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Effects of Multiple Maternal Relationship Transitions on Offspring Antisocial Behavior in Childhood and Adolescence: A Cousin-Comparison Analysis

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Abstract

Previous studies of the association between multiple parental relationship transitions (i.e., when a parent begins or terminates an intimate relationship involving cohabitation) and offspring antisocial behavior have varied in their efforts to rule out confounding influences, such as parental antisocial behavior and low income. They also have been limited in the representativeness of their samples. Thus, it remains unclear to what degree parents' multiple relationship transitions have independent effects on children's antisocial behavior. Analyses were conducted using data on 8,652 6–9-year-old, 6,911 10–13-year-old, and 6,495 14–17-year-old offspring of a nationally representative sample of U.S. women. Cousin-comparisons were used in combination with statistical covariates to evaluate the associations between maternal relationship transitions and offspring antisocial behavior in childhood and adolescence. Cousin-comparisons suggested that associations between maternal relationship transitions and antisocial behavior in childhood and early adolescence are largely explained by confounding factors. In contrast, the associations between maternal relationship transitions and offspring delinquency in late adolescence were robust to measured and unmeasured confounds. The present findings suggest that interventions aimed at reducing exposure to parental relationship transitions or addressing the psychosocial consequences of exposure to parental relationship transitions could reduce risk for offspring delinquency in late adolescence.

Keywords

antisocial behavior; family instability; relationship transitions; cousin-comparisons

The composition of families in the U.S. has changed considerably over the last several decades (Cherlin, 2010). Notable among these changes, childbearing has become more common in the context of nonmarried cohabitation, and divorce has become increasingly likely to lead to nonmarried cohabitation rather than remarriage (Cherlin, 2010).

Cohabiting relationships continue to be highly unstable, with approximately half of cohabiting unions ending within the first or second year (Kennedy & Bumpass, 2008; Lichter, Qian, & Mellot, 2006; Seltzer, 2004). Thus, despite declines in the average divorce rate in the U.S., many children, especially those who experience social and economic disadvantage, are at risk for experiencing multiple changes in family composition and living arrangements (Cherlin, 2010).

Although studies of divorce and separation provide strong evidence that parental relationship dissolution influences offspring antisocial behavior (Amato & Cheadle, 2008; Burt, Barnes, McGue, & Iacono, 2008; D'Onofrio et al., 2007; D'Onofrio et al., 2005), consequences of repeated exposure to multiple parental relationship transitions (i.e., when a parent's partner joins or leaves the household) are not as well established. Although findings from several studies have been interpreted as meaning that multiple parental relationship transitions contribute to offspring maladjustment (e.g., Cavanagh & Huston, 2006), these studies all relied solely on measured covariates to rule out confounding influences. The current study provides an alternative method for testing the effects of parental relationship transitions on antisocial behavior (AB) in childhood and adolescence that involves using a quasi-experimental approach, a cousin-comparison design, in combination with statistical covariates (e.g., maternal AB, previous levels of child AB). Comparing cousins who are differentially exposed to parental relationship transitions reduces the confounding influence of unmeasured shared family background characteristics that may not be fully controlled by measured covariates, and the addition of statistical covariates helps to address confounds that are not adequately addressed by comparing cousins.

Instability Hypothesis

Several researchers (e.g., Brody, Neubaum, & Forehand, 1988; Capaldi & Patterson, 1991; Fomby & Cherlin, 2007) have hypothesized that exposure to multiple parental relationship transitions increases risk for offspring behavior problems. This "instability hypothesis" asserts that multiple relationship transitions cause repeated disruptions in family functioning (e.g., parenting, routines) and resources (e.g., income) that delay or prevent children's adjustment to newly established living situations. In contrast, continuity of a family system, whether single or partnered, is thought to increase stability and predictability in family functioning that helps to prevent negative outcomes in childhood (Brody et al., 1988; Cavanagh & Huston, 2006). The negative effects of multiple parental relationship transitions are thought to be linear, such that each transition is associated with an equivalent increase in risk for negative outcomes (Brody et al., 1988; Fomby & Cherlin, 2007; Furstenberg & Teitler, 1994).

It is possible, however, that multiple parental relationship transitions do not exert a causal effect, and that the correlation between parental relationship transitions and offspring AB is confounded by risk factors for parental relationship transitions that also increase risk for offspring AB. Consistent with this possibility, Brody et al. (1988) reviewed evidence suggesting that "serial marriers" were more likely to be impulsive, socially nonconforming, and to abuse drugs and alcohol than individuals who experienced a single divorce. In addition, studies of divorce indicate that risk for relationship dissolution is associated with unemployment, lack of education, poverty, and delinquency (Cherlin, 2010; Emery, Waldron, Kitzmann, & Aaron, 1999). Furthermore, socioeconomic disadvantage is associated with childbearing in the context of cohabitation, where the rate of dissolution is twice that of marriage (Cherlin, 2010). Because many of these contextual, behavioral, and personality characteristics also are correlated with offspring AB (e.g., Carter et al., 2010), they could account for what appears to be a causal effect of multiple parental relationship transitions on offspring AB. Finally, it is possible that the association between parental

relationship transitions and offspring AB reflects the influence of offspring AB on risk for parental relationship instability, rather than a causal effect of relationship instability on child AB (Schermerhorn, Cummings, DeCarlo, & Davies, 2007).

Several studies have examined the instability hypothesis by testing associations between total maternal relationship transitions experienced and offspring maladjustment. Capaldi and Patterson (1991) found that transitions predicted higher scores on a composite measure of offspring maladjustment reflecting AB, depression, poor academic achievement, and other negative outcomes, but found that the association became nonsignificant after controlling for maternal antisocial behavior. However, because this study did not predict AB separately from other forms of maladjustment, it is not possible to conclude that maternal characteristics confound the link between multiple maternal relationship transitions and youth AB per se. Indeed, Martinez & Forgatch (2002) found that maternal relationship transitions significantly predicted AB after controlling for maternal antisocial behavior. Moreover, Fomby and Cherlin (2007) found statistically significant effects of maternal relationship transitions on AB in childhood and early adolescence when controlling for numerous maternal characteristics, such as maternal AB, substance use, education, income, and ethnicity, and Cavanagh and Huston (2006, 2008) found significant effects when also controlling for previous levels of child AB.

