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The Relationship between Parent-Child Conflict and Adolescent Antisocial Behavior: Confirming Shared Environmental Mediation

Ashlea M. Klahr[1], **Martha A. Rueter**[2], **Matt McGue**[3], **William G. Iacono**[3], and **S. Alexandra Burt**[1]

[1]Department of Psychology, Michigan State University, East Lansing, MI

[2]Department of Family Social Science, University of Minnesota, Minneapolis, MN

[3]Department of Psychology, University of Minnesota, Minneapolis, MN

Abstract

Prior studies have indicated that the relationship between0020parent-child conflict and adolescent antisocial behavior is at least partially shared environmental in origin. However, all available research on this topic (to our knowledge) relies exclusively on parent and/or adolescent informant-reports, both of which are subject to various forms of rater bias. As the presence of significant shared environmental effects has often been attributed to rater bias in the past (Baker, Jacobsen, Raine, Lozano, & Bezdjian, 2007; Bartels et al., 2004; Bartels et al., 2003; Hewitt, Silberg, Neale, & Eaves, 1992), it would be important to confirm that findings of shared environmental mediation persist when even examining (presumably more objective) observer-ratings of these constructs. The current study thus examined the origins of the relationship between parent-child conflict and adolescent acting-out behavior, as measured using both observer-ratings and various informant-reports. Participants included 1,199 adopted and non-adopted adolescents in 610 families from the Sibling Interaction and Behavior Study (SIBS). Results indicated that parent-child conflict consistently predicts acting-out behavior in adopted adolescents, and moreover, that this association is equivalent to that in biologically-related adolescents. Most importantly, these findings did not vary across parent- and adolescent-reported or observer-ratings of parent-child conflict and acting-out behavior. Such findings argue strongly against rater bias as a primary explanation of shared environmental mediation of the association between parent-child conflict and adolescent antisocial behavior.

Keywords

Adoption study; Parenting; Antisocial behavior; Observer-ratings; Shared environment

Within behavioral genetic research designs, the environment is decomposed into two sources of variance, the shared and the non-shared environment. The shared environment is that part of the environment which is common to individuals living within the same family and acts to increase sibling similarity regardless of the proportion of genes shared. By contrast, the non-shared environment is composed of those environmental experiences which differentiate members of the same family and acts to decrease their similarity. Although early work focused primarily on the non-shared environment, there has been a recent resurgence of interest in the shared environment. Indeed, Burt (2009) argued that shared environmental influences on child and adolescent psychopathology are typically

moderate in magnitude, and unlike non-shared environmental influences, they appear to persist over time (at least up through late adolescence; see Burt, McGue, & Iacono, 2010).

Perhaps most importantly, however, prior empirical studies have strongly suggested that shared environmental influences are identifiable sources of environmental influence as well (Burt, 2009; Burt, McGue, & Iacono, 2009). One such identifiable source of shared environmental influence may be parenting (McGue, Sharma, & Benson, 1996; Pike, McGuire, Hetherington, Reiss, & Plomin, 1996). As an example, Burt, Krueger, McGue, & Iacono (2003) examined a sample of more than 700 11 year-old twin pairs and their mothers and found that the shared environmental influences contributing to parent-child conflict accounted for roughly 12% of the total variance in child externalizing disorders. Subsequent longitudinal research with these families further suggested that this association persists over time, such that parent-child conflict at age 11 influences the development of externalizing pathology at age 14 partially via shared environmental mechanisms (Burt, McGue, Krueger, & Iacono, 2005). By contrast, specific sources of variance within the non-shared environment have proven very difficult to identify (Rutter, Silberg, O'Connor, & Simonoff, 1999; Turkheimer & Waldron, 2000), typically accounting for 2% or less of the outcome variance even in cross-sectional data.

In one sense, these findings are not at all surprising. A great deal of child developmental work has also found that parenting is related to child outcomes (see Steinberg, 2001 for a review), an association that is often assumed to be environmental in origin. However, the vast majority of child development studies have failed to meaningfully rule out genetic explanations for their findings, leaving the actual origin of the association unclear. Twin studies represent an improvement on such designs (at least in terms of more definitively identifying etiology). Importantly, however, twin studies also have significant limitations when attempting to identify shared environmental influences in particular. Within biological families (such as those used in most child development work and in child-based twin designs), shared environmental influences are confounded by passive gene-environment correlations. Put differently, what appear to be the effects of the shared environment may in fact be a function of common parent-child genes, since biological parents who exhibit high levels of antisocial behavior are more likely to provide their children with both genes of risk for conduct problems and a deleterious rearing environment (Jaffee, Belsky, Harrington, Caspi, & Moffit, 2006). To the extent that parent-child conflict is a function of the parent's genetically-influenced tendency towards antisocial behavior then, the association between parent-child conflict and child antisocial behavior could thus be a reflection of common genes rather than the direct effects of shared-environmental influences (Neiderhiser et al., 2004, Reiss et al., 2001).

