan, 2002). Important questions remain however as to the role of family relationship influences on children's psychopathology and, in particular, the mechanisms that underlie observed associations between family-level and child-level variables. The present study examines two questions of fundamental relevance to this area of contemporary social, clinical, and policy concern: the differential role that mothers' and fathers' parenting practices play in mediating links between interparental conflict and negative child outcomes (externalizing problems) and the relative role that passive genotype-environment correlation may play in accounting for associations between family level variables and externalizing problems in children.

Family Relationship Influences on Children: The Relative Role of Mothers and Fathers

Past research examining family socialization influences on children has historically focused on the mother-child relationship to the relative neglect of the father-child relationship. However, the role of fathers is increasingly recognized as an important influence on children's emotional, behavioral, and academic development (Lamb, 2004). Specifically relating to associations between interparental conflict, hostile parenting, and children's externalizing problems, several studies support the hypothesis that emotions expressed in the interparental relationship "spill over" to the parent-child relationship (Erel & Burman, 1995), with some studies suggesting that fathers' parenting may be more sensitive to couple-level problems than mothers' parenting (Goldberg & Eastbrooks, 1984; Katz & Gottman, 1996). Other studies highlight the respective role of the mother-child and father-child relationships as important mediators of interparental conflict effects on children's psychological adjustment (Shelton & Harold, 2008; Stover et al., 2012). The present study advances research in this area by examining the relative role of mother-to-child hostility and father-to-child hostility in the context of interparental conflict on

children's externalizing behavior problems, with the added novel feature that the potentially confounding role of passive genotype-environment correlation underlying associations between family level (interparental conflict), parent level (mother-child, father-child hostility), and child level (externalizing) variables is controlled through the application of natural experimental designs in examining proposed theoretical pathways.

The Confound of Passive Genotype-Environment Correlation in Prior Family Socialization Research

Past research examining associations between interparental conflict, hostile parenting, and children's psychological outcomes has typically been conducted with biologically related parents and children (Combs-Ronto, Olson, Lunkenheimer, & Sameroff, 2009; Shaw, Bell, & Gilliom, 2000). However, it is difficult to ascertain whether associations between family-level variables and child outcomes represent environmental effects or shared genetic influences in studies of biologically related family members (Plomin, DeFries, & Loehlin, 1977; Scarr & McCartney, 1983). In biological families, associations between a characteristic of the parent and a characteristic of the child may result from an underlying shared genetic characteristic that simultaneously influences both the trait in the parent and the trait in the child. That is, in examining the relative role of genetic and environmental factors on children's psychological symptoms, genes may not only affect the specific index of psychopathology considered (e.g., externalizing problems), but may also affect the rearing environment that children experience (e.g., interparental conflict, hostile parenting practices). This overlap of influence has been defined as genotype-environment correlation (r_{GE}). Two primary configurations of r_{GE} —evocative r_{GE} and passive r_{GE} —have been highlighted in past research. *Evocative r_{GE}* suggests that genetically influenced child characteristics (e.g., externalizing problems) evoke patterned responses such as hostility or negativity from a parent (Ge et al., 1996). *Passive r_{GE}* suggests that associations between parent and child characteristics (hostile parenting and child externalizing problems) result from common underlying genetic factors that simultaneously influence behavioral traits in both parent and child (Harold et al., 2011; Jaffe & Price, 2007; Price & Jaffee, 2008). Although both forms of r_{GE} have the potential to affect family process and child outcome associations, this article focuses specifically on passive r_{GE} and does not measure evocative r_{GE} .

Disentangling Common Genetic Factors From Family Relationship Influences on Children: Utilizing the Advantages of Natural Experimental Research Designs

Utilizing research designs that permit separation of passive r_{GE} from family relationship and child outcome associations has significant implications for understanding associations between interparental conflict, hostile parenting practices, and children's psychopathology, and thus intervention targets aimed at remediating negative family relationship influences on children. We offer two complementary study designs that provide this unique opportunity. The first study represents an adoption at birth design using a sample of families with domestic infant adoptions; the second study constitutes an adoption at conception design using a sample of families with children conceived through in vitro fertilization

(IVF). Both studies allow examination of the interplay between family relationship variables and child outcomes, for which the potential confounding influence of passive *r*GE is controlled.

Children conceived via assisted reproductive technologies may be genetically related to both parents (homologous IVF), the mother only (sperm donation), the father only (egg donation), or to neither parent (embryo donation). A further category exists in which both parents are genetically related to the child but the intrauterine environment is provided by a genetically unrelated surrogate (gestational surrogacy). Fundamentally, the research design facilitated by this study constitutes an adoption at conception design such that rearing parents who are genetically unrelated to offspring “adopt” genetic information to facilitate child birth. By comparing the association between two theoretically relevant variables (e.g., hostile parenting and child externalizing problems) across parents and children that are genetically related (mothers: homologous IVF, sperm donation, surrogacy; fathers: homologous IVF, egg donation, surrogacy) and genetically unrelated (mothers: egg and embryo donation; fathers: sperm and embryo donation), it is possible to ascertain whether the magnitude of any association between parent and child is primarily genetically mediated, environmentally mediated, or a combination of the two. For example, if an association is noted between interparental conflict and hostile parenting among genetically related parent and child groupings, but not between genetically unrelated parent and child groupings, the association is attributable to genetic mediation. Where the association is present among genetically related and genetically unrelated groupings, the association cannot be entirely genetically mediated. Furthermore, where significant associations are found among genetically unrelated family members (in which passive *r*GE is controlled), the primacy of environmental mechanisms underlying any such association is apparent.

Precisely the same opportunity is accorded through the use of an adoption at birth design. By using a sample of children adopted at birth and their genetically unrelated rearing parents, the influence of shared genes on family- and child-level variables is eliminated in examining the pattern of associations linking interparental conflict, hostile parenting, and child externalizing problems. Furthermore, the relative role of the mother–child and father–child relationships in mediating interparental conflict effects on children’s psychological adjustment across genetically related and genetically unrelated configurations is offered within the context of the two samples, thereby advancing understanding of the environmental salience of maternal as compared to paternal parenting practices on children’s psychological outcomes in the context of hostile interparental relations.