Limitations of Past Research

Findings from several studies are consistent with the hypothesis that multiple parental relationship transitions contribute to increased risk for offspring AB. These studies are notable for addressing a host of potentially confounding influences, including maternal antisocial behavior, substance use, education, and income. Furthermore, these studies have been prospective in design, which helps to rule out the possibility that the association between parental relationship transitions and offspring AB solely reflects the influence of child AB on risk for parental relationship transitions. However, all previous studies of parental relationship transitions have relied entirely on statistical controls to reduce confounding. Although statistical controls provide an important method for ruling out alternative explanations for the observed association between parental relationship transitions and child AB, their effectiveness depends on their comprehensiveness, the degree to which the covariates are free of measurement error, and the degree to which the associations with child AB are accurately modeled (e.g., linear versus nonlinear associations; Shadish, Cook, & Campbell, 2002). Given that all research designs suffer from limitations, the best evidence for causal influence comes from a replicated pattern of findings generated by studies with offsetting threats to their validity (Academy of Medical Sciences Working Group, 2007). Previous studies have provided an important form of support for the hypothesis that parental relationship transitions lead to increased risk for child AB, but because these studies share common methodological limitations, further research is needed before causal inference is warranted.

Although experimental studies would provide the most convincing evidence for causal effects, they are not feasible for parental relationship transitions. However, quasi-experimental designs, such as within-family comparisons, provide powerful, ecologically valid, and more feasible methods for ruling out many confounding influences that may not be addressed adequately through the use of statistical covariates alone (Shadish et al., 2002). By comparing related individuals who are differentially exposed to a risk factor, within-family comparisons automatically and completely control for all unmeasured factors (including environmental and genetic influences) that are shared by members of the same family. Quasi-experimental methods have been used to study effects of divorce (Amato & Cheadle, 2008; Burt, et al., 2008; D'Onofrio, et al., 2007; D'Onofrio, et al., 2005). For

example, D'Onofrio et al. (2005) used a children of twins design to test the degree to which the association between divorce and offspring AB could be attributed to environmental versus genetic influences and found that the effects of divorce on offspring AB was largely due to environmental influences. But, no quasi-experimental, within-family designs have been used to date in the study of multiple parental relationship transitions.

Previous studies of multiple parental relationship transitions have also been limited in terms of the representativeness of their samples. Capaldi and Patterson (1991) and Martinez and Forgatch (2002) both used all-male convenience samples. Bachman, Coley, & Carrano (in press) found links between cumulative transitions and AB in middle childhood in an urban, low-income sample. Although Cavanagh and Huston (2006, 2008) studied the larger and more ethnically diverse NICHD Study of Early Child Care and Youth Development sample, this sample over-represented higher income families. Finally, while Fomby and Cherlin (2007) studied the more representative National Longitudinal Survey of Youth (NLSY) and Children of the NLSY (CNLSY) samples, they used data last collected in 2000 that over-represented young mothers at heightened risk for being disadvantaged and for having offspring with behavior problems (D'Onofrio et al., 2009). As a result, the generalizability of previous findings on the effects of parental relationship transitions may be limited.

Previous studies also have not evaluated whether multiple parental relationship transitions are associated with AB in late adolescence. Most studies have focused on early and middle childhood (Bachman et al., in press; Cavanagh & Huston, 2006, 2008; Martinez & Forgatch, 2002), and the only study to consider AB in adolescence did not include children over the age of 14 years (Fomby & Cherlin, 2007). There are several reasons to suspect that the association between parental transitions and AB may vary from childhood to adolescence. Some studies focusing on divorce have found larger effects in childhood, while others have found larger effects when divorce occurs in adolescence (Lansford, 2009). In addition, theoretical accounts of "sleeping effects" of relationship instability suggest the possibility that parental relationship transitions may have larger effects on adjustment in late adolescence and adulthood as compared to childhood, even if transitions occur before adolescence (Wallerstein, Lewis, & Blakeslee, 2000). Finally, developmental taxonomies of offending suggest that causes of AB may be different for early-starting versus late-starting AB (Moffitt, 2006). For example, twin-studies have shown greater heritability for early starting relative to late starting AB (e.g., Arseneault et al., 2003; Taylor, Iacono, & McGue, 2000). This finding suggests the possibility that the influence of parental relationship transitions on AB may be greater in adolescence than in childhood. Because previous studies have not included older adolescents, the association between multiple parental relationship transitions and late adolescent adjustment remains to be determined.

Finally, while all studies described above have studied prospective influences of parental relationship transitions, only Cavanagh and Huston (2006, 2008) controlled for previous levels of child AB. Not controlling for previous AB allows for the possibility that the prospective association between parental relationship transitions and later child AB is confounded by the effect of previous levels of child AB on parents' risk for parental relationship dissolution and on children's risk for future AB.

The Current Study

The current study evaluates the hypothesis that maternal relationship transitions contribute to AB in childhood and adolescence and addresses limitations of past studies by comparing cousins who were differentially exposed to maternal relationship transitions using the most recently available, and thus most representative, data from the NLSY/CNLSY. All of the present analyses tested for moderation by gender and race-ethnicity, as some studies have

suggested that effects may be stronger for European Americans and boys than for African Americans and girls, respectively (Cavanagh & Huston, 2008; Fomby & Cherlin, 2007). Finding significant relationship transition effects when comparing cousins and controlling for measured confounds would greatly strengthen support for the hypothesis that multiple parental relationship transitions contribute in a causal manner to the development of AB. Alternatively, failure to confirm the hypothesis would suggest that the observed correlation between parental relationship transitions and offspring AB may be attributable to confounding influences.

Methods

Sample

The NLSY initially included a nationally representative sample of 6,111 individuals and an over-sample of 3,652 Hispanics and African Americans 14–22 years of age. Because all eligible individuals in each household were selected, multiple females from the same homes were included. Participants were assessed annually from 1979 to 1994 and biennially since then. NLSY response rates have consistently been at or above 90%. Probability weights for the maternal sample enabled estimates of US population-based parameters. Other studies provide additional details about the NLSY sample (Baker & Mott, 1989).