Fortunately, adoption studies provide an ideal alternative for more definitively identifying shared environmental influences. Because adopted children do not share segregating genetic material with their adoptive parents, shared genes are necessarily unable to confound shared environmental mediation. There are a handful of adoption studies examining the association between parent-child conflict and adolescent externalizing problems. Burt, McGue, Krueger, & Iacono (2007) found evidence that the association between parent-child conflict and adolescent delinquency was similar in adoptive and non-adoptive families (*r*s were roughly .2–.3), results that strongly support prior findings of cross-sectional shared environmental mediation of this association because, as mentioned above, the association cannot be accounted for by genes shared between parents and adopted children. Glover et al. (2010) found similar results within a sample of adopted and biological children (ages 4–16). These adoption study findings also appear to persist longitudinally. Klahr, McGue, Iacono, & Burt (2011) found that parent-child conflict predicts conduct problems in adopted adolescents over time. These results collectively suggest that the relationship between parent-child

conflict and conduct problems is indeed shared-environmental in origin, rather than a passive gene-environment correlation in disguise.[1]

That said, one as yet unaddressed concern with prior adoption (and even twin) studies of the association between parent-child conflict and adolescent antisocial behavior is that all available research on this topic (to our knowledge) uses parent and/or adolescent reports of conduct problems and the parent-child relationship, each of which are subject to various forms of rater bias (as reviewed in Burt, 2009; De Los Reyes & Kazdin, 2005). For instance, because antisocial acts are often illegal, adolescents may not be fully forthcoming about their antisocial behaviors. By contrast, parents may not have full knowledge of their adolescent's behaviors (behaviors that their children are highly motivated to conceal), causing them to unintentionally underreport antisocial acts. Consistent with the latter possibility (though not the former), available data indicate that adolescents report twice as many instances of antisocial behavior as do their parents (Verhulst & van der Ende, 2006). Alternately, parents may seek to represent their own parenting style and/or their child's behavior in a more favorable light due to societal pressures or personal expectations (Morsbach & Prinz, 2006). Parents may also have limited knowledge regarding normative adolescent behavior, and thus may interpret behaviors as more or less deviant accordingly. Finally, all informant-reports may be influenced by the rater's own personality and/or psychological functioning, or by a very recent and salient event (i.e., recency effects; Paulhus & Vaizre, 2007).

One way to circumvent the possibility of rater bias is to use observer-ratings of behaviors. In observer-ratings, children are typically rated in comparison to other children in the same developmental stage, thereby ensuring that children are evaluated in reference to normative behaviors. Moreover, coders receive extensive manual-based training to reach and then maintain reliability with other coders (ensuring that all coders are coding the same way and thereby reducing the biases introduced by individual coders). Scores obtained this way thus allow researchers to obtain data that are largely (though, of course, not entirely) free of personological interference and recency effects. Given this, should shared environmental mediation of the association between parent-child conflict and adolescent antisocial behavior persist to observer-ratings, it would argue against rater bias as a primary explanation for prior findings.

That said, observer-ratings also have limitations. In particular, they often focus on very thin slices of behavior, and thus may not be as representative of an individual's typical behavior as would informant-reports. Findings obtained using observer-ratings and informant-reports, although each imperfect as measurement strategies, can thus serve to complement one another. Indeed, should evidence of shared environmental mediation between parent-child conflict and adolescent antisocial behavior be consistent across the two strategies, it would strongly suggest that these effects are legitimate ones.

Although there is now good evidence of shared environmental influences on observer-rated antisocial behavior per se (see Burt, Klahr, Reuter, McGue, & Iacono, in press), we know of no genetically-informed study that has examined whether parent-child conflict accounts for (some of) this shared environmental variance using observer-rated data. The current study sought to do just this, examining the association between parent- and adolescent-reported and observer-rated parent-child conflict and acting-out behaviors in a sample of adopted and non-adopted adolescents. In this way, we sought to exclude rater bias as a primary

[1]Klahr et al. (2011) also found that parent-child conflict predicted the development of conduct problems over time, but not vice versa. These results suggest that the relationship between parent-child conflict and conduct problems cannot be accounted for by evocative rGE, further bolstering claims that this relationship is indeed shared-environmental in origin.

explanation for prior findings of shared environmental mediation. Evidence of shared environmental mediation in the current study would constitute particularly strong evidence for the identifiability of the shared environment, given both the very different assessment strategies (e.g., informant-reports of conflict versus a 10-minute slice of observation) as well as the fact that observer-ratings should be largely free from rater bias. Should our predictions hold, it would thus provide some of the strongest available evidence for prior arguments that the shared environment is an *identifiable* source of environmental variance in child and adolescent psychopathology.

METHODS

PARTICIPANTS

Participants were 1,199 adopted and non-adopted adolescents in 610 families who participated in the intake assessment of the Sibling Interaction and Behavior Study (SIBS), a population-based, longitudinal study of adopted and non-adopted adolescent siblings and their parents in the state of Minnesota. Adoptive families living in the Twin Cities greater metropolitan area were contacted based on records from the three largest adoption agencies in Minnesota (averaging between 600 and 700 placements a year, many of which were international), and were selected to have 1) an adopted adolescent placed as an infant and between the ages of 11 and 19 years at the time of the first assessment, and 2) a second non-biologically related adolescent sibling falling within the same approximate age range (no more than 5 years apart in age from the other sibling). Non-adopted siblings were selected to have sex and age composition similar to that of the adopted siblings, but were otherwise not matched so as to obtain representative samples of both family-types (Stoolmiller, 1998). Additional eligibility requirements for both family types included living within driving distance of the Minneapolis-based laboratory and the absence of cognitive or physical handicaps that would interfere with completion of the daylong assessment (McGue et al., 2007).

Among eligible families, 63% of adoptive and 57% of non-adoptive families participated in the study. There were no significant differences between participating and non-participating adoptive families in parental education, occupational status, and rate of divorce (McGue et al., 2007). Moreover, there were no significant differences between participating and non-participating non-adoptive parents in terms of paternal education, paternal and maternal occupational status, or marital dissolution. However, participating mothers were significantly more likely to have a college degree (44%) than were non-participating mothers (29%).