Collectively, analyses conducted in the present study benefit from a complementary cross-study approach through comparative configurations of genetically related and genetically unrelated mother–child and father–child groupings where passive *r*GE is or is not a factor in explaining associations between family and child level variables. Indeed, to our knowledge, this is the first study to incorporate an adoption at birth and an adoption at conception design to examine family relationship influences on child psychopathology. The study therefore advances a core objective outlined by Rutter, Pickles, Murray, and Eaves (2001) in testing causal hypotheses relating to environmental influences on children’s psychological outcomes: to identify environmental factors where confounding genetic factors have been removed. As a result, reinvig-

orated opportunity is offered in targeting specific environmental factors underlying family stress–child behavior links in the context of family intervention studies.

The Present Study

In the present study we examined the role of mother-to-child and father-to-child hostility as mediating mechanisms underlying links between interparental conflict and children’s externalizing behavior problems. Analyses were conducted utilizing four primary configurations across genetically related and genetically unrelated parent–child groupings. First, mothers and fathers across families who were fully genetically related (IVF homologous group) and fully genetically unrelated (adoption sample) were compared in relation to associations linking interparental conflict, hostile parenting, and child externalizing problems. Mothers and fathers provided reports on each theoretical construct, allowing examination of family processes separately by parent sex while incorporating other-parent report of child externalizing behaviors.

Second, analyses were conducted separately for mothers and fathers within families who were respectively genetically related (mothers: homologous IVF, sperm donation, surrogacy; fathers: homologous IVF, egg donation, surrogacy) and genetically unrelated (mothers: egg and embryo donation; fathers: sperm and embryo donation) to their children. These analyses are separated by parent sex in order to allow examination of processes by genetic relatedness. Once again mothers and fathers provided information regarding their own experiences of interparental conflict and hostile parenting, and the other parent provided information on children’s externalizing behavior problems. This approach was used to remedy reliance on a single reporter across each theoretical construct, potentially leading to inflated correlations as a result of self-report bias (Harold et al., 2011). When possible, identical measures were used across the two studies. Given the dearth of research in this area, we did not specify hypotheses regarding mother–father differences or evidence of passive *r*GE, but rather, we focus on testing mother/father-to-child hostility as a mediator of associations between interparental conflict and child externalizing problems across genetically related and genetically unrelated groupings.

Method

Participants and Procedures

Sample 1: Early Growth and Development Study (EGDS). Participants were a subsample ($n = 218$; 60%) of 361 linked sets of adopted children and adoptive mothers and fathers from Cohort I of the longitudinal Early Growth and Development Study (Leve et al., 2007). The study began during infancy, and the current subsample included all children who had completed the Kindergarten assessment (retention rate of 85% of children who had entered Kindergarten). Participants were recruited between 2003 and 2006 through 33 adoption agencies located in 10 states spanning the northwest, mid-Atlantic, and southwest regions of the United States. Participating agencies reflected the full range of adoption agencies in the United States: public, private, religious, secular, those favoring open adoptions and those favoring closed adoptions. The full EGDS study also includes birth parent assess-

ments; only adoptive family assessments are utilized in this report in order to match designs with the IVF study. Eligibility criteria included (1) domestic adoption placement; (2) placement occurring within 3 months postpartum; (3) nonrelative placement; (4) no known major medical conditions such as extreme prematurity or extensive medical surgeries; and (5) birth and adoptive parents able to understand English at the eighth-grade level. Data were collected by home visit assessments and online questionnaires. Questionnaires assessed a range of features including couple relationship quality, parenting, parent-child relations, life events, and parent and child psychological well-being.

For the present study, data from the fifth assessment when children were 6 years old ($M = 5.98$, $SD = 0.17$) was used so as to be comparable in age and stage of educational experience to the Cardiff IVF sample. Fifty-six percent of the children were boys. The median child age at adoption placement was 2 days. Adoptive parents were typically college educated, middle- to upper-class families (single parents and same-sex couples were excluded from the present study). Adoptive mother and adoptive father mean ages were 38 years ($SD = 5.5$) and 38 years ($SD = 5.8$), respectively, at the start of the study. The ethnicity of adoptive mothers and fathers was 91% and 90% Caucasian, 4% and 5% African American, 3% and 2% Hispanic or Latino, 1% and 1% multiracial, 1% and 1% Asian, 0% and <1% American Indian or Alaskan Native, and 1% and 1% unknown or unreported, respectively. For full demographic information, refer to Leve, Neiderhiser, Scaramella, and Reiss (2010).

Sample 2: Cardiff IVF study. Participants were families who had conceived a child through one of the assisted reproductive methods and were subsequently recruited through a number of different fertility clinics who agreed to participate (18 clinics in the United Kingdom and 1 in the United States). Families with children born between 1994 and 2002 (child age of 4 to 10 years) following successful artificial reproductive treatment from any of the five conception groups were considered eligible for the study and were contacted via mail from the clinic on behalf of the research team. For the purposes of comparison between conception groups, it was required that gamete donors and surrogates were unrelated to either rearing parent. Questionnaire measures on a range of health and mental health variables and child outcomes were assembled. All data were collected by mailed questionnaires sent to families by each participating clinic. Questionnaires assessed a range of features including sociodemographic information, parents' physical and psychological health, couple relationship quality, parent-child relations, children's life events, and children's psychological well-being.

For the present study, the sample included mothers, fathers, and their 5- to 8-year-old children (mother genetically related, $N = 536$; mother genetically unrelated, $N = 158$; father genetically related, $N = 370$; father genetically unrelated, $N = 121$). Parents reported for an approximately even proportion of boys (50.01%) and girls (49.99%) who were between 5 and 8 years old ($M = 6.47$ years, $SD = .83$), so as to be comparable in age and stage of educational experience to the EGDS adoption sample. Mother and father mean ages were 35 years ($SD = 4.73$) and 38 years ($SD = 6.58$), respectively, at the birth of the child. The number of families in each conception group for mothers ($N = 694$) was as follows: 370 homologous IVF (53.31%), 149 IVF with sperm donation (21.47%), 134 IVF with egg donation (19.31%), 24 IVF with

embryo donation (3.46%), and 17 IVF with gestational surrogacy (2.45%); for fathers ($N = 491$) it was 268 homologous IVF (54.58%), 107 IVF with sperm donation (21.79%), 92 IVF with egg donation (18.74%), 14 IVF with embryo donation (2.85%), and 10 IVF with gestational surrogacy (2.04%). The ethnicity of mothers and fathers was 91% and 89% Welsh, English, Scottish, or Irish; 2% and 1% other European; <1% and <1% African or Afro-Caribbean; 1% and <1% Bangladeshi, Indian, or Pakistani; <1% and <1% South East Asian, other ethnicity; 1% and 1% unknown; and 5% and 7% unreported.