Biennial assessment of the biological offspring (making up the CNLSY sample) of the NLSY women began in 1986. In the NLSY sample, there are 4,930 female participants who have given birth to 11,506 children involved in the CNLSY, with 91% of females from the NLSY79 having three or fewer children in the CNLSY (1 child=43%, 2 children=33%, 3 children=16%, 4+ children=9%). The average age at first childbirth was 22.4 years old ($SD=5.1$). Ethnically, 53% of the CNLSY sample identify as Caucasian ($n=6,097$), 28% as African-American ($n=3,188$), and 19% as Hispanic ($n=2,210$). Slightly more than half of CNLSY participants are male (51%). Although the NLSY sample was representative of the US population, it cannot be concluded that their offspring are entirely representative of the US population. Most mothers participated in each assessment: 95% in the initial assessment and 90% on average in subsequent waves (Chase-Lansdale, Mott, Brooks-Gunn, & Phillips, 1991). Current analyses are based on mother reports of conduct problems (CPs) for children age 6–9 years ($N=8,652$) and youth self-reported delinquency for ages 10–13 and 14–17 ($Ns=6,911$ and 6,495, respectively), assessed through 2008. Cousin-comparisons included fewer “informative units,” however, as only those extended families including two mothers each having at least one child could have non-zero cousin-deviation scores. Specifically, for the age 6–9 analyses, there were 1,062 mothers in the sample who were both sisters and mothers (and thus, provided cousin offspring with CP data). For the 10 to 13 analyses, there were 803 mothers, and for the 14 to 17 window, there were 809 mothers. Informed consent was obtained from participants of the NLSY and CNLSY at the time of data collection. The current study was reviewed and approved by institutional review boards at the University of Dayton, Indiana University, and the University of Chicago.

Full information maximum-likelihood estimation was used in all models to accommodate missing data on the maternal relationship transitions variables and the covariates, allowing for a consistent sample size across models within each age range. However, a subset of participants at each age range was not included in analyses due to missingness on the AB variables. Tests of sample bias were conducted to determine the degree to which the subset of participants included in analyses were different from those who were not included. The analyses were based on t-tests for continuously distributed variables and logistic regressions for categorical variables.

Compared to those not included in the analysis of CPs at ages 6-9 years, the offspring included experienced more maternal relationship transitions, higher family income during childhood, later maternal age at childbearing, and less exposure to smoking and drinking during pregnancy. The mothers of children included in the analysis of CPs at 6-9 years had lower IQs, more years of school, and fewer maternal relationship transitions during childhood. In addition, the families included in the analyses were more likely to be African American and more likely to be Hispanic than to be Caucasian.

Compared to those not included in the analyses of delinquency at ages 10-13 years, the offspring included experienced more maternal relationship transitions, earlier maternal age at childbearing, and less exposure to smoking during pregnancy. The mothers of children included in the analysis of delinquency at 10-13 years had lower IQs, more years of school, and more maternal relationship transitions during childhood. In addition, the families included in the analyses were more likely to be African American and more likely to be Hispanic than to be Caucasian. The same differences were observed for the sample included in the analysis of delinquency at ages 14-17 years.

In sum, the analysis of the effects of maternal relationship transitions on offspring at 6-9 years is based on a sample that contains fewer risks associated with child and adolescent AB than the full sample. The sample used to explore maternal relationship transitions at 10-13 and 14-17 years had fewer differences from the full CNLSY sample than the sample at 6-9 years did.

Measures

Relationship Transitions—Mothers reported on their relationship status in each assessment. Variables indexing cumulative maternal relationship transitions were created for individual children at ages 5, 9, and 13. Using the approach taken by Fomby and Cherlin (2007), the following maternal relationship transitions were included: from single to cohabiting or married, from cohabiting to single, and from married to separated, divorced, or widowed. Transitions from separation to divorce and from cohabiting to married were excluded, as they were unlikely to indicate changes in living arrangements. In addition, transitions between cohabiting relationships across waves could not be counted due to limitations of the assessment of maternal relationship changes. In addition, only mothers' relationship transitions were included, as information regarding fathers' relationships was not collected, and transitions were counted only for offspring living in the household of the mother at the time of assessment. Although this approach to measuring parental relationship transitions may underestimate total exposure, it has yielded positive findings in previous analyses of NLSY/CNLSY data (Fomby & Cherlin, 2007).

Because the NLSY included all individuals in the original 1979 households and the CNLSY assesses every offspring of the women in the NLSY, the combined dataset includes three levels of nesting: the NLSY household level, the individual women in the NLSY (the mothers in the current study), and the offspring of the women in the NLSY (the CNLSY sample). This clustering allows for the decomposition of variation in exposure to maternal relationship transitions at each level. Calculation of intra-class correlations revealed the extent to which variability in maternal relationship transitions was shared with one's cousins, one's siblings, or was unique to individuals. Analysis of cumulative transitions through child age 5 indicated that cousins shared 12% ($ICC=.12$) of the variation in transitions, siblings shared an additional 29% ($ICC=.29$), and the remaining 59% ($ICC=.59$) of variance in exposure to maternal relationship transitions was unique to individuals. However, by age 13, only 31% of variation in exposure to maternal relationship transitions was unique to individuals, as cousins shared 18% and siblings shared an additional 51% of total variation. This severe restriction of variation among siblings at age 13 indicates that

exposure to maternal relationship transitions was largely shared among siblings by the time they reached adolescence. Within-family comparisons can only be used when there is sufficient variability in exposure to the variable of interest (Lahey & D'Onofrio, 2010). Because variability among siblings in exposure to parental relationship transitions in adolescence was restricted, cousin comparisons were used to test within-family associations between maternal relationship transitions and offspring AB.