Among participating families, adoptive parents were less likely than non-adoptive parents to be diagnosed with lifetime occurrence of drug abuse or dependence, but there were no significant differences in the rates of major depressive disorder, nicotine dependence, antisocial personality disorder, or alcohol dependence between adoptive and non-adoptive parents (see McGue et al., 2007 for more information). However, adoptive parents typically had a higher occupational status than did non-adoptive parents (2.5 versus 3.2, respectively; occupational status was coded on the 6-point Hollingshead scale with 1 reflecting professional/managerial classes) and were more likely to have a college education (64% versus 44%, respectively). However, there were no significant differences in lifetime rates of parental divorce between adoptive and non-adoptive families (20.1% of adoptive families and 19.9% of biological families, $p = .91$), nor in mean parental age at divorce (31.4 years for adoptive parents and 33.0 years for biological parents, $p=.20$). Of note, this somewhat low divorce rate is likely a function of the study's requirement that siblings share both parents (i.e., are full biological siblings, or "full" adoptive siblings). In particular, requiring

that parents remain together long enough to have at least two children together inadvertently selects for marital stability.

The current sample consisted of the 406 adoptive and 204 non-adoptive families where at least one of the two adolescents was younger than 19 (n=1,199 adolescent siblings, 604 mothers, and 541 fathers from 610 families). Participants aged 19 or 20 (n=23) were excluded from the present sample because they typically no longer resided with their family of origin. Some of the adoptive families (n=124) also contained a non-adopted child who was biologically related to the parents, but not to the adopted sibling. Roughly 38% of the sample consisted of opposite-sex sibling pairs. Adolescent participants ranged in age from 10 to 18 years (average 14), while mothers and fathers had a mean age of 46.57 and 48.23 years, respectively. A little over half of the sample was female (55%). Approximately 95% of parents, and thus the non-adopted adolescents, were of Caucasian origin, reflecting the ethnic composition of the Minnesota population at the time they were born. However, due to predominantly international adoptions in Minnesota, the adopted adolescents were 67% Asian-American, 21% Caucasian, 2% African-American, 2% East Indian, 3% Hispanic/Latino, 1% South or Central American Indian, 4% mixed race, and 0.1% other ethnicities.

MEASURES

Observer-ratings—Observer-ratings were based on two 5-minute videotaped family interactions. The interactions took place with family members seated around a dining table, in a room decorated to look like a living room/dining room (as detailed in Rueter, Keyes, Iacono, & McGue, 2009). The video camera was inconspicuously located in a bookcase, although family members were aware that they were being videotaped. For the first task, families were presented with a novel object, a Rorschach inkblot (Exner, 2002), and asked to come to a consensus about what the inkblot resembled. For the second task, families were presented with a moral dilemma (Kohlberg, 1981). In the story, a man's wife has been diagnosed with a fatal disease but he cannot afford to buy the only drug that can save her life. Families were asked to work together to decide: (a) whether the man should steal the drug for his wife, and (b) whether he should also steal the drug for a stranger in need.

Trained observers viewed the family interaction tasks described above and globally rated twelve family interaction characteristics using the Sibling Interaction and Behavior Study Rating Scales (SIBSRS), adapted from the well-known Iowa Family Interaction Rating Scales (IFIRS; Melby & Conger, 2001). Each family member's behavior toward each of the other family members was rated using a 9-point scale ranging from 1 (*not at all characteristic of the person*) to 9 (*mainly characteristic of the person*). Each observer received approximately 100 hours of training and was required to pass written and observation examinations before viewing videotapes. Observers attended biweekly coder meetings for ongoing training and to prevent "rater drift." Observer reliability was assessed by randomly assigning 25% of all tapes to be rated by a second observer, and then comparing the primary and secondary ratings using intraclass correlations. Inter-rater intraclass correlations for the scales examined in this study had a mean of .71 (with a range of .56 for the Angry Coercion scale to .82 for the Antisocial scale).

Observer-rated adolescent acting-out behavior was assessed via the SIBSRS Antisocial (ANTI) scale. The ANTI scale assesses the extent to which an individual's behavior towards each of his/her family members was characterized by anger, hostility, aggression, and contempt, as well as socially irresponsible or age-inappropriate behaviors. An adolescent scoring 1 on this scale was described as "not in any way unpleasant, antagonistic, immature, or disrespectful towards the other interactor". By contrast, an adolescent scoring 9 on this scale was described as demonstrating "immaturity, non-compliance, irritability, whining, or may 'talk back to' or threaten the other or actively refuse to participate in the task". In

addition, he/she may "exhibit signs of physical aggression, out-of-control behavior, lack of constraint in his/her behavior, or pleasure in actively resisting the other. The focal may go out of his/her way to instigate conflict. He/she may be actively rebellious, cruel, or try to cause distress for the other". Not surprisingly, ANTI towards the mother and the father were highly correlated (r = .86, p <.001). ANTI towards the sibling was also highly correlated with ANTI towards the parents (r = .78 and .76, with ANTI towards mother and father, respectively; both p <.001).

