

## REPORT

# Early development of delinquency within divorced families: evaluating a randomized preventive intervention trial

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### Abstract

*This paper reports on an experimental test of coercion theory early onset model of delinquency. Results are from the Oregon Divorce Study-II, a randomized preventive intervention trial with a sample of 238 recently separated mothers and their sons in early elementary school. The objective was to experimentally manipulate parenting variables hypothesized to influence development of delinquent behaviors. Multiple-method assessment spanned 36 months. Because the intervention focused on parent training, we expected that any intervention effects on changes in child outcomes would be mediated by hypothesized intervening mechanisms. Linear growth models showed significantly greater reduction in boys' delinquency and deviant peer affiliation in the experimental group relative to the controls. Subsequent models using no method overlap in constructs demonstrated that the intervention effect on delinquency operated through growth in parenting and reduction in deviant peer affiliation.*

There is a well-established link between marital transitions and increased likelihood of problem behaviors in children (Amato, 1993; Hetherington, Bridges & Insabella, 1998), especially young boys (Shaw, Emery & Tuer, 1993). Increased problem behaviors place boys at risk for peer rejection, deviant peer association, and subsequent delinquency (Patterson & Dishion, 1985; Patterson, Reid & Dishion, 1992). Although established developmental models exist, there remain few experimental trials addressing how preventive interventions operate to ameliorate problem behaviors associated with divorce. Here, we evaluate the roles of parenting and deviant peers in a clearly specified developmental theory of delinquency using a selective prevention sample.

Several studies conclude that early parenting has a direct impact on delinquency as well as an indirect impact on deviant peer affiliation (Simons, 1996; Vitaro, Brendgen & Tremblay, 2000). Still others conclude that early parenting has a weak or fully mediated association with delinquency upon entering deviant peer affiliation (c.f. Scaramella, Conger, Spoth & Simons, 2002; Thornberry & Krohn, 1997). There are few developmental models specifying how divorce is linked with delinquency (Patterson, Forgatch, Yoerger & Stoolmiller, 1998; Rebellon, 2002; Simons, 1996). We attempt to expand this literature using an experimental design.

Even fewer experimental studies have evaluated developmental models within divorce, with the exception of two noted studies. Forgatch and colleagues have shown short- and long-term effects of parenting on changes in child behaviors (DeGarmo, Patterson & Forgatch, 2004; Forgatch & DeGarmo, 1999, 2002; Martinez & Forgatch, 2001). Similarly, comparing a parent training condition with a literature control, Wolchik and colleagues have demonstrated that improvements in parental discipline and mother-child relationship quality accounted for experimental reductions in children's externalizing (Tein, Sandler, MacKinnon & Wolchik, 2004; Wolchik, Sandler, Mill-sap, Plummer, Greene, Anderson, Dawson-McClure, Hipke & Haine, 2002; Wolchik, West, Westover, Sandler, Martin, Lustig, Tien & Fisher, 1993). Much of the earlier work has focused on externalizing and internalizing (Forgatch & DeGarmo, 1999, 2002; Martinez & Forgatch, 2001; Wolchik *et al.*, 2002; Wolchik *et al.*, 1993). The current report extends prior findings by focusing on mechanisms of delinquency, including deviant peers.

### The social interaction learning model (SIL) of parenting and delinquency

This investigation is based on principles of social interaction and social learning (Patterson, 1982; Patterson

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*et al.*, 1992), as well as the early starter model of delinquency (Patterson, Dishion & Yoerger, 2000; Patterson *et al.*, 1998; Patterson & Yoerger, 1999). One key aspect of the SIL is the role of reinforcement and functional payoffs for children in key social settings. Coercive processes within SIL describe reinforcement patterns established in early parent-child socialization that become overlearned and promote antisocial behaviors. Antisocial behaviors are thought to be a prelude to early-onset delinquency. Once coercive patterns are established at home, subsequent antisocial behaviors and coercive interactions generalize to other settings. Aversive interactions with teachers and peers lead to early school failure and peer rejection. This, in turn, leads to association with deviant peers, providing yet another social training ground with functional payoffs for deviancy that escalates antisocial behaviors (Dishion, Eddy, Haas, Li & Spraklen, 1997; Patterson *et al.*, 2000; Snyder, 2002).