Mother-reported child CPs—NLSY mothers rated their children on the Behavior Problem Index, which includes 13 items from the externalizing factor of the Child Behavior Checklist (Peterson & Zill, 1986). Factor analyses (D'Onofrio, et al., 2008) showed that the items loaded on 3 factors: conduct problems, oppositional problems, and attention/impulsivity problems. The 7 CP items (e.g., cheats or tells lies; has trouble getting along with teachers; disobedient at home) overlap with those used in other population-based longitudinal studies (Lahey et al., 2006). Average raw scores across ages 6 through 9 years were calculated, allowing for the inclusion of data from all offspring at least age 6 at the time of the 2008 data collection. This measure of AB correlates with other measures of adjustment, predicts future criminal convictions in adolescence, and shows no evidence of sex differences in criterion validity (Lahey et al., 2006).

Youth-reported delinquency—Offspring between ages 10 and 17 were administered 7 delinquency items from the self-reported delinquency (SRD) interview in each assessment. The SRD has been shown to be reliable and valid and is a benchmark measure in delinquency research (Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998). In addition, Thornberry and Krohn (2000) reviewed evidence supporting the validity of self-report measures of delinquency and their advantages over other report-forms in adolescence, when many forms of AB are covert acts that go undetected by parents and other authority figures. The 7 SRD delinquency items assess high-prevalence acts (e.g., hurt someone bad enough to need bandages or a doctor, lied to parent about something important) that correlate highly with more serious antisocial behaviors from the SRD. The measure predicts later criminal convictions with no evidence of sex differences in criterion validity (Lahey, Van Hulle, D'Onofrio, Rodgers, & Waldman, 2008). Average levels of self-reported delinquency from ages 10-13, and from 14-17, were rounded to the nearest whole number for use as count outcomes in models predicting adolescent AB. Averaging across the age ranges allowed offspring who were at least 10 years of age (or 14 for late adolescent outcomes) in 2008 to be included in the analyses, thereby maximizing the representativeness of the samples. Delinquency from ages 10-13 and ages 14-17 were significantly correlated with each other ($r=.34$) and with CPs from ages 6-9 ($r=.24$ and $.19$, respectively).

Family and child-specific covariates—Analyses included several child-specific and maternal covariates that might confound effects of maternal relationship transitions. Child-specific covariates included: family income averaged from child birth to age 5, 9, or 13 (depending on analysis), mother-reported smoking and drinking during pregnancy, CNLSY siblings' birth order, maternal age at birth of each child, and child sex. Maternal covariates included highest grade completed in school by 2008, total maternal relationship transitions experienced by mothers from birth to age 18, maternal age at birth of her first child, and mother's race-ethnicity, coded as Hispanic, African American, or non-African American/non-Hispanic. Mothers' intellectual abilities were estimated in 1980 using the Armed Services Vocational Aptitude Battery of intellectual assessments, and maternal delinquency was assessed between ages 15-22 years using 12 items from the Self-Reported Delinquency (SRD) interview (Elliott & Huizinga, 1983). All covariates were collected from NLSY mothers, and all were significantly correlated with measures of cumulative maternal relationship transitions (Table 1).

Statistical analyses—Analyses were conducted using Mplus 6.11 (Muthén & Muthén, 1998-2010) to estimate multilevel models that accommodate the nested structure of the data. As noted above, the dataset included three levels of nesting: the NLSY household level, the individual women in the NLSY (the mothers in the current study), and the offspring of the women in the NLSY (the CNLSY sample). The following four models were fit to CPs in childhood (averaged across ages 6-9), delinquency in early adolescence (10-13), and delinquency in late adolescence (14-17): Model 1 examined the unadjusted between-family association between transitions and offspring AB, controlling for child sex and family race-ethnicity. Model 2 examined the between-family association between transitions and AB after controlling for all maternal/family-level and child-specific factors. As noted above, these maternal/family-level covariates included mothers' highest grade completed, maternal relationship transitions experienced by mothers before age 18, maternal age at birth of her first child, and mother's race-ethnicity. Child-specific covariates included family income averaged from child birth to age 5, 9, or 13 (depending on analysis), mother-reported smoking and drinking during pregnancy, CNLSY siblings' birth order, maternal age at birth of each child, and child sex.

Models 3 and 4 compared cousins in the CNLSY. This analytic approach rules out a greater number of genetic and environmental confounds than is possible when controlling for measured covariates alone (but does not control for all possible confounds). Model 3 estimated the association between maternal relationship transitions and AB both within cousins and between unrelated families. This model examined if differences in exposure to transitions among cousins are associated with AB. Model 4 combined cousin-comparisons from Model 3 with the maternal/family and child specific statistical covariates that were controlled in Model 2. The addition of measured covariates help to rule out additional confounds that may not be addressed by comparing cousins. Cousin-comparisons were calculated by taking the difference between of the average number of transitions experienced by siblings in a nuclear family from the average number of transitions experienced by all cousins in an extended family. The statistical approach provides correct within-family estimates (Neuhaus & McCulloch, 2006) and yields the same parameter estimates as fixed-effect models (Greene, 2003).

Moderating influences of sex and family race-ethnicity were tested in all models by testing interaction terms created by multiplying the maternal relationship transitions variable by dummy coded sex and race-ethnicity variables. When these effects were nonsignificant, models were estimated again without them. In addition, initial models were tested for nonlinear effects of the number of relationship transitions by estimating the quadratic component. Quadratic effects were nonsignificant in all three age ranges; therefore, only linear effects of transitions were tested in the models presented.

The mother-reported child CP variable was analyzed as a normally-distributed, continuous outcome, and robust standard errors were estimated to minimize bias in standard errors due to departures from normality (Yuan & Bentler, 2000). The self-reported adolescent delinquency variables were analyzed as count distributions. A negative binomial distribution was initially assumed to allow for overdispersion. However, the overdispersion parameter was nonsignificant; thus, models were estimated using a Poisson distribution. Full information maximum-likelihood estimation was used in all models to accommodate missing data on the maternal relationship transitions variables and the covariates, allowing for a consistent sample size across models within each age range. Sampling weights were used so that estimates were generalizable to the original nationally-representative NLSY sample

Results

Mother-Reported Child CPs

Table 2 presents unstandardized parameter estimates and standard errors for models testing associations between cumulative maternal relationship transitions experienced through child age 5 and mother-reported child CPs averaged from age 6-9 years of age. Standardized effects are reported in the text. Standardized effects were calculated by dividing unstandardized coefficients by the standard deviation of the outcome variable, which can be interpreted as indicating the difference in standard deviations in CPs associated with each relationship transition. Model 1 indicated that each parental transition was significantly associated with a .184 standard deviation (SD) positive difference in offspring CPs. Offspring sex and African American ethnicity significantly moderated the effect of maternal relationship transitions, indicating stronger effects for boys and European Americans than for girls and African Americans, respectively. Model 2 indicated that each relationship was significantly associated with a .088 SD positive difference in offspring CPs, controlling for child-specific and maternal/family level factors. The maternal relationship transition effect was again found to be significantly moderated by offspring sex, but not African American ethnicity. The results indicated that the magnitude of the association between relationship transitions and child CPs was reduced, but still significant, after controlling for covariates. The association was significantly larger for boys than for girls, but was not significantly moderated by race/ethnicity after statistical covariates were considered.