To index each participant's general level of ANTI during the interaction, and because of the very high correlations reported above, we first created a composite of overall acting-out behavior, averaging ratings of the adolescent's behavior towards his/her mother (available on 1,154 participants), father (available on 920 participants), and sibling (available on 1,173 participants). As we allowed up to one missing rating per person, these overall composite ratings were available on 1,174 participants (mean acting-out was 3.40 with a standard deviation of 1.74; the range was 1 through 9). However, prior work with these data has indicated that, despite their high levels of covariation, ANTI towards parent and ANTI towards the sibling incrementally predict various informant reports of the focal adolescent's acting-out behavior (see Burt et al., in press). Given this, we sought to ensure that our results for ANTI were not specific to this more general operationalization of ANTI. We thus examined those acting-out behaviors that were directed specifically towards the parents (i.e., averaging acting-out behavior directed towards the mother and father to form a parent composite), as well as those directed specifically towards the sibling (M = 3.45, SD = 1.85, range = 1–9). Ratings of acting-out behaviors towards the parent(s) were available on 1,174 participants (M = 3.37, SD = 1.82, range = 1–9).

Observed coercive parenting (i.e., observer-rated parent-child conflict on the part of the parents) was assessed via the SIBSRS Angry Coercion (i.e., AC) scale. The AC scale assesses the degree to which the focal attempts to control or change the behavior or opinions of another, or attempts in a hostile manner to get another person to do what the focal wants (e.g., power plays, demands, hostile commands, contingent physical or verbal threats, refusals, prohibitions, forcing own opinions on the other, angry blaming, contemptuous mocking, derogatory insistence, etc.). A parent scoring 1 on this scale was described as not at all coercive or manipulative, while a parent scoring a 9 on this scale was described as showing intense instances of angry coercion: "The focal may infrequently include verbal and physical threats, refusals, or prohibitions to influence the other… He/she frequently attempts to change the behavior of the other in a hostile or contemptuous fashion". In order to capture overall levels of observed coercive parenting, we created a composite of mother (available on 1,154 participants) and father (available on 918 participants) AC directed toward each adolescent. Allowing for one missing parent, the observed coercive parenting composite was available on 1,174 participants (M = 1.25, SD = 0.66, range = 1–9). Because of positive skew, this measure was log-transformed prior to analysis (skew following transformation = 2.46).

Informant-reported Acting Out Behavior—Adolescent self-reports of acting-out behavior were assessed using the Delinquent Behavior Index (DBI). The DBI (Burt & Donnellan, 2008; Burt, McGue et al., 2007; Farrington & West, 1971; Gibson, 1967) is an inventory of minor (e.g., skipping school) and more serious (e.g., using a weapon in a fight) acting-out behaviors, 21-items of which were administered in this sample (available on 1,162 adolescents). Participants were asked whether they had engaged in each behavior "as an adolescent" (0=no; 1=yes). Items were summed such that higher scores reflect endorsement of more delinquent behaviors. If fewer than two items were missing, items were prorated and added to the scale score. If more than two items were missing, the score was coded as missing. The scale demonstrated good internal consistency reliability with an

alpha of .87 (M = 2.96, SD = 3.62, range = 0–20). Because of positive skew, the DBI was log-transformed prior to analysis (skew following transformation = 0.28). As previously reported (Burt et al., in press), the DBI was significantly and positively correlated with overall observer-rated acting-out behavior (r = .24, p<.01).

Importantly, levels of delinquency in these participants are comparable to those in other samples. We compared DBI data from the current sample to that in two other samples: a large epidemiological sample of twins (Burt, McGue, & Iacono, in preparation) and a sample of male college students at a large Midwestern university (Burt & Donnellan, 2008; note that the DBI was analyzed on a 1–3 scale in that publication, but was converted to 0–1 here to maintain consistency with the present study). The mean DBI score in late-adolescent male college students (ages 17–21, averaged 19 years-old, n = 148) was 8.09 (SD = 4.9), whereas the mean DBI score in similarly-aged male participants in our sample (ages 16–18, n = 93) was 8.24 (SD =6.8), a trivial difference (Cohen's *d* standardized effect size = .02). Similarly, the mean DBI score in mid-adolescent twins (ages 13–16 years-old, n = 1,328) was 4.81 (SD = 5.2), whereas the mean DBI score in mid-adolescent participants in our sample was 4.31 (SD = 4.6). As before, this difference is quite small ($d = -.10$). Such results thus strongly suggest that our delinquency data are comparable to those in other adolescent and epidemiological samples.

Informant-reported Parent-child Conflict—The Parental Environment Questionnaire (PEQ; Elkins, McGue, & Iacono, 1997) was administered to tap perceptions of the parent-child relationship. The current study focused on the 12-item parent-child conflict scale (e.g., "I often criticize my child"; "My child and I often get into arguments"). For this scale, mothers and fathers individually rated their relationships with each of their participating adolescents and adolescents rated their relationship with their parents. Each informant rated items on a 4-point scale (1=definitely true; 2 = somewhat true, 3 = somewhat false; 4 = definitely false). In order to maximize consistency with published examinations of parent-child conflict (e.g., Burt et al., 2003, 2005, 2007), we created a composite of parent and child informant-reports of parent-child conflict. Consistent with prior literature, correlations between the various informants ranged from .32–.44 (all $p < .01$). To accommodate any missing data, we allowed for up to two missing informant reports. Composite reports were available for 1,172 participants. Items were scored such that high scores corresponded to high levels of parent-child conflict. The PEQ conflict scale displayed good internal consistency reliability, with an alpha of .90. The PEQ conflict scale and observed coercive parenting were weakly but significantly correlated ($r = .08$, $p < .05$).