Measures

Interparental conflict. In both studies, mothers and fathers completed the Behavior Affect Rating Scale (BARS) from the Iowa Youth and Families Project (Melby et al., 1993). Parents reported on their own hostility during the past month on a 7-point scale ranging from *never* to *always* with high scores indicating greater hostility. For the EGDS study, a 13-item hostility scale was administered from the full scale; for the Cardiff IVF study, a 4-item hostility scale was administered (items overlapped with the EGDS items). Both the BARS full scale (Harold & Conger, 1997; Leinonen, Solantaus, & Punamäki, 2002; Rhoades et al., 2011; Stover et al., 2012) and the 4-item subscale (Harold et al., 2004, 2007) have previously been used to measure interparental conflict. Items in both samples included "how often did you get angry at your partner," "how often did you criticize your partner," and "how often did you argue with your partner when you disagreed about something." Internal consistency estimates were acceptable for mothers and fathers in both studies: $\alpha = .91$ (mothers) and $\alpha = .89$ (fathers) in EGDS; $\alpha = .90$ (mothers) and $\alpha = .88$ (fathers) in Cardiff IVF. Mother and father reports of hostility were significantly correlated ($r = .36$, $p < .001$ EGDS; $r = .45$, $p < .001$ Cardiff IVF), and were summed to create a composite measure representative of overall levels of marital hostility within the family.

Parent-to-child hostility. Mothers and fathers in both studies completed the Iowa Family Interaction Rating Scales (Melby et al., 1993) about their parenting behaviors. Parents reported on their own hostile behaviors toward their child during the past month on a 7-point scale ranging from *never* to *always* with high scores indicating greater hostility. In EGDS, a 5-item hostility subscale from this measure was administered; in the Cardiff IVF study, a 4-item hostility subscale was administered. Again, items overlapped between samples and included "how often did you get angry at him/her," "how often did you criticize him/her," and "how often did you argue with him/her when you disagreed about something." Internal consistency estimates were good for mothers and fathers in both studies: $\alpha = .75$ (mothers) and $\alpha = .70$ (fathers) in EGDS, and $\alpha = .80$ (mothers) and $\alpha = .82$ (fathers) in Cardiff IVF.

Child externalizing behavior. In EGDS, mothers and fathers completed the Child Behavior Checklist (Achenbach & Rescorla, 2000). Adoptive parents reported on a range of child problem behaviors that occurred during the past 2 months on a 3-point scale ranging from *not true* to *very true* with high scores indicating greater problem behavior. Items for the 24-item externalizing subscale included "destroys things belonging to his or her family or to other children," "gets in many fights," and "physically attacks

people." Internal consistency estimates were good for mothers and fathers, respectively ($\alpha = .88$, $\alpha = .90$).

In the Cardiff IVF study, mothers and fathers completed 16 items from the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) and 6 items from the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR*; American Psychiatric Association, 2000). Parents reported on their children's conduct problems (5 items; SDQ) and oppositional disorder (6 items; *DSM-IV-TR*) on a 3-point scale ranging from *not true* to *certainly true* with higher scores indicating greater problem behavior. Scores from the two subscales were significantly correlated ($r = .69$ and $.54$ for mothers and fathers, respectively) and summed to create a child externalizing problems construct for each parent. Items from the conduct problems subscale included "often has temper tantrums" and "often lies or cheats," and the oppositional disorder subscale included "often angry/resentful" and "often argues with adults." Internal consistency estimates were good for mothers and fathers ($\alpha = .80$, $\alpha = .78$, respectively).

Residual scores were created for parent reports of externalizing behavior by partialing out the effects of several relevant covariates (e.g., EGDS study: adoption openness [contact with birth parents]; EGDS and IVF study: child ethnicity).

Statistical Analyses

Correlations between primary theoretical constructs were initially examined across the EGDS adoption and Cardiff IVF samples; analyses were then extended to examine hypothesized theoretical pathways using path analysis across genetically related and genetically unrelated parent-child configurations within and across both study designs.

Results

Correlational Analysis

Intercorrelations, means, and standard deviations are presented for fully genetically related (IVF homologous) and fully genetically unrelated (EGDS) parent-child pairs (see Table 1), and genetically related and genetically unrelated mother-child and father-child groupings across the IVF sample configurations (see Table 2). Significant associations were apparent between parents' combined report of interparental conflict and respective mother and father report of child externalizing problems for genetically

related parent-child pairs (IVF homologous; mother report $r = .13$, $p < .05$ and father report $r = .18$, $p < .01$), but not for genetically unrelated parent-child pairs (adoption sample; mother report $r = -.02$ and father report $r = .11$, $p > .10$). Significant bivariate associations were also apparent between interparental conflict and other-parent report of child externalizing for genetically unrelated mothers ($r = .27$, $p < .01$), with a trend level association for genetically related mothers ($r = .09$, $p < .10$), genetically related fathers ($r = .10$, $p < .10$), and genetically unrelated fathers ($r = .14$, $p < .10$). Interparental conflict was associated with mother-to-child hostility and father-to-child hostility for the adoption group (mother-child, $r = .17$, $p < .05$; father-child, $r = .19$, $p < .05$), the homologous IVF group (mother-child, $r = .23$, $p < .001$; father-child, $r = .33$, $p < .001$), and genetically related and genetically unrelated mothers and fathers across the IVF subgroups (genetically related mothers, $r = .33$, $p < .001$; genetically unrelated mothers, $r = .37$, $p < .001$; genetically related fathers, $r = .45$, $p < .001$; genetically unrelated fathers, $r = .58$, $p < .001$). Mother-to-child and father-to-child hostility measures were in turn associated with parent reports of child externalizing behavior problems (EGDS, r ranged from $.26$ to $.46$, $p < .001$; homologous IVF, r ranged from $.25$ to $.44$, $p < .001$; genetically related mothers, $r = .30$, $p < .001$; genetically related fathers, $r = .34$, $p < .001$; genetically unrelated mothers, $r = .34$, $p < .001$; genetically unrelated father, $r = .34$, $p < .01$). This pattern of association across all groupings was examined further in tests of the theoretical model using path analysis.