The next two models compared cousins in the same extended families who were differentially exposed to maternal relationship transitions. In Model 3, the cousin-comparison parameter indicated that each transition was associated with a nonsignificant .055 SD positive difference in childhood CPs, and the addition of measured covariates in Model 4 further reduced the magnitude of the cousin-comparison to near zero. In summary, findings for mother-reported child CPs from ages 6-9 suggest that the effect found in unrelated comparisons is largely attenuated and nonsignificant after confounding influences are controlled by comparing cousins who were differentially exposed to maternal relationship transitions. In addition, the interaction effects found between ethnicity and maternal relationship transitions, and between child sex and maternal relationship transitions, were also largely attenuated and nonsignificant in cousin-comparison analyses, suggesting that these effects may be explained by confounding family background characteristics rather than gender or ethnicity, per se.

Self-Reported Delinquency, Ages 10-13

Table 3 presents unstandardized parameter estimates and standard errors for models testing associations between maternal relationship transitions experienced through child age 9 and youth-reported delinquency averaged from age 10-13 years of age. Unstandardized coefficients (expressed as logits) are presented in Table 3, and rates are presented in the text. Rates were calculated by exponentiating the unstandardized coefficients, resulting in coefficients that can be interpreted as indicating the percentage difference in delinquency associated with each additional maternal relationship transition. Model 1 indicated that each transition was significantly associated with a 6.4% positive difference in delinquency. Effects were not found to be significantly moderated by ethnicity or offspring sex. Model 2 indicated that each transition was associated at the trend level with a 2.5% positive difference in delinquency after child-specific and maternal/family level factors were controlled. The effect of transitions was not significantly moderated by offspring sex or race/ethnicity in this model.

The next two models compared cousins from the same extended families who were differentially exposed to relationship transitions. The Model 3 cousin-comparison parameter (not including statistical covariates) indicated that each transition was associated with a nonsignificant 5.2% positive difference in delinquency, and the addition of measured covariates in Model 4 reduced the magnitude of the cousin-comparison parameter to 3.9%. As in the childhood models, the attenuated effect of maternal relationship transitions when comparing cousins and controlling for measured covariates suggests that part of the association in early adolescence may be attributable to confounding family background characteristics that are correlated with exposure to maternal relationship transitions and with delinquency in late childhood/early adolescence. Both unrelated and cousin-comparisons found no evidence for moderation of the effect of maternal relationship transitions by offspring sex or race/ethnicity.

Self-Reported Delinquency, Ages 14-17

Table 4 presents unstandardized parameter estimates and standard errors for models testing associations between transitions experienced through age 13 and adolescent-reported delinquency from 14-17 years of age. Coefficients in the form of rates are reported in the text. Model 1 indicated that each additional maternal relationship transition was significantly associated with a 13.5% positive difference in offspring delinquency. Race/ethnicity, but not offspring sex, moderated the effect of transitions, indicating larger effects for European Americans than for African Americans. Model 2 indicated that each transition was significantly associated with a 4.9% positive difference in offspring delinquency, controlling for family and child-specific factors. The moderating effect of race/ethnicity was not significant after including statistical covariates.

In Model 3, the comparison of cousins from the same extended families who were differentially exposed to maternal relationship transitions indicated that each relationship transition was associated with a statistically significant 10.2% positive difference in delinquency. With the addition of covariates in Model 4, the cousin-comparison parameter indicated a smaller, but still significant, 6.9% positive difference in delinquency associated with each additional maternal relationship transition. Offspring sex and race/ethnicity were not found to moderate effects of maternal relationship transitions. Figure 1 depicts the estimated cousin-comparison association between maternal relationship transitions and delinquency in late adolescence. In contrast to findings from the analysis of CPs from 6-9 and delinquency from 10-13 years, the effect of maternal relationship transitions on delinquency in middle to late adolescence was robust to both measured and unmeasured confounds. These findings suggest that the effect of maternal relationship transitions in middle to late adolescence are not confounded by shared family background characteristics.

Supplemental Analyses of Self-Reported Delinquency, Ages 14-17

Supplemental cousin-comparison analyses with covariates (except child AB) were conducted to test whether effects of maternal relationship transitions on late adolescent delinquency were due to cumulative maternal relationship transitions across all of childhood and adolescence or whether (consistent with the “sleeping hypothesis”) they were due to transitions occurring during early childhood. Unstandardized coefficients and standard errors from these cousin-comparison models are presented in Table 5. In the first model, each maternal relationship transition through age 5 was associated with a statistically significant 13.6% positive difference in delinquency among cousins in late adolescence. In the second model, transitions occurring after age 5 was associated with a nonsignificant 8.1% increase in adolescent delinquency ($b=0.078$, $p=.116$). In the third model early childhood and later childhood/adolescence transitions were tested simultaneously. Each additional transition through age 5 was associated with a trend-level 12.3% positive

difference in delinquency, whereas transitions occurring between age 6 and 13 were associated with a nonsignificant 4.0% positive difference in delinquency. These results suggest that delinquency in middle-to-late adolescence is more strongly predicted by transitions occurring in early childhood than by transitions occurring in later childhood or early adolescence, and that the effects of transitions in early childhood cannot be attributed to shared family background characteristics.