STATISTICAL ANALYSES

The association between parent-child conflict and acting-out behavior in non-adopted adolescents is a function of the 50% of additive genetic influences shared between the parents and adolescents, as well as any shared environmental effects (i.e., those environmental influences that increase similarity among family members regardless of genetic similarity). By contrast, because adoptees do not share genes with their parents, the association between parent-child conflict and acting-out behavior in the adopted adolescents serves as a direct estimate of shared environmental mediation. Making use of these distinctions, we examined the origins of the association between parent-child conflict and acting-out behavior. Should shared genes mediate the association between conflict and acting-out behavior, we would expect non-adopted youth to manifest higher rates of acting-out in the presence of parent-child conflict, and this association should not extend to adopted youth (as they do not share genes with their parents). By contrast, a shared environmental influence of conflict on acting-out behavior would be implicated if acting-out behavior is associated with parent-child conflict in adopted youth. Using this theoretical framework, we

examined the association between parent-child conflict and acting-out behavior via several interrelated sets of analyses.

First, we computed correlations between observed and reported parent-child conflict and observed and reported acting-out behavior. We then compared these correlations across adoption status to examine the evidence for both genetic and/or shared environmental contributions on the association. For our final set of analyses, we evaluated the association between parent-child conflict and adolescent acting-out behavior via a series of moderated regressions. This analytic approach allowed us to statistically evaluate the independent main effects of adoption status and parent-child conflict on adolescent acting-out behavior, as well as whether the impact of parent-child conflict on acting-out varied significantly by adoption status. Because we used Type III sum of squares (DeFries & Fulker, 1985), this model acts as an extension of the DeFries–Fulker twin analyses. Specifically, the interaction between the independent variable (in this case, parent-child conflict) and degree of genetic relatedness (in this case, adoption status) estimates passive gene-environment correlation, whereas the main effect of the predictor (i.e., parent-child conflict) estimates family-level or shared environmental mediation. Accordingly, a shared environmental influence of parent-child conflict on acting-out behavior is indicated if increases in acting-out behavior are associated with parent-child conflict *regardless of adoption status* (i.e., there is a main effect of parent-child conflict on adolescent acting-out behavior). By contrast, should the association between parent-child conflict and acting-out behavior reflect a passive gene-environment correlation, we would expect a significant interaction between adoption status and parent-child conflict (i.e., should conflict predict adolescent acting-out behavior only in non-adoptive families, but not in adoptive families, it would indicate that this association is a function of shared genes). This model does not identify effects of the non-shared environment.

We conducted the above analyses using hierarchical linear modeling (HLM) in SPSS 15.0 (Norušis, 2007) to account for the nonindependence of observations within families while maximizing statistical power. Because siblings are nested within families, our data have a two-level structure, with the adolescent as the lower level unit and the family as the upper level unit. Predictor variables can occur at either the child level (e.g., adoption status) or the family level. Sibling sex and ethnicity were entered into the regression as factors, and age was added as a covariate, so as to ensure that these demographic variables did not unduly influence our results. Analyses were conducted across all pairs of outcome and predictor variables (e.g., observed acting-out behaviors and reported parent-child conflict, reported acting-out behavior and observed parent-child conflict, etc). HLM accommodates missing data via Full-Information Maximum-Likelihood raw data techniques (FIML), which produce less biased and more efficient and consistent estimates than other techniques (Little & Rubin, 1987).

RESULTS

Mean levels of parent- and adolescent-reported and observer-rated parent-child conflict and acting out behaviors were calculated separately for males and females, as well as separately for adopted and non-adopted adolescents (see Tables 1 and 2). Although parent- and adolescent-reports of parent-child conflict did not differ across sex ($d = 0.06$; $p = .29$), observed coercive parenting was higher for boys as compared to girls ($d = 0.21$; $p < .01$). Boys also engaged in more acting-out behavior than did girls, both according to their own self-report ($d = 0.42$, $p < .01$) and as rated by independent observers (Overall: $d = 0.23$; $p < .01$; Toward parents: $d = 0.23$; $p < .01$; Toward sibling: $d = 0.22$, $p < .01$).

By contrast, independent-samples *t* tests indicated that mean levels of observed and reported acting-out behavior were largely equivalent across adopted and nonadopted adolescents (Reported: $d = 0.03$, $p = .58$; Observed overall: $d = 0.10$; $p = .08$; Observed toward parents: $d = 0.11$; $p = .07$; Observed toward sibling: $d = 0.08$; $p = .16$). Observed parent-child conflict also did not differ across adoption status ($d = 0.04$, $p = .43$). However, parent and adolescent-reported conflict did differ, such that adoptive parents and their children reported slightly higher levels of parent-child conflict as compared to non-adoptive parents and children ($d = 0.35$; $p < .01$).

Phenotypic Correlations

We next calculated correlations between parent-child conflict and acting-out behavior separately by adoption status (see Table 3). We adjusted for the nonindependence of the observations within families by using the number of families, rather than the number of individuals, to calculate *p* values. Results revealed that the association between parent-child conflict and adolescent acting-out behavior was consistently significant and small-to-moderate in magnitude in adopted youth, results which provide clear support for at least some shared environmental mediation of this association. Associations in non-adopted youth were comparable in magnitude, and in no case were they significantly larger than that in adopted youth. Such results argue against passive gene-environment correlation as an explanation for this association.

HLM regressions

We next regressed adolescent self-reports of their own acting-out behavior onto adoption status and parent-child conflict, with families (rather than individual adolescents) as the unit of analysis. We performed this analysis once using parent- and adolescent-reports of parent-child conflict as the predictor, and then again using observed coercive parenting as the predictor. As noted, when using Type III sum of squares, the main effect of parent-child conflict estimates shared environmental mediation (since shared environmental influences are present in both adoptive and non-adoptive families by definition), whereas the interaction with adoption status estimates the role of passive gene-environment correlation. More specifically, because effects of passive rGE are necessarily eliminated in adoptive families, the failure to find a significant interaction with adoption status effectively rules out passive gene-environment correlation as an explanation for the association between parent-child conflict and acting-out behaviors. As seen in Table 4, parent-child conflict was found to be a highly significant predictor of reported acting-out behaviors, regardless of its operationalization. By contrast, the interaction between adoption status and parent-child conflict was not significant in either case.