Training for early arrests, prior to age 14, begins in the home as early as the preschool years (Patterson & Yoerger, 1997). Family members provide negative reinforcement for overt antisocial behaviors (e.g. argues, talks back, fights, etc.), and as early as kindergarten, deviant peers provide positive reinforcement for covert forms of antisocial behaviors (e.g. lying, stealing, cheating, etc.; Patterson, *in press*; Snyder, Reid & Patterson, 2003). Once on this trajectory, early-onset boys are at greater risk for adult chronic offending (Patterson & Yoerger, 1999).

With increasing autonomy in the course of development, individuals gravitate toward activities, settings, and people that provide higher relative ratios of positive to aversive social experiences (Conger & Simons, 1997; Dishion, Spraklen, Andrews & Patterson, 1996). Peer relationships provide a rich iterative set of daily social experiences and contingencies that shape social behavior, including reinforcing responses to the content of talk as well as responses to behaviors (Snyder, 2002). Peer relationships are elective rather than obligatory in nature and functional payoffs are particularly salient.

### The theoretical role of deviant peers and deviancy training

One area needing theoretical clarity is specification of relationships among early parenting practices, deviant peers, and subsequent delinquency. Criminological paradigms focusing on social learning principles underscore that deviant peers provide a fertile training ground for delinquency (Akers, 1998; Thornberry & Krohn, 1997). A main difference between these social learning models

and the SIL approach is that SIL emphasizes the antecedent role and lasting impact of parenting. Social learning models posit that parenting plays a secondary role in adolescent delinquency through promoting lack of self-control and conformity. And a lack of self-control promotes deviant peer association, the primary and most proximal mechanism of delinquency (c.f. Elliot, Huizinga & Ageton, 1985; Gottfredson & Hirschi, 1990; Scaramella *et al.*, 2002).

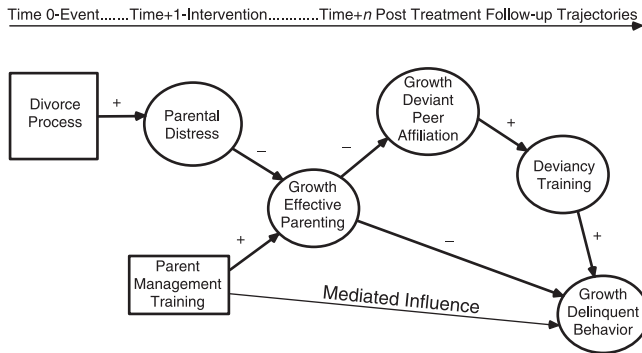
In contrast, others have argued that parenting has both a *direct and indirect effect* on subsequent delinquent behaviors (see Simons, 1996, for a review). Supporting this, Patterson and Dishion (1985) showed a direct and indirect effect of monitoring on delinquency for boys; Simons (1996) showed direct and indirect effects of maternal discipline and monitoring on delinquency for boys and girls. Finally, a recent experimental test focusing on parent training demonstrated an intervention effect on changes in parental supervision, and parenting in turn showed direct and indirect effects on delinquency through deviant peers (Vitaro, Brendgen & Tremblay, 2001).

From the SIL model, we believe several factors can influence detection of prior parenting effects. First, full mediation may be less likely to occur when one or two dimensions of parenting are measured, as opposed to more comprehensive parenting constructs that include discipline, positive involvement, and problem solving. Second, weaker effects of early parenting may be more likely when utilizing self-report or global ratings of parenting as opposed to observation of specific behaviors. Finally, lagged models of prior parenting effects that do not incorporate *changes* in parenting may produce weaker effects. For example, many models specify a lag of 1 to 3 years of some prior cross-sectional parenting measure; however, measures that covary change may more likely detect parenting effects (c.f. Vitaro *et al.*'s, 2001, 7-year growth model).

### Hypotheses

For parents, divorce and its accompanying stressors lead to increased distress and disrupted social interactions. These social disruptions occur with friends, coworkers, extended family, and especially with their children. Disrupted parenting interrupts stable monitoring skills, problem solving, and consistent discipline, each contributing to wandering and deviant peer association. Disrupted and ineffective parenting is the key mechanism placing children at risk for adjustment problems (see Figure 1).