Path Analysis

Path analysis was used to examine the associations linking interparental conflict, mother-child and father-child hostility, and child externalizing problems across genetically related and genetically unrelated groupings. Model tests were conducted using *Mplus* 5.2 (Muthén & Muthén, 2007), which uses full information maximum likelihood (FIML) to estimate model parameters in the presence of incomplete or missing data. FIML produces unbiased estimates when data are missing at random (MAR). The Little's test of missing data indicated that the pattern of missingness across each study was missing completely at random (MCAR; Little, 1988), thereby meeting necessary assumptions for the application of FIML estimation procedures. Results of model tests are presented for the fully genetically related and fully genetically unrelated parent-child groupings (EGDS and IVF homologous), fol-

Table 1

Intercorrelations, Means, and Standard Deviations (SD) Among Constructs for the Homologous IVF Sample (Lower Diagonal, n = 378) and Adoption Sample (Upper Diagonal, n = 218)

Variable	1	2	3	4	5	Mean	SD
1. Interparental conflict (mother and father report)	—	0.17*	0.19*	-0.02	0.11	50.77	12.61
2. Mother-to-child hostility	0.23***	—	0.12	0.32***	0.26**	10.85	2.77
3. Father-to-child hostility	0.33***	0.38***	—	0.35***	0.46***	10.90	3.10
4. Child externalizing behavior (mother report)	0.13*	0.41***	0.36***	—	0.57***	10.05	6.27
5. Child externalizing behavior (father report)	0.18**	0.25***	0.44***	0.56***	—	9.25	6.57
Mean	24.31	11.83	11.66	1.65	1.70		
SD	6.95	3.33	3.77	0.97	0.88		

Note. IVF = in vitro fertilization. Externalizing scores for the Adoption Sample reflect raw values.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2

Intercorrelations, Means, and Standard Deviations (SD) Among Constructs for Genetically Related Mothers (Lower Diagonal, n = 536) and Genetically Unrelated Mothers (Upper Diagonal, n = 158), as well as for Genetically Related Fathers (Lower Diagonal, n = 370) and Genetically Unrelated Fathers (Upper Diagonal, n = 121)

Variable	Mothers					Fathers				
	1	2	3	Mean	SD	1	2	3	Mean	SD
1. Interparental conflict	—	0.37**	0.27*	13.21	4.22	—	0.58**	0.14 [†]	11.80	4.10
2. Parent-to-child hostility	0.33**	—	0.34**	11.80	3.25	0.45**	—	0.34*	11.43	3.88
3. Child externalizing (other parent report)	0.09 [†]	0.30**	—	1.85	0.98	0.10 [†]	0.34**	—	1.62	0.95
Mean	13.12	11.89	1.68			11.55	11.73	1.69		
SD	4.24	3.45	0.91			3.99	3.75	0.96		

[†] $p < .10$. * $p < .01$. ** $p < .001$.

lowed by specific examination of genetically related and genetically unrelated mother-child and father-child pairings within IVF families.

Interparental Conflict, Hostile Parenting, and Child Externalizing Problems: Calibrating Passive rGE Across Genetically Related and Unrelated Families

Figure 1 illustrates results for genetically related parent-child pairs (IVF homologous group; italicized coefficients) and genetically unrelated parent-child pairs (EGDS sample; nonitalicized coefficients). For both groups, significant associations were found between interparental conflict and mother-to-child hostility ($\beta = .23, p < .001$, and $\beta = .17, p < .05$) and father-to-child hostility ($\beta = .33, p < .001$, and $\beta = .19, p < .05$), which were in turn associated with mother and father report of child externalizing problems (homologous IVF: $\beta = .32, p < .001$, and $\beta = .39, p < .001$; $\beta = .24, p < .001$; EGDS: $\beta = .31, p < .001$, $\beta = .44, p < .001$, and $\beta = .34, p < .001$; $\beta = .21, p < .01$), except that in the genetically related homologous IVF group, mother-to-child hostility was not related to father report of child externalizing problems. Initial bivariate analyses suggested that a significant association existed between interparental conflict and externalizing problems for the genetically related homologous IVF group, but not for the nongenetically related adoption sample (see Table 1). Thus for this latter group, the data do not meet the criteria that Baron and Kenny

(1986) described as necessary to define a mediational pathway. However, an independent variable can have an indirect effect on a dependent variable even if the two variables are not correlated, if the independent variable influences a third, intervening variable, which in turn affects the dependent variable (MacKinnon, Krull, & Lockwood, 2000; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). If the independent and dependent variables are each related to the proposed intervening variable, the significance of the indirect association between the independent and dependent variables can then be assessed statistically. We examined whether interparental conflict had an indirect effect on parent report of externalizing problems through the intervening variables of mother-to-child and father-to-child hostility, using procedures outlined by Sobel (1982) to test the significance of all indirect effects. Significant indirect effects were noted between interparental conflict and mothers' report of externalizing problems via mother-to-child (IVF: $\beta = .07, p < .01$, EGDS: $\beta = .05, p < .05$) and father-to-child hostility (IVF: $\beta = .08, p < .01$, EGDS: $\beta = .06, p < .05$), as well as to fathers' report of externalizing problems via father-to-child hostility (IVF: $\beta = .13, p < .001$, EGDS: $\beta = .08, p < .05$), but not mother-to-child hostility (IVF: $\beta = .02, p > .10$, EGDS: $\beta = .04, p > .05$). Interestingly, when the magnitude of associations linking interparental conflict, father-to-child hostility, and children's externalizing problems are inspected relative to associations for mother-to-child hostility, associations are of consistently larger magnitude for the pathways through father-to-child hostility compared to mother-to-child hostility. As these samples derive from distinct geographic locations and represent differential sampling populations, statistical comparison of these pathways for significant differences and interpretation of differential effects based on parent sex alone would be erroneous. Comparison of parallel pathways among the IVF subgroups, however, is viable (as described below).