We next regressed observed adolescent acting-out behavior on to adoption status and parent-child conflict, again with families as the unit of analysis. We again performed separate regressions for parent- and adolescent-reported and observed parent-child conflict. As seen in Table 5, parent-child conflict was consistently found to be highly significant predictor of observed acting-out behaviors. Moreover, as indicated by the nonsignificant interactions between adoption status and parent-child conflict, the association between parent-child conflict and observed acting-out behavior did not vary across adoption status.

We finally examined whether these results generalized to different operationalizations of observer-rated acting-out behavior, by evaluating whether results persisted to examinations of acting-out directed solely towards parents and acting-out directed solely toward the sibling. Results were essentially unchanged. Parent-child conflict significantly predicted observer-rated acting-out behavior toward parents and toward the sibling, while the interaction between parent-child conflict and adoption status was not significant in any

case[2]. Such findings collectively suggest that the above results persist regardless of the recipient of the adolescent's observed acting-out behavior.

DISCUSSION

The goal of the present study was to examine the origins of the association between parent-child conflict and acting-out behavior in a sample of adopted and non-adopted adolescents. In so doing, we sought to constructively replicate and expand on prior findings of shared environmental mediation of the relationship between parent-child conflict and adolescent antisocial behavior (Klahr et al., in press; Burt, McGue et al., 2005; Burt et al., 2005; Burt et al., 2003) using both informant-reports and observer-ratings of these behaviors, and in this way, rule out rater bias as a primary explanation for prior findings. Analyses revealed that parent-child conflict was moderately associated with acting-out behavior and that this association was equivalent across adoption status, thereby ruling out passive gene-environment correlation as an explanation for our results. Moreover, these findings extended across all possible informant combinations. Such findings thus constructively replicate prior work, arguing against rater bias as an explanation of prior findings, and for a "true" shared environmentally-mediated association between parent-child conflict and adolescent antisocial behavior.

There are some limitations of the current study. First, the results of this study are applicable only during adolescence and not during other developmental periods, both because the heritability of conduct problems appears to vary with age (Burt & Neiderhiser, 2009), but also because child- and adolescent-onset trajectories may have different etiological origins (Moffitt, 2003). That being said, adolescence is a critical stage in the development of antisocial behavior, as these behaviors are more frequent during this period than at any other point in the lifespan. It is thus crucial to understand the etiology of antisocial behavior during adolescence in particular.

Secondly, the intraclass correlation for the SIBSRS AC scale (.56) suggests the presence of some measurement error in our ratings of coercive parenting. However, as the results using the AC scale were essentially identical to those using the other combination of scales, we would argue that this does not undermine our ultimate conclusions. In addition, our observer-ratings of adolescent acting-out behavior and parent-child conflict were obtained from the same 10 minute family interaction. It could thus be argued that what was observed during that time was a function of social and family dynamics at work solely during that interaction and may not be relevant for explaining behaviors more generally. However, the fact that the observer ratings evidenced largely equivalent associations with informant-reports of parent-child conflict and acting-out behavior suggests that what was captured during the observation was both important and representative.

Finally, although our results effectively rule-out passive rGE as an explanation for the association between parent-child conflict and acting-out behavior, we were unable to rule out other forms of rGE, namely evocative rGE (i.e., the child's genetically-influenced acting-out behavior could elicit a conflictual parent-child relationship). Indeed, some research suggests that evocative rGE is important for explaining parental behavior, at least in part (O'Connor, Deater-Deckard, Fulker, Rutter, & Plomin, 1998), and thus there is reason to suspect that evocative rGE may be at play. Importantly, however, Klahr et al

[2]The interaction between reported parent-child conflict/observer-rated parenting and adoption status was approaching significance (p = .06 and .08, respectively) for predicting acting-out behaviors toward the sibling. Although outside of the scope of this paper, these findings suggest that there may be important sibling dynamics which differ across adoptive vs. non-adoptive families. These sibling effects should be examined in future research.

(2011) found that evocative rGE did not explain the shared environmental association between parent-child conflict and conduct problems. That said, a simple distinction between child-driven and parenting-driven effects does not likely capture the complexity of the parent-child relationship and its association with antisocial behavior. Prior research has indicated the importance of both child-driven and parent-driven effects for explaining various parental behaviors in mothers and fathers (Neiderhiser, Reiss, Lichtenstein, Spotts, & Ganiban, 2007; Neiderhiser et al., 2004). Future research should move toward a more nuanced and dynamic approach to understanding the mutual influences of parents and children on the parent-child relationship and the development of conduct problems.

Despite these limitations, the current study has several important implications. The absence of shared environmental influences in adulthood led several behavioral geneticists to argue that, to the extent that parents impact child outcomes, they do so at a child-specific rather than family-wide level (McGue & Bouchard, 1998; Reiss et al., 1995). Others took the implications of this finding further still, arguing that because parents are the most obvious source of environmentally mediated similarities among siblings, and because only non-shared environmental influences are statistically significant in adulthood, it must therefore mean that parenting has minimal influence on psychological and behavioral outcomes (Harris, 1998, 2000). The current results argue strongly against this proposition, offering support not only for the presence and predictive value of the shared environment prior to adulthood, but also for the importance of parenting as a shared environmental risk factor in particular. The latter conclusion has important implications for intervention and prevention efforts. Consistent with Patterson's theory about the role of coercive interaction cycles within the family in the development of conduct problems (Patterson, 1976), these results bolster the notion that parent-child conflict may be an important intervention target in the treatment of adolescent problem behaviors.