The intervention is expected to improve parenting skills to manage stressful transitions and prevent development



**Figure 1** Theoretical model of divorce and early onset delinquency.

of boys' antisocial behaviors. Early delinquent behaviors are shaped by a set of effective parenting practices: monitoring, appropriate discipline, positive involvement, skill encouragement, and interpersonal problem-solving. Because the intervention was provided to mothers and not children, intervention effects associated with distal changes in children's behaviors should be accounted for by changes in parenting practices as shown by the mediated path in Figure 1.

Finally, parenting is expected to impact delinquency through deviant peer association. Prior studies have shown that poor monitoring increases the likelihood of unsupervised wandering and deviant peer affiliation (Stoolmiller, 1994), and that conflict-ridden parent-child interactions predict wandering and deviant peer affiliation (Forgatch & Stoolmiller, 1994). Conversely, cohesive positive family interactions have been shown to protect against child wandering (Forgatch & DeGarmo, 1999) and deviant peer affiliation (Eddy & Chamberlain, 2000; Scaramella *et al.*, 2002).

## Methods

### Analytic strategy

We employed data from the Oregon Divorce Study-II (ODS-II). Prior reports have shown that improvements in parenting were associated with improvements in child behavior at 12 and 30 months (DeGarmo *et al.*, 2004; Forgatch & DeGarmo, 1999, 2002; Martinez & Forgatch, 2001). Unique to the current analysis is an evaluation of early delinquent trajectories reported by teachers from baseline to 36 months and an evaluation incorporating growth in deviant peer affiliation. The analysis combines a multilevel growth model with a mediation analysis. The growth model focuses on fixed and time-varying predictors of variance in individual

trajectories, and the mediation analysis focuses on causal mechanisms. Mediation requires a direct intervention effect on delinquency. The second step requires an intervention effect on intervening mechanisms (i.e. parenting and deviant peers). These mechanisms in turn must be associated with growth in delinquency, and also render the intervention effect on delinquency nonsignificant.

We employed hierarchical linear growth modeling (HLM) estimating fixed effects with robust standard errors (HLM5; Raudenbush, Bryk, Cheong & Congdon, 2000). At Level 1, linear slopes are estimated for the repeated measures of each individual, thus specifying variation in individual trajectories. The growth curves then become the outcome focus of analysis. At Level 2, group means and variation in growth are estimated from the Level 1 data. The outcome slopes are then regressed on fixed or time-varying predictors of change.

HLM provides several advantages for modeling intervention effects. First, it can handle mistimed data. For example, random error and slope coefficients require three or more time points. In HLM, individuals who have one or two missing data points out of four post-treatment follow-up assessments are not excluded. Second, HLM estimates growth based on each individual's assessment timeline. One person, for example, may have been assessed at exactly 6-month intervals while another person's curve can be modeled for sporadic assessments (e.g. baseline and 6.3, 12.4, 18.2, and 27.5 mos.). Repeated measures analysis of variance (MANOVA) requires list-wise deletion of data with equidistant time spacing for all individuals.

### Participants

Participants were 238 recently separated single mothers and their sons residing in a medium-sized city in the Pacific Northwest. Families were recruited through media advertisements, flyers distributed throughout the community, and divorce court records. Mothers in eligible families (a) had been separated from their partner within the prior 3 to 24 months, (b) resided with a biological son in Grades 1 through 3, and (c) did not cohabit with a new partner. At baseline, mothers had been separated for an average of 9.2 months. Families had 2.1 children on the average. Mothers' mean age was 34.8 years ( $SD = 5.4$ ; range 21.4 to 49.6); boys' mean age was 7.8 years ( $SD = .93$ ; range 6.1 to 10.4). The racial/ethnic composition of the boys in the sample was 86% White, 1% African American, 2% Latino, 2% Native American, and 9% from 'other' racial/ethnic groups including those who were identified as belonging to more than one group. This distribution reflected the racial/ethnic makeup of the community in which the

study was conducted. The mean annual family income was \$14,900. Seventy-six percent of the families were receiving public assistance.