Interparental Conflict, Hostile Parenting, and Child Externalizing Problems: Calibrating rGE Across Genetically Related and Unrelated Parents

Figures 2A and 2B illustrates results for genetically related (italicized coefficients) and genetically unrelated (nonitalicized coefficients) mother-child and father-child pairings in the IVF sample. For genetically related mothers and children, significant paths were found between interparental conflict and mother-child hostility ($\beta = .33, p < .001$), and between mother-child hostility

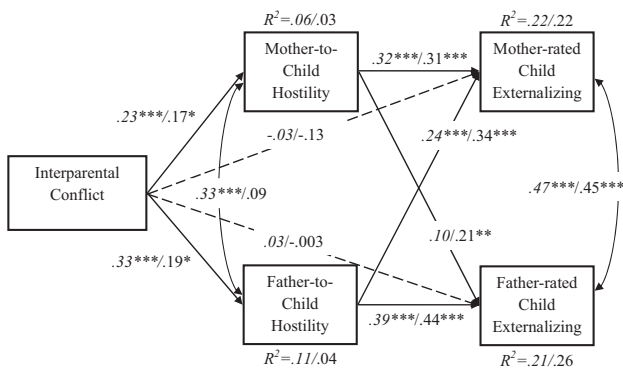


Figure 1. Model results for homologous in vitro fertilization (IVF) sample (before the forward slash symbol, in italic type) and the adoption sample (after the slash). * $p < .05$. ** $p < .01$. *** $p < .001$.

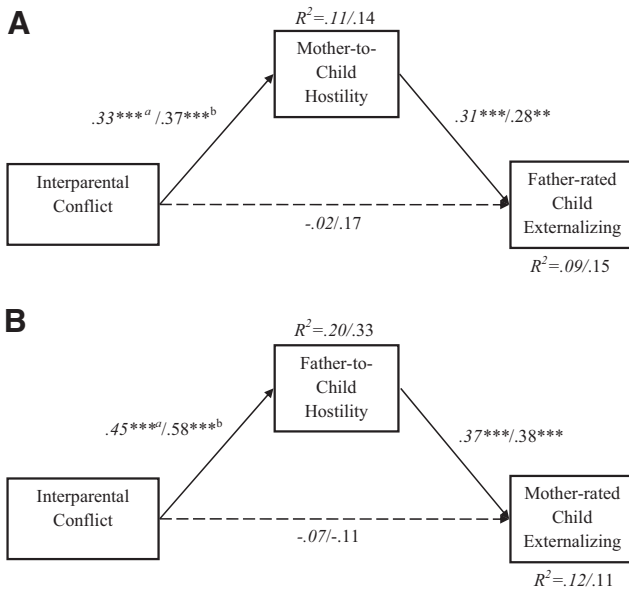


Figure 2. Model results (A) for genetically related mothers (before the forward slash symbol, in italic type) and genetically unrelated mothers (after the slash) and (B) for genetically related fathers (before the slash, in italic type) and genetically unrelated fathers (after the slash) ** $p < .01$. *** $p < .001$. ^a Significant difference across genetically related mothers versus genetically related fathers. ^b Significant difference across genetically unrelated mothers versus genetically unrelated fathers.

and child externalizing problems ($\beta = .31, p < .001$). This pattern of effects was also apparent for genetically related father-child pairings ($\beta = .45$ and $.37, p < .001$). For genetically unrelated mother-child and father-child pairings, this pattern of indirect association was again replicated (mothers: $\beta = .37$ and $.28, p < .01$; fathers: $\beta = .58$ and $.38, p < .001$). Significant indirect effects were found from interparental conflict to father-rated externalizing problems via mother-to-child hostility (genetically related mothers: $\beta = .10, p < .001$, genetically unrelated mothers: $\beta = .10, p < .05$), as well as to mother-rated externalizing problems via father-to-child hostility (genetically related mothers: $\beta = .17, p < .001$; genetically unrelated mothers: $\beta = .22, p < .01$). Because genetically related and genetically unrelated mother-child and father-child pairings constitute independent groupings, it is possible to examine if specific associations by group membership are significantly different from each other. Comparisons between specific pathways of theoretical interest were conducted using stacked modeling procedures across genetically related and genetically unrelated parent-child groupings. This procedure involves comparing the chi-square statistics derived from a model in which a specific pathway is treated as equivalent across groups to that derived from a model where the path in each subgroup model (e.g., genetically related vs. genetically unrelated mother- and father-child pairings) is allowed to freely vary. The difference in the chi-square statistics provides an estimate of the statistical significance of any genetically related versus unrelated based difference in the specific pathways considered. The association between interparental conflict and parent-to-child hostility was significantly stronger for genetically related fathers compared to genetically

related mothers, $\Delta\chi^2(1) = 5.13, p < .05$, and for genetically unrelated fathers compared to genetically unrelated mothers, $\Delta\chi^2(1) = 4.89, p < .05$.

Each of the models tested across genetically related and genetically unrelated parent-child groupings represent fully saturated statistical models. Fit statistics therefore suggest a perfect fit by way of artifact between the proposed theoretical model and the underlying pattern of variance and covariance observed between each theoretical variable, $\chi^2(0) = 0.00$, goodness-of-fit index (GFI) = 1.00, and are thus not reported in the figures.

Discussion

The present study utilized two complementary genetically sensitive research designs to examine the role of the mother-child and father-child relationships as mediating variables underlying links between interparental conflict and children's externalizing problems. While past research in this area is well established, findings from the present study advance understanding of the interplay between these family relationships on children's behavior problems in three important respects.