The current results are also relevant for behavioral genetic thinking on the environment. Specifically, the conclusion that non-shared environmental influences are more important than shared environmental influences continues to influence theory and interpretation of environmental influences up to the present day (Plomin, 2001). Other research, however, has suggested moderate influences of the shared environment on child and adolescent psychopathology, including antisocial behavior (Burt, 2009). It has also been argued that, unlike non-shared environmental effects (Rutter et al., 1999; Turkheimer & Waldron, 2000), shared environmental influences are both identifiable and persistent over time (Burt, 2009). Unfortunately, prior studies identifying specific sources of this shared environmental variance (Burt et al., 2003, 2005, 2007; Klahr et al., 2011) were unable to rule out possible contamination by various forms of rater bias (e.g., underreporting of antisocial acts, personality and recency effects, etc.). The current study addressed this limitation via the use of observer-ratings of parent-child conflict and acting-out behaviors. Results remained highly consistent with prior findings and were highly consistent across informants, thereby serving to further highlight the importance of the shared environment for child and adolescent outcomes.

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Table 1

Observed and Reported Parent-Child Conflict and Observed and Reported Adolescent Acting-Out, separately by Sex

	Females					Males				
Variable	**Mean**	**SD**	**Min**	**Max**	**N**	**Mean**	**SD**	**Min**	**Max**	**N**
Self-Reported Acting-Out Behavior	2.27**	2.92	0	18	633	3.79**	4.17	0	20	529
Observed Acting-Out Behavior- overall	3.22**	1.63	1	9	639	3.62**	1.86	1	9	535
Observed Acting-Out Behavior towards Parents	3.18**	1.70	1	9	639	3.59**	1.94	1	9	535
Observed Acting-Out Behavior towards Sibling	3.27**	1.75	1	9	638	3.67**	1.94	1	9	535
Reported Parent-Child Conflict	21.54	5.17	12	38	637	21.86	5.18	12	41	535
Observed Coercive Parenting	1.18**	0.60	1	9	639	1.32**	0.72	1	7	535

Note. Min = minimum; max = maximum; SD = standard deviation

Reported and observer-rated parent-child conflict statistics are based on family-member informant composites.

** Means significantly different between females and males, $p < .01$.

Table 2

Observed and Reported Parent-Child Conflict and Observed and Reported Adolescent Acting-Out, separately by Adoption Status

	Adopted					Non-adopted				
Variable	**Mean**	**SD**	**Min**	**Max**	**N**	**Mean**	**SD**	**Min**	**Max**	**N**
Self-Reported Acting-Out Behavior	3.02	3.57	0	20	654	2.90	3.70	0	20	508
Observed Acting-Out Behavior- overall	3.48	1.77	1	9	661	3.30	1.70	1	9	513
Observed Acting-out Behavior toward Parents	3.46	1.87	1	9	661	3.26	1.76	1	9	513
Observed Acting-Out Behavior toward Sibling	3.52	1.88	1	9	660	3.37	1.80	1	9	513
Reported Parent-Child Conflict	22.48**	5.29	12	39	661	20.66**	4.83	12	41	511
Observed Coercive Parenting	1.23	0.60	1	7	661	1.26	0.73	1	9	513

Note. Min = minimum; max = maximum; SD = standard deviation

Reported and observed parent-child conflict statistics are based on family member informant composites.

** Means significantly different between adopted and non-adopted adolescents, $p < .01$.

Table 3

Associations between Observed and Reported Parent-Child Conflict and Observed and Reported Adolescent Acting-Out, by Adoption Status

	Self-Reported Acting-Out	Observed Acting-Out Overall	Observed Acting-Out Toward Parents	Observed Acting-Out Toward Sibling
Reported Parent-Child Conflict				
Adopted	.40** (n = 390)	.26** (n = 396)	.26** (n = 396)	.23** (n = 396)
Non-adopted	.32** (n = 312)	.14* (n = 318)	.17** (n = 318)	.09 (n = 318)
Observed Coercive Parenting				
Adopted	.09 (n = 390)	.33** (n = 396)	.33** (n = 396)	.30** (n = 396)
Non-adopted	.15** (n = 312)	.33** (n = 318)	.34** (n = 318)	.29** (n = 318)

Note. Phenotypic correlations are reported for adopted adolescents (those who do not share genes with their parents) and nonadopted adolescents (those who do share genes with their parents). To adjust for the nonindependence of the observations, we used number of families to determine significance (note that families with both an adopted and a non-adopted child are therefore represented twice, whereas families with two adopted or two non-adopted children are represented only once).

n = number of families

* $p < .05$

** $p < .01$

Table 4

Testing for Family-Level Environmental Mediation and Passive Gene/Environment Correlation by Examining Effects of Adoption Status and Parent-Child Conflict on Adolescent Self-reports of Acting-Out Behavior