Discussion

The present study is the first to conduct within-family analyses of associations between multiple maternal relationship transitions and offspring AB, and to our knowledge it is the first to examine associations in late adolescence. Previous studies comparing unrelated offspring reported significant associations between maternal relationship transitions and AB in childhood (Bachman et al., in press; Cavanagh & Huston, 2006, 2008; Martinez & Forgatch, 2002) and in early adolescence (Fomby & Cherlin, 2007). These studies controlled for numerous confounds (e.g., income, parental education, maternal antisocial behavior, pre-existing child AB, child sex) and found larger associations among European Americans (Fomby & Cherlin, 2007) and boys (Cavanagh & Huston, 2008). Consistent with those findings, the results from between-family (i.e., unrelated) comparisons in the present study indicated a significant association between cumulative maternal relationship transitions and AB in childhood and in early and late adolescence, even after controlling for many of the measured confounds that were controlled in previous studies. Also consistent with past research, between-family comparisons indicated that correlations with transitions in childhood were stronger for boys than for girls after statistical covariates were included in the model. However, in contrast to previous findings, offspring sex and race-ethnicity were not found to moderate maternal relationship transition effects in adolescence in models that included statistical covariates. It is not clear why findings for sex and race-ethnicity interactions in between-family analyses were not consistently replicated in the current study. However, the lack of significant moderation by race-ethnicity in the current study could reflect differences in analytical procedures between the current study and Fomby & Cherlin (2007), who tested the effects of maternal relationship transitions separately for European American and African American children, but did not formally test ethnicity as a moderator.

Within-family analyses were also conducted in order to more completely control the confounding influence of shared family background on the association between maternal relationship transitions and offspring AB. This approach controls for all influences that are shared by cousins (e.g., income, family history of AB) rather than relying only on those statistical covariates that are identified and measured by the researcher. Within-family comparisons are especially powerful when combined with measured statistical covariates that address influences not shared by cousins (e.g., maternal age at childbirth) that could also confound the influence of maternal relationship transitions. The effect of maternal relationship transitions in analyses comparing cousins differentially exposed to transitions were nonsignificant when predicting AB in childhood and in late childhood/early adolescence (although the lack of associations could be due, in part, by reduced statistical power for cousin comparisons relative to unrelated comparisons). Moreover, the inclusion of statistical covariates further reduced the strength of associations of maternal transitions with offspring AB in those age ranges, suggesting that the apparent effects of transitions in childhood and early adolescence may be largely explained by confounding genetic and other environmental influences (e.g., family history of psychopathology or low income) that are shared in common by members of extended families. In addition, cousin-comparisons did not provide evidence for moderation by child sex or race-ethnicity.

In contrast to the results from cousin-comparisons during childhood and early adolescence, maternal relationship transitions were significantly associated with a linear increase in levels of delinquency in late adolescence when cousins within the same extended families were compared, even after statistical covariates were considered. Gender and race-ethnicity were not found to moderate the effect. Furthermore, supplemental analyses of delinquency in late adolescence in which maternal relationship transitions before age 5 and after age 5 were considered separately suggested that the effect of transitions occurring before age 5 are larger than the effect of those experienced after age 5. This finding is consistent with the hypothesis that transitions in early childhood have a delayed impact on adolescent delinquency, and is consistent in its pattern with previous findings showing delayed effects of transitions in early childhood on CPs at the end of elementary school (Cavanagh & Huston, 2008).

Although the current findings suggest that maternal relationship transitions contribute to delinquency in late adolescence, they do not prove that the effect is causal. Nonetheless, because it is not feasible to conduct experimental research on maternal relationship transitions, within-family designs provide a powerful alternative. Cousin-comparisons have been used in previous research on predictors of externalizing problems (e.g., Geronimus, Korenman, & Hillemeier, 1994), as they rule out confounding influences shared by members of extended families. However, because cousins share on average only 12.5% of their genes, they do not rule out all genetic confounds. Unfortunately, restricted variability among siblings in exposure to maternal relationship transitions in adolescence precluded the use of sibling comparisons in the current study, which rule out more genetic and environmental confounds than cousin-comparisons (D'Onofrio, et al., 2009). Despite the limitations of cousin-comparisons, the current study is the most rigorous study of multiple maternal relationship transitions to date. Moreover, the current study benefited from a large, socioeconomically and ethnically diverse sample that enhances the generalizability of the findings relative to past studies.

The present study did not examine processes accounting for the putative causal effect of maternal relationship transitions on delinquency in late adolescence, but other researchers have suggested several possibilities. Capaldi and Patterson (1991) and Brody et al. (1988) hypothesized that parental relationship transitions contribute to inconsistent parental responsiveness, loss of routine and structure, and inadequate involvement with and supervision of offspring, any of which could increase risk for delinquency (Dodge & Pettit, 2003). Supporting the parenting deficiency hypothesis, Martinez and Forgatch (2002) found that mothers experiencing multiple relationship transitions exhibited increased coercive behaviors and decreased involvement and monitoring, and these parenting differences mediated the effect of maternal relationship transitions on child AB. It is also possible that parental relationship transitions could lead to changes in employment and residence that sever ties to community resources that promote positive adjustment (Cavanagh & Huston, 2008).

The delayed effect of early maternal relationship transitions on delinquency in late adolescence is more difficult to explain. However, it is somewhat consistent with the hypothesized “sleeping effect” of divorce: that many of the most negative effects of divorce occur in emerging adulthood, when offspring begin making major life decisions (Wallerstein et al., 2000). Alternatively, the presence of the transition effect in adolescence might indicate that the effects of maternal relationship transitions are stronger for youths exhibiting adolescence-onset AB than for youths exhibiting early-onset AB. This possibility is consistent with research showing that environmental influences are larger for adolescent-onset AB than for childhood-onset AB (e.g., Arseneault et al., 2003; Taylor et al., 2000). Gene-by-environment influences may also contribute to the association between exposure to

maternal relationship transitions and adolescent delinquency. Previous research has shown that highly antisocial mothers are likely to partner with highly antisocial fathers. Assortative mating among antisocial parents not only increases exposure to genetic risk for AB, it also increases risk for parental relationship instability and exposure to associated environmental risks for AB (e.g., deficient parenting), making it difficult to disentangle genetic and environmental influences associated with parental relationship transitions (Jaffee, Belsky, Harrington, Caspi, & Moffitt, 2006). Furthermore, exposure to antisocial fathers has been found to increase risk for offspring AB, suggesting the possibility that the influence of parental transitions may depend partly on the degree to which it alters exposure to antisocial fathers (Jaffee, Moffitt, & Taylor, 2003). Finally, it is also possible that younger children do in fact experience negative effects of maternal relationship transitions, such as internalizing or academic problems, but these effects are not manifest in AB until late adolescence. Future research should evaluate these possibilities.