Examining the Role of Passive Genotype-Environment Correlation

First, associations between interparental conflict, parent-to-child hostility, and child externalizing problems were examined utilizing two research designs that respectively allow disaggregation of the role of passive rGE underlying associations linking family relationship variables and childhood psychopathology. Studies that involve biologically related family members are limited in allowing understanding of the relative role of genetic and/or environmental-based underpinnings of family relationship influences on child psychopathology in that children share 50% of their genes with each biological parent, thereby potentially inflating associations between family- and child-level variables that share common phenotypic elements (interparental conflict, parent-to-child hostility, child externalizing problems).

The present study utilizes a sample of children adopted at birth and a sample of children conceived through IVF whereby rearing parents may be categorized as genetically related or genetically unrelated to their children. Therefore, associations between the family relationship and child outcome variables may or may not be confounded by passive rGE based on genetic relatedness across parent-child groupings. For fully genetically related parents and children (IVF homologous group), significant associations were noted between interparental conflict, mother-to-child and father-to-child hostility, and child externalizing problems. This was also the case for fully genetically unrelated parent-child groupings (adoption sample). Because associations for the homologous IVF group are confounded by passive rGE , we cannot conclude that the hypothesized mediating pathways through mother-child and father-child hostility offer a salient environmental transmission mechanism relative to underlying genetic influences, replicating challenges inherent to interpreting associations in samples of biologically related parents and children in past research. However, for the adoption sample, the role of passive rGE underlying associations between family relationship variables and child externalizing problems is controlled as children and parents are not genet-

ically related, thereby adding confidence that the transmission mechanism linking interparental conflict and child externalizing is explained by the environmental salience of maternal and paternal parenting practices across genetically related and genetically unrelated families.

Analyses focusing specifically on mother–child and father–child hostility underlying links between interparental conflict and child externalizing among genetically related and genetically unrelated parents within families confirm this pattern of results. For both genetically related and genetically unrelated mother–child and father–child pairs, hostile parenting mediated associations between interparental conflict and child externalizing problems. As the pattern of results for genetically unrelated parent–child pairings is once again free of the potentially confounding influence of passive *rGE*, we may be more confident that the mother–child and father–child relationships serve as environmental transmission mechanisms underlying the interparental conflict–child externalizing link. Furthermore, the pattern of significant differences across father–child and mother–child groupings suggest that paternal parenting practices in the context of interparental conflict may be a distinct environmental influence on children’s externalizing behaviors relative to maternal parenting practices.

The Relative Role of Father-Child and Mother-Child Relationships

Building on this pattern of mother–father comparisons, a second primary contribution made by the present study is that analyses are conducted separately across genetically related and genetically unrelated mother–child and father–child configurations, thereby remedying the dearth of evidence relating to father–child versus mother–child influences on childhood psychopathology (Ramchandani & Psychogiou, 2009). While both the mother–child and father–child relationships offer indirect mechanisms through which interparental conflict effects on child externalizing problems are explained, associations between interparental conflict and parent-to-child hostility were significantly stronger for fathers compared to mothers across genetically related and genetically unrelated parent–child groupings. Taken together, results suggest that across mother–child and father–child configurations, the father–child relationship consistently offers an indirect mechanism through which interparental conflict affects child externalizing problems. This finding adds to emerging research suggesting that the father–child relationship is at least as important as the mother–child relationship in accounting for family process influences on children’s psychopathology (Shelton & Harold, 2008; Stover et al., 2012). Furthermore, the significantly stronger associations linking interparental conflict and hostile parenting practices for genetically related fathers compared to genetically related mothers and for genetically unrelated fathers compared to genetically unrelated mothers, suggest that the spillover mechanism may operate to a greater degree within the context of the father–child relationship relative to the mother–child relationship. In addition, these effects may be explained as more than shared genetic influences. This finding is distinctly noteworthy given the historical paucity of research disaggregating mother–child and father–child relationship influences on childhood psychopathology.

Interparental Conflict, Hostile Parenting, and Child Adjustment

Third, the present study advances understanding of the interplay among interparental conflict, hostile parenting, and child adjustment by examining associations among an age group of children somewhat underrepresented in past research in this area—children experiencing the early primary school years. Evidence suggests that children who do better at school come from homes that are quieter, less chaotic, and where family relationships are marked by low levels of conflict and volatility (Hanscombe, Haworth, Davis, Jaffee, & Plomin, 2011; Harold et al., 2007). Indeed, according to Hanscombe et al. (2011), children who live in households where there are high levels of family chaos and unpredictability have lower expectations, evidence a lack of persistence, are more likely to withdraw from academic challenges, and struggle with basic skills (e.g., reading). Although family relationship influences on children’s academic attainment during late childhood and early adolescence remain critically important, relatively little is known about the mechanisms through which specific family process factors affect children during early childhood to early middle childhood (i.e., child age 2–7; Stover et al., 2012). Furthermore, little is known about the relative role of family relationship (environmental) influences on children’s behavioral outcomes at this age at which shared genetic factors are controlled. Findings highlight the salience of both the mother–child and father–child relationships in the context of interparental conflict on children’s behavioral outcomes during this important stage of development. Interventions that target not only the mother–child relationship, but also the father–child relationship, may thus promote more adaptive educational trajectories for children by remediating behavioral disruptions borne out of systemic family level disruptions indicated by hostile interparental relations and associated negative parenting practices.

Limitations and Recommendations for Future Research

Although a primary strength of the current analyses are the adoption and IVF research designs that allow passive *rGE* to be disentangled from associations underlying family relationship and child outcome variables, this does not preclude the possibility of evocative *rGE* as an explanatory mechanism underlying such associations. Evocative *rGE* has been evidenced in samples of genetically unrelated parents and children (Ge et al., 1996), and it is thus conceivable that inherited characteristics of the child influenced the parenting and couple conflict processes measured in the current study. Future research is needed to simultaneously examine passive and evocative *rGE* within a single study. In addition, other limitations should be noted. First, reliance on parent-only reports of each primary theoretical construct would ordinarily limit conclusions relating to the observed magnitude of association across constructs. To militate against this limitation, we used a cross-rater approach across all models tested such that mothers and fathers reported on their own relationship experiences and parenting behavior with the other parents’ report of child externalizing problems in each instance. Second, cross-sectional data were used in the present study, thereby precluding cause-and-effect conclusions. However, the pattern and direction of associations hypoth-

esized in the proposed theoretical model are consistent with past longitudinal studies utilizing genetically related parents and children (e.g., Grych, Harold, & Miles, 2003; Harold & Conger, 1997; Krishnakumar & Buehler, 2000). Future studies could examine the role of child gender to further unpack these effects.