	Using Reported Parent-child conflict			Using Observer-rated Coercive Parenting		
Fixed Effects	***F (df)***	***p-value***	***Fixed effect (SE)***	***F (df)***	***p-value***	***Fixed effect (SE)***
Intercept	159.23 (1127)	<.01	−9.70 (0.94)	82.00 (1132)	<.01	−7.74 (0.83)
Adoption status	0.97 (1149)	0.33	−0.84 (0.85)	3.74 (961)	0.05	0.62 (0.32)
Sex	63.91 (1148)	<0.01	1.46 (0.18)	52.05 (1152)	<0.01	1.42 (0.20)
Age	122.94 (1127)	<0.01	0.55 (0.05)	169.48 (1126)	<0.01	0.68 (0.05)
Ethnicity	0.15 (925)	0.86	−0.03 (0.38)	1.48 (918)	0.23	0.25 (0.41)
Parent-child conflict	131.30 (1138)	<0.01	0.20 (0.03)	12.51 (1006)	<0.01	1.49 (0.44)
Adoption status x Parent-child conflict	0.74 (1148)	0.39	0.03 (0.04)	1.94 (1151)	0.16	−0.82 (0.59)

Note. Adolescent self-reports of their acting-out behavior were regressed onto adoption status and parent-child conflict using an HLM design (to adjust for nonindependent observations within families). Informant reports of parent-child conflict were measured using the parent-child conflict scale of the PEQ. Observed coercive parenting was measured using the angry coercion scale of the SIBSRS. Adoption status (i.e., adopted, nonadopted), sex, age, ethnicity, and parenting were entered as main effects. The interaction between parent-child conflict and adoption status (i.e., “Does the association between parent-child conflict and reported acting-out behavior vary across adopted and nonadopted adolescents?”) was also examined.

Table 5

Testing for Family-Level Environmental Mediation and Passive Gene/Environment Correlation by Examining Effects of Adoption Status and Parent-Child Conflict on Observer-ratings of Adolescent Acting-Out Behaviors

		Using Reported Parent-child conflict			Using Observer-rated Coercive Parenting		
	Fixed Effects	***F (df)***	***p-value***	***Fixed effect (SE)***	***F (df)***	***p-value***	***Fixed effect (SE)***
Acting-Out Behavior: Overall	*Intercept*	27.23 (1101)	<0.01	2.07 (0.49)	67.54 (1102)	<0.01	2.60 (0.40)
	Adoption status	1.77 (1157)	0.18	−0.60 (0.45)	1.64 (1059)	0.20	0.20 (0.16)
	Sex	20.31 (1133)	<0.01	0.44 (0.10)	7.85 (1142)	<0.01	0.26 (0.09)
	Age	0.32 (1103)	0.57	−0.01 (0.03)	0.33 (1091)	0.56	0.01 (0.02)
	Ethnicity	0.88 (1008)	0.42	−0.01 (0.21)	0.17 (1010)	0.85	0.11 (0.20)
	Parent-child conflict	51.18 (1163)	<0.01	0.06 (0.02)	152.02 (1096)	<0.01	1.66 (0.21)
	Adoption status x parent-child conflict	1.87 (1135)	0.18	0.04 (0.02)	1.93 (1151)	0.17	0.39 (0.28)
Acting-Out Behavior: Toward Parent	*Intercept*	19.11 (1136)	<0.01	1.80 (0.53)	54.23 (1138)	<0.01	2.47 (0.42)
	Adoption status	1.06 (1136)	0.30	−0.50 (0.48)	1.73 (1001)	0.19	0.22 (0.16)
	Sex	17.39 (1158)	<0.01	0.43 (0.10)	6.58 (1163)	0.01	0.26 (0.10)
	Age	0.23 (1139)	0.63	−0.01 (0.03)	0.47 (1132)	0.49	0.02 (0.03)
	Ethnicity	0.93 (950)	0.39	0.01 (0.22)	0.22 (949)	0.81	0.13 (0.21)
	Parent-child conflict	54.83 (1153)	<0.01	0.07 (0.02)	155.11 (1040)	<0.01	1.80 (0.22)
	Adoption status x parent-child conflict	1.03 (1159)	0.31	0.02 (0.02)	1.07 (1165)	0.30	0.31 (0.20)
Acting-Out Behavior: Toward Sibling	*Intercept*	32.11 (1044)	<0.01	2.40 (0.51)	65.00 (1047)	<0.01	2.65 (0.41)

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		Using Reported Parent-child conflict			Using Observer-rated Coercive Parenting		
	Fixed Effects	***F (df)***	***p-value***	***Fixed effect (SE)***	***F (df)***	***p-value***	***Fixed effect (SE)***
	Adoption status	3.07 (1120)	0.08	−0.82 (0.47)	0.82 (1116)	0.37	0.15 (0.17)
	Sex	19.41 (1076)	<0.01	0.44 (0.10)	7.95 (1093)	<0.01	0.28 (0.10)
	Age	0.05 (1041)	0.83	−0.01 (0.03)	0.46 (1029)	0.50	0.02 (0.03)
	Ethnicity	0.97 (1076)	0.38	0.21 (0.22)	0.21 (1075)	0.81	0.11 (0.22)
	Parent-child conflict	30.63 (1140)	<0.01	0.04 (0.02)	99.77 (1144)	<0.01	1.35 (0.23)
	Adoption status x parent-child conflict	3.44 (1077)	0.06	0.04 (0.02)	3.03 (1107)	0.08	0.51 (0.29)

Note. Observed adolescent acting-out behaviors, both overall and separately toward parents and toward the sibling, were regressed onto adoption status and parent-child conflict using an HLM design. Informant reports of parent-child conflict were measured using the parent-child conflict scale of the PEQ. Observed coercive parenting was measured using the angry coercion scale of the SIBSRS. Adoption status, sex, age, ethnicity, and parent-child conflict were entered as main effects. The interaction between parent-child conflict and adoption status was also examined.