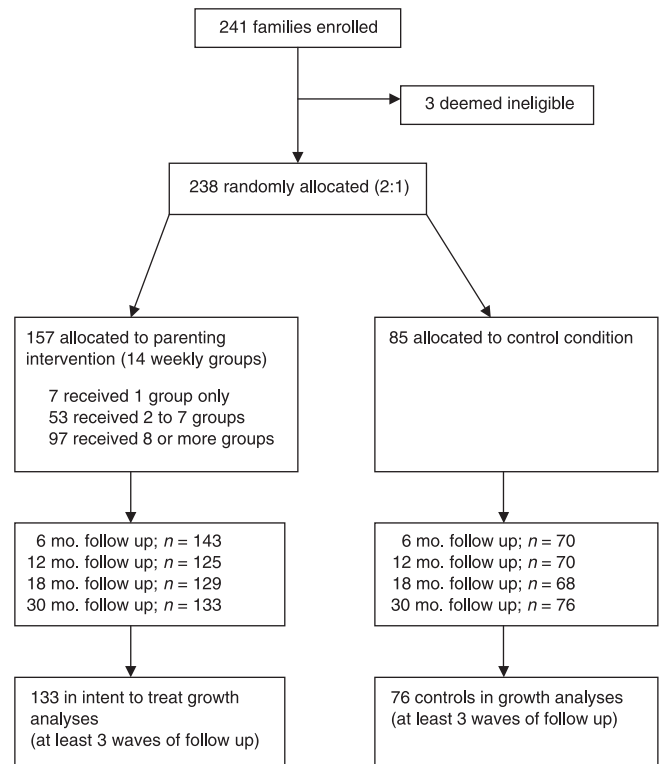
The majority of mothers (76%) had some academic or vocational training beyond high school, although only 17% had completed a 4-year college degree or higher. Approximately 20% of the women completed their education with high school graduation; 4% had not completed high school. Most mothers were classified within the lower- and working-class ranges in terms of occupation (Hollingshead, 1975): 32% unskilled, 21% semiskilled, 23% clerical/skilled, 22% minor professional to medium business, and 3% major business/major professional.

The experimental and control groups did not differ on any baseline variables except for two characteristics: the number of months since time of separation and boys' age. On average, mothers in the experimental group had been separated for about 2.4 months longer than those in the control group ( $M = 9.84$  and  $7.48$ , respectively,  $p < .01$ ). Boys in the experimental group were about .28 years younger than those in the control group ( $M = 7.65$  and  $7.93$ , respectively,  $p < .05$ ). These variables, along with mothers' age, were included in all multivariate models because they are potentially relevant.

### Design

In ODS-II, families were randomly assigned approximately two-thirds to the experimental group ( $n = 153$ ) and one-third to the no-intervention control group ( $n = 85$ ). Unequal groups were done to provide sufficient sample size within the experimental condition for examining potential full-implementation intervention effects (Vinokur, Price & Caplan, 1991). Mothers in the experimental group were invited to participate in the intervention; families in the control condition received no intervention. Experimentals and controls participated in the same assessment schedules.

Participant families received extensive multiple-method, -setting, and -agent assessment five times: at baseline and at 6, 12, 18, and 30 months. Teacher ratings were collected annually at baseline and at 12, 24, and 36 months. All experimental families completed intervention by the 6-month assessment. There were 209 longitudinal families participating at the 30-month follow-up with no significant differences in attrition by group condition (89.4% participation for experimental and 86.9% for the controls). We obtained relatively high retention by using methods previously proven successful (see Capaldi, Chamberlain, Fetrow & Wilson, 1997; Capaldi & Patterson, 1987). These include a combination of incentives and intensive tracking procedures for following the sample (e.g. incentive pay, obtaining



**Figure 2** Flow diagram for divorced mother parent training preventive intervention trial.

addresses and phone numbers for multiple contacts, regular newsletters informing of upcoming assessments and for address verification, using publicly available databases for tracking, etc.).

The intervention consisted of a series of 14 parent group meetings held weekly in the early evening hours at the Oregon Social Learning Center (OSLC). The original intervention curriculum included 16 weekly topics, but two topics were combined with others for parsimony when the intervention was under way. There were 13 parent groups, which ranged in size from 6 to 16 ( $M = 9.5$ ). Experimental-group mothers participated in an average of 8.5 sessions ( $SD = 5.7$ ). Figure 2 provides a summary of random allocation, sample retention, and intervention dosage as recommended for the reporting of randomized trials (Altman, Schulz, Moher, Egger, Davidoff, Elbourne, Gotsche & Lang, 2001).