Another limitation is that while the utilization and advantages of two complementary genetically sensitive research designs comprise the present study, interpretive challenges are posed because the respective adoption and IVF designs derive from two geographically distinct regions. In addition, although both studies used the same core measures of interparental and parenting hostility, a smaller subset of items was used in the Cardiff IVF study and the two studies used different measures of externalizing problems (Note: Supplementary analyses were conducted comparing results from the full EGDS measures and those using a parallel subset of items in the EGDS study to those available in the IVF study. No differences in the pattern of results reported were observed.) Measurement reliability and core findings, therefore, are consistent across both studies, with an evident pattern of paternal versus maternal magnitude differences in association apparent across both the fully genetically related and fully genetically unrelated family groupings. These findings are further replicated, with significant differences across genetically related and genetically unrelated fathers compared to mothers, thereby lending confidence to the pattern of association noted across studies and specified parent-child configurations. Indeed, as Rutter (2007) outlined, greater confidence is achieved when there is convergence of findings across studies using a complement of research designs.

Limitations notwithstanding, the present study illustrates the unique opportunity offered by using a complement of genetically sensitive research designs in disentangling passive genetic and environmental influences underlying family relationship influences on child externalizing problems. This study thus advances a core objective outlined by Rutter et al. (2001) in testing causal hypotheses relating to environmental influences on children's psychological outcomes: to identify environmental factors in which confounding genetic factors have been removed. Findings support the further study of prevention and intervention initiatives that target multiple domains of the family environment in ameliorating childhood psychopathology, and further suggest that programs aiming to remediate the rising rates of externalizing problems across childhood and adolescence (Ford, 2008) would benefit from systematic assessment of mothers' and fathers' parenting in the context of disrupted interparental relations.

References

- Achenbach, T. M., & Rescorla, L. A. (2000). *Manual for the ASEBA preschool forms & profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182. doi:10.1037/0022-3514.51.6.1173
- Combs-Ronto, L. A., Olson, S. L., Lunkenheimer, E. S., & Sameroff, A. J. (2009). Interactions between maternal parenting and children's early disruptive behavior: Bidirectional associations across the transition from preschool to school entry. *Journal of Abnormal Child Psychology, 37*, 1151-1163. doi:10.1007/s10802-009-9332-2
- Cowan, P. A., & Cowan, C. P. (2002). Interventions as tests of family systems theories: Marital and family relationships in children's development and psychopathology. *Development and Psychopathology, 14*, 731-759. doi:10.1017/S0954579402004054
- Cummings, E. M., & Davies, P. T. (2002). Effects of marital conflict on children: Recent advances and emerging themes in process-oriented research. *Journal of Child Psychology and Psychiatry, 43*, 31-63. doi:10.1111/1469-7610.00003
- Erel, O., & Burman, B. (1995). Interrelatedness of marital relations and parent-child relations: A meta-analytic review. *Psychological Bulletin, 118*, 108-132. doi:10.1037/0033-2909.118.1.108
- Ford, T. (2008). Practitioner review: How can epidemiology help us plan and deliver effective child and adolescent mental health services? *Journal of Child Psychology and Psychiatry, 49*, 900-914. doi:10.1111/j.1469-7610.2008.01927.x
- Ge, X., Conger, R. J., Cadoret, R., Neiderhiser, J. M., Yates, W., Troughton, E., & Stewart, M. A. (1996). The developmental interface between nature and nurture: A mutual influence model of child antisocial behavior and parent behaviors. *Developmental Psychology, 32*, 574-589. doi:10.1037/0012-1649.32.4.574
- Goldberg, W. A., & Easterbrooks, M. A. (1984). The role of marital quality in toddler development. *Developmental Psychology, 20*, 504-514. doi:10.1037/0012-1649.20.3.504
- Goodman, R. (1997). The Strengths and Difficulties Questionnaire: A research note. *Journal of Child Psychology and Psychiatry, 38*, 581-586. doi:10.1111/j.1469-7610.1997.tb01545.x
- Grych, J. H., Fincham, F. D., Jouriles, E. N., & McDonald, R. (2000). Interparental conflict and child adjustment: Testing the mediational role of appraisals in the cognitive-contextual framework. *Child Development, 71*, 1648-1661. doi:10.1111/1467-8624.00255
- Grych, J. H., Harold, G. T., & Miles, C. J. (2003). A prospective investigation of appraisals as mediators of the link between inter-parental conflict and child adjustment. *Child Development, 74*, 1176-1193. doi:10.1111/1467-8624.00600
- Hanscombe, K. B., Haworth, C. M. A., Davis, O. S. P., Jaffee, S. R., & Plomin, R. (2011). Chaotic homes and school achievement: A twin study. *Journal of Child Psychology and Psychiatry, 52*, 1212-1220. doi:10.1111/j.1469-7610.2011.02421.x
- Harold, G. T., Aitken, J. J., & Shelton, K. H. (2007). Inter-parental conflict and children's academic attainment: A longitudinal analysis. *Journal of Child Psychology and Psychiatry, 48*, 1223-1232. doi:10.1111/j.1469-7610.2007.01793.x
- Harold, G. T., & Conger, R. D. (1997). Marital conflict and adolescent distress: The role of adolescent awareness. *Child Development, 68*, 333-350.
- Harold, G. T., Rice, F., Hay, D. F., Boivin, J., van den Bree, M., & Thapar, A. (2011). Familial transmission of depression and antisocial behavior symptoms: Disentangling the contribution of inherited and environmental factors and testing the mediation role of parenting. *Psychological Medicine, 41*, 1-6. doi:10.1017/S0033291710001753
- Harold, G. T., Shelton, K. H., Goeke-Morey, M. C., & Cummings, E. M. (2004). Marital conflict, child emotional security about family relationships and child adjustment. *Social Development, 13*, 350-376. doi:10.1111/j.1467-9507.2004.00272.x
- Jaffee, S. R., & Price, T. S. (2007). Gene-environment correlations: A review of the evidence and implications for prevention of mental illness. *Molecular Psychiatry, 12*, 432-442. doi:10.1038/sj.mp.4001950
- Katz, L. F., & Gottman, J. M. (1996). Spillover effects of marital conflict: In search of parenting and coparenting mechanisms. *New Directions in Child Development, 74*, 57-76. doi:10.1002/cd.23219967406
- Krishnakumar, A., & Buehler, C. (2000). Interparental conflict and parenting behaviors: A meta-analytic review. *Family Relations: An Inter-*