Limitations

The present study was limited in several ways. First, analyses did not include the youngest portion of CNLSY offspring who were not yet age 6, 10, or 14 (depending on analysis) at the time of the 2008 CNLSY data collection. As the CNLSY sample ages, the sample will be more representative of children born in the U.S. Sampling weights reduced the influence of this limitation, but replication is needed. Second, paternal relationship transitions and maternal transitions between cohabiting relationships across waves (e.g., serial cohabitation) were not measured owing to limitations of relationship status assessments in the NLSY. This omission likely resulted in an underestimation of total relationship transitions. Third, analyses predicted AB averaged across multiple years, rather than trajectories. Predicting trajectories would have greatly reduced the number of participants included in the analyses, as many offspring were not old enough to provide sufficient data. In addition, because of the biennial pattern of assessment in the CNLSY, participants provided only 2 data points across the late adolescent period from ages 14-17. Growth curve modeling requires at least 3 data points. Fourth, as noted above, cousin comparisons can only control for unmeasured confounding influences that are shared by extended family members. Therefore, any differences between extended family members that are associated both with exposure to maternal relationship transitions and with offspring AB would not be addressed by comparing cousins. However, the inclusion of child-specific and maternal-level statistical covariates helped to minimize the influences of these remaining confounds. Finally, effects of transitions on AB from 6-9, 10-13, and 14-17 years were not compared directly. Thus, it cannot be concluded that effects across childhood and adolescence are significantly different, even though effects were nonsignificant across 6-9 and 10-13 years and significant across 14-17 years. Differences in reporters during childhood (mother-report) and adolescence (self-report) further complicate the comparison of coefficients across these age periods.

Despite its limitations, the present study makes an important contribution to understanding the effects of maternal relationship transitions on offspring AB. The present findings suggest that maternal relationship transitions (perhaps especially those occurring in early childhood) contribute in a linear fashion to higher levels of offspring delinquency at 14-17 years of age, implying that interventions reducing early relationship transitions or environmental risks following from relationship transitions could help prevent AB during the period of development in which it is the greatest social problem. However, additional support is needed from studies using other quasi-experimental designs with different threats to their validity before causal inference is warranted.

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Figure 1.
Estimated Association between Transitions Experienced through Age 13 and Delinquency in Late Adolescence (Ages 14-17)

Table 1
Correlations between Parent Relationship Transitions and Continuous Covariates.

Covariates	Cumulative Transitions					
	Age 5		Age 9		Age 13	
	r	n	r	n	r	n
Child-Specific						
Smoking during Pregnancy	0.15 ^c	10040	0.16 ^c	10180	0.15 ^c	10198
Drinking during Pregnancy	0.05 ^c	10058	0.05 ^c	10197	0.05 ^c	10214
Family Income ^b	-0.25 ^c	10571	-0.27 ^c	10827	-0.26 ^c	10881
Maternal Age at Childbirth	-0.20 ^c	11157	-0.25 ^c	11335	-0.29 ^c	11370
Maternal/Family-Level ^a						
Maternal Intellectual Abilities	-0.17 ^c	4625	-0.20 ^c	4644	-0.21 ^c	4649
Maternal Highest Grade	-0.12 ^c	4864	-0.12 ^c	4887	-0.11 ^c	4897
Maternal History of Delinquency	0.14 ^c	4599	0.15 ^c	4615	0.15 ^c	4622
Family Instability during Mother's Childhood	0.12 ^c	4300	0.12 ^c	4316	0.13 ^c	4319
Maternal Age at First Birth	-0.23 ^c	4732	-0.27 ^c	4751	-0.29 ^c	4757

^aNote. Correlations are based on mean exposure to family instability for all children of each mother.

^bAveraged from offspring birth to age at which family transitions are summed.

^cp<.001.

Table 2

Parent Relationship Transitions Predicting Childhood CP from Ages 6-9 Using Quasi-Experimental and Statistical Controls

Variables	Model 1		Model 2		Model 3		Model 4	
	b	SE	b	SE	b	SE	b	SE
Parent Transitions (through age 5)								
Focal Family Instability	.050 *	.009	.024 *	.009				
Between-Family Comparison					.063 *	.008	.029 *	.008
Cousin-Comparison ^a					.015	.014	-.002	.014
Interaction Effects								
Unrelated Comparison x Sex	-.024 *	.009	-.022 *	.009				
Unrelated Comparison x Hispanic	-.013	.012	-.002	.012				
Unrelated Comparison x AA ^b	-.023 *	.011	-.005	.011				
Child-Specific Covariates								
Child Sex (0=male, 1=female)	-.076 *	.007	-.076 *	.007	-.085 *	.006	-.084 *	.006
Birth Order			.008	.006			.008	.006
Smoking during Pregnancy			.038 *	.008			.038 *	.008
Drinking during Pregnancy			.009 *	.004			.009 *	.004
Family Income (Ages 0-5)			-.006	.004			-.006	.004
Maternal Age at Childbirth			-.007 *	.001			-.007 *	.001
Race-ethnicity								
Hispanic	.026 *	.011	.016	.012	.015	.010	.014	.011
African American	.081 *	.010	.051 *	.011	.065	.009	.048 *	.010
Maternal/Family-Level Covariates								
Maternal Intellectual Abilities			.000	.000			.000	.000
Maternal Highest Grade			-.001	.002			-.001	.002
Maternal History of Delinquency			.017 *	.003			.016 *	.003
Family Instability during Mother's Childhood			.015 *	.005			.014 *	.005
Maternal Age at First Birth			.000	.002			.001	.002

Note. Analyses are based on 8652 offspring. Parameters are unstandardized coefficients.