- disciplinary Journal of Applied Family Studies*, 49, 25–44. doi:10.1111/j.1741-3729.2000.00025.x
- Lamb, M. E. (2004). *The role of the father in child development* (4th ed.). Hoboken, NJ: Wiley.
- Leinonen, J. A., Solantaus, T. S., & Punamaki, R. (2002). The specific mediating paths between economic hardship and the quality of parenting. *International Journal of Behavioral Development*, 26, 423–435. doi:10.1080/01650250143000364
- Leve, L. D., Neiderhiser, J. M., Ge, X., Scaramella, L. V., Conger, R. D., Reid, J. B., . . . , Reiss, D. (2007). The Early Growth and Development Study: A prospective adoption design. *Twin Research and Human Genetics*, 10, 84–95. doi:10.1375/twin.10.1.84
- Leve, L. D., Neiderhiser, J. M., Scaramella, L. V., & Reiss, D. (2010). The Early Growth and Development Study: Using the prospective adoption design to examine genotype–environment interplay [Special section]. *Behavior Genetics*, 40, 306–314. (Reprinted from 2008 *Acta Psychologica Sinica*, 40, 1106–1115.)
- Lipscomb, S. T., Leve, L. D., Harold, G. T., Neiderhiser, J. M., Shaw, D. S., Ge, X., & Reiss, D. (2011). Trajectories of parenting and child negative emotionality during infancy and toddlerhood: A longitudinal analysis. *Child Development*, 82, 1661–1675. doi:10.1111/j.1467-8624.2011.01639.x
- Little, T. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, 83, 1198–1202. doi:10.1080/01621459.1988.10478722
- MacKinnon, D. P., Krull, J. L., & Lockwood, C. M. (2000). Equivalence of the mediation, confounding, and suppression effect. *Prevention Science*, 1, 173–181. doi:10.1023/A:1026595011371
- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test the significance of the mediated effect. *Psychological Methods*, 7, 83–104. doi:10.1037/1082-989X.7.1.83
- Melby, J. N., Conger, R. D., Book, R., Rueter, M., Lucy, L., Repinski, D., . . . , Stavros, T. (1993). *The Iowa Family Interaction Rating Scales* (2nd ed.). Unpublished manuscript, Iowa State University Center for Family Research in Rural Mental Health.
- Muthén, L., & Muthén, B. (2007). *Mplus user's guide* (5th ed.). Los Angeles, CA: Muthén and Muthén.
- Plomin, R., DeFries, J. C., & Loehlin, J. C. (1977). Genotype–environment interaction and correlation in the analysis of human behavior. *Psychological Bulletin*, 84, 309–322. doi:10.1037/0033-2909.84.2.309
- Price, T. S., & Jaffee, S. R. (2008). Effects of the family environment: Gene–environment interaction and passive gene–environment correlation. *Developmental Psychology*, 44, 305–315. doi:10.1037/0012-1649.44.2.305
- Ramchandani, P., & Psychogiou, L. (2009). Paternal psychiatric disorders and children's psychosocial development. *Lancet*, 374, 646–653. doi:10.1016/S0140-6736(09)60238-5
- Rhoades, K. A., Leve, L. D., Harold, G. T., Neiderhiser, J. M., Shaw, D. S., & Reiss, D. (2011). Longitudinal pathways from marital hostility to child anger during toddlerhood: Genetic susceptibility and indirect effects via harsh parenting. *Journal of Family Psychology*, 25, 282–291. doi:10.1037/a0022886
- Rutter, M. (2007). Proceeding from observed correlation to causal inference. The use of natural experiments. *Perspectives on Psychological Science*, 2, 377–395. doi:10.1111/j.1745-6916.2007.00050.x
- Rutter, M., Pickles, A., Murray, R., & Eaves, L. (2001). Testing hypotheses on specific environmental causal effects on behavior. *Psychological Bulletin*, 127, 291–324. doi:10.1037/0033-2909.127.3.291
- Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype greater than environment effects. *Child Development*, 54, 424–435.
- Shaw, D. S., Bell, R. Q., & Gilliom, M. (2000). A truly early starter model of antisocial behavior revisited. *Clinical Child and Family Psychology Review*, 3, 155–172. doi:10.1023/A:1009599208790
- Shelton, K. H., & Harold, G. T. (2008). Interparental conflict, negative parenting, and children's adjustment: Bridging links between parent's depression and children's psychological distress. *Journal of Family Psychology*, 22, 712–724. doi:10.1037/a0013515
- Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), *Sociological methodology* (pp. 290–312). Washington DC: American Sociological Association. doi:10.2307/270723
- Stover, C. S., Connell, C., Leve, L. D., Neiderhiser, J. M., Shaw, D. S., Scaramella, L., . . . , Reiss, D. (2012). Fathering and mothering in the family system: Linking marital hostility and aggression in adopted toddlers. *Journal of Child Psychology and Psychiatry*, 53, 401–409. doi:10.1111/j.1469-7610.2011.02510.x
- Towle, C. (1931). The evaluation and management of marital situation in foster homes. *American Journal of Orthopsychiatry*, 1, 271–283. doi:10.1111/j.1939-0025.1931.tb04821.x

Received December 23, 2011

Revision received August 29, 2012

Accepted September 10, 2012 ■

E-Mail Notification of Your Latest Issue Online!

Would you like to know when the next issue of your favorite APA journal will be available online? This service is now available to you. Sign up at <http://notify.apa.org/> and you will be notified by e-mail when issues of interest to you become available!