*
=p<.05.

^aCousin-comparison coefficient based on a subsample of 1062 sibling mothers.

^bAA=African American.

Parent Relationship Transitions Predicting Delinquency from Ages 10-13 Using Quasi-Experimental and Statistical Controls

Table 3

Variables	Model 1		Model 2		Model 3		Model 4	
	b	SE	b	SE	b	SE	b	SE
Parent Transitions (through age 9)								
Focal Transitions	.062 *	.013	.025	.013				
Between-Family Comparison					.082 *	.015	.026	.016
Cousin-Comparison ^a					.051	.036	.038	.038
Child-Specific Covariates								
Child Sex (0=male 1=female)	-.338 *	.026	-.271 *	.026	-.338 *	.026	-.271 *	.026
Birth Order			.063 *	.019			.062 *	.019
Smoking during Pregnancy			.047 *	.021			.046 *	.021
Drinking during Pregnancy			.025 *	.012			.026 *	.012
Family Income (Ages 0-9)			.016	.015			.016	.014
Maternal Age at Childbirth			-.001	.005			-.001	.005
Child CPs (Ages 6-9)			.596 *	.045			.596 *	.045
Race-ethnicity								
Hispanic	.234 *	.036	.162 *	.041	.230 *	.036	.162 *	.041
African American	.394 *	.028	.273 *	.035	.388 *	.028	.273 *	.035
Maternal/Family-Level Covariates								
Maternal Intellectual Abilities			-.002 *	.001			-.002 *	.001
Maternal Highest Grade			-.004	.006			-.004	.006
Maternal History of Delinquency			.033 *	.009			.032 *	.009
Family Instability during Mother's Childhood			-.010	.015			-.010	.015
Maternal Age at First Birth			.000	.004			.000	.004

Note. Analyses are based on 6911 offspring. Parameters are expressed as logits.

* =p<.05

^aCousin-comparison coefficient based on a subsample of 803 sibling mothers.

Table 4

Parent Relationship Transitions Predicting Late Adolescent Delinquency from Ages 14-17 Using Quasi-Experimental and Statistical Controls

Variables	Model 1		Model 2		Model 3		Model 4	
	b	SE	b	SE	b	SE	b	SE
Parent Transitions (through age 13)								
Focal Transitions	.127 *	.016	.048 *	.012				
Between-Family Comparison					.120 *	.013	.053 *	.014
Cousin-Comparison ^a					.097 *	.033	.067 *	.030
Interaction Effects								
Unrelated Comparison x Sex	-.019	.019						
Unrelated Comparison x Hispanic	-.010	.023						
Unrelated Comparison x AA ^b	-.080 *	.022						
Child-Specific Covariates								
Child Sex (0=male, 1=female)	-.225 *	.035	-.184 *	.028	-.247 *	.028	-.184 *	.028
Birth Order			.036 *	.018			.034 *	.018
Smoking during Pregnancy			.039	.024			.039	.024
Drinking during Pregnancy			.007	.012			.007	.012
Family Income (Ages 0-13)			-.018	.018			-.018	.018
Maternal Age at Childbirth			-.014 *	.005			-.015 *	.005
Child Delinquency (Ages 10-13)			.584 *	.047			.584 *	.047
Race-ethnicity								
Hispanic	.264 *	.048	.199 *	.042	.252 *	.038	.200 *	.042
African American	.301 *	.039	.072	.037	.201 *	.031	.073	.037
Maternal/Family-Level Covariates								
Maternal Intellectual Abilities			.000	.001			.000	.001
Maternal Highest Grade			-.004	.007			-.004	.007
Maternal History of Delinquency			.045 *	.011			.044 *	.011
Family Instability during Mother's Childhood			.008	.020			.009	.020
Maternal Age at First Birth			-.004	.004			-.004	.004

Note. Analyses are based on 6495 offspring. Parameters are expressed as logits.

*
=p<.05.

^aCousin-comparison coefficient based on a subsample of 809 sibling mothers.

^bAA=African American.

Supplemental Analyses of Effects of Transitions in Early Childhood on Delinquency in Late Adolescence from Ages 14-17 Using Quasi-Experimental and Statistical Controls

Table 5

Variables	Model 1		Model 2		Model 3	
	B	SE	B	SE	b	SE
Parental Transitions (birth to age 5)						
Unrelated Comparison	.105 *	.025			.074 *	.027
Cousin-Comparison ^a	.128 *	.056			.116	.062
Parental Transitions (age 6 to age 13)						
Unrelated Comparison			.087 *	.021	.066 *	.023
Cousin-comparison ^a			.078	.050	.039	.054
Child-Specific Covariates						
Child Sex (0=male, 1=female)	-.246 *	.028	-.247 *	.028	-.247 *	.028
Birth Order	.040 *	.018	.036 *	.018	.038 *	.018
Smoking during Pregnancy	.059 *	.025	.063 *	.024	.058 *	.025
Drinking during Pregnancy	.012	.013	.015	.013	.012	.013
Family Income (Ages 0-13)	-.034 *	.016	-.035 *	.017	-.027	.017
Maternal Age at Childbirth	-.021 *	.005	-.021 *	.005	-.020 *	.005
Race-ethnicity						
Hispanic	.207 *	.043	.219 *	.043	.212 *	.042
African American	.099 *	.037	.109 *	.038	.108 *	.038
Maternal/Family-Level Covariates						
Maternal Intellectual Abilities	.000	.001	.000	.001	.000	.001
Maternal Highest Grade	-.002	.007	-.002	.007	-.002	.007
Maternal History of Delinquency	.055 *	.011	.057 *	.011	.054 *	.011
Family Instability during Mother's Childhood	.017	.020	.018	.020	.015	.020
Maternal Age at First Birth	-.006	.004	-.006	.004	-.006	.004

Note. Analyses are based on 6495 offspring. Parameters are unstandardized coefficients expressed as logits.

* =p<.05.

^aCousin-comparison coefficient based on a subsample of 809 sibling mothers.