The intervention was built around five theoretically based parenting practices (appropriate discipline, skill encouragement, monitoring, problem solving, positive involvement) and specific issues relevant to divorcing women (e.g. regulating negative emotions, managing interpersonal conflict). The parenting topics taught mothers strategies for decreasing coercive exchanges with their children by responding early and appropriately

**Table 1** Longitudinal measurement of study variables

Data	Baseline	6 mos.	12 mos.	18 mos.	24 mos.	30 mos.	36 mos.
Parenting practices observed and mother-report	Time 1	Time 2	Time 3		Time 4	Time 5	
Deviant peers boy-report	Time 1	Time 2	Time 3		Time 4	Time 5	
Delinquency teacher-report	Time 1		Time 2		Time 3		Time 4

to child misbehavior with non-corporal discipline (e.g. time out, work chores, privilege removal). Simultaneously, the intervention focused on the use of contingent positive reinforcement (e.g. praise, incentive charts) to promote prosocial behavior. The topics were presented in an integrated step-by-step approach. Each new topic was introduced to build upon a previously learned skill. Topics were usually introduced in one or more sessions and then reviewed and revisited throughout the remainder of the program. The program was flexible in that it allowed participants to discuss current relevant issues as part of the regular agenda for each session. Issues were often linked directly to a specific curriculum topic.

Forgatch and DeGarmo (1999) summarized the content of each intervention session, described interventionist training, and provided details regarding program fidelity. The intervention program is fully described in the manual *Parenting through change* (Forgatch, 1994). The manual contains information for group leaders and materials for mothers. In the leader manual, each session is detailed with agenda, objectives and rationales, procedures, exercises and role-plays, and group process suggestions. Parent materials include summaries of principles, home practice assignments, charts, and other necessary materials. The program also includes a 30-minute videotape, *The divorce workout* (Forgatch & Marquez, 1993), which shows three families using effective parenting practices to help their children adjust to divorce.

### Measures

Multiple-method assessments were conducted that included structured interviews with mothers and children; observations of mother-child interactions in the laboratory; and questionnaires filled out by mothers, children, and teachers. Teacher data were collected annually for 36 months, whereas the majority of parent-child data were collected semi-annually for 30 months. The assessment timelines for teacher and family data for this report are presented in Table 1.

### Child outcomes

*Delinquency* was evaluated on a nationally normed measure of delinquent acts rated by teachers using the

Delinquency T-score from the Teacher Report Form (TRF) of the Child Behavior Checklist (CBCL; Achenbach, 1991). The T-score consisted of 17 items (e.g. steals, physically attacks people, destroys others' property, lies, cheats). Cronbach alphas were .95, .93, .93, and .93 across the four annual assessments.

*Deviant peer association* was a summative index of 5 items scored 1 for true and 0 for false. The items were the boys' report of their friends' deviant behaviors (e.g. my friends get into fights, clown around, get into trouble, do not like schoolwork, and find schoolwork too hard).

### Effective parenting practices

Observations of parenting were obtained in the laboratory during structured interaction tasks (SIT) lasting 45 minutes. The tasks included mother-son problem-solving discussions about current hot conflicts, a teaching task, an unstructured activity, a forbidden toy situation, and a refreshment break. Microsocial data were scored using the Interpersonal Process Code (IPC; Rusby, Estes & Dishion, 1991). The IPC has 13 codes scored in real time using computers providing information on respondent and recipient, sequence, content, affect, context, and duration. Aversive behaviors are those scored as negative either in content (e.g. refusal, criticism) or in affective tone (e.g. hostile, sad). Positive behaviors are either positive in content (e.g. positive interpersonal, endearment) with neutral or positive affect, or neutral in content (e.g. talk) with positive affect (e.g. happy, caring). Coders also rated more global aspects of interaction following microsocial coding. Approximately 15% of the interactions were scored for intercoder reliability at each wave.

The factor score of *effective parenting* was measured by 7 domains demonstrating convergence (Forgatch & DeGarmo, 2002): positive involvement, skill encouragement, problem solving, monitoring, negative reinforcement, negative reciprocity, and aversive discipline. Cronbach's alpha for the 7-indicator construct was .73, .70, .73, .72, and .63 across time.

*Positive involvement* was obtained from global coder ratings following each of the eight SIT tasks. Likert-scale items included: warm, empathetic, encouraging, affectionate, treated child with respect. Cronbach alphas ranged from .90 to .94. ICCs were .83, .90, .82, .79, and .93.

*Skill encouragement* was based on global ratings of mothers' ability to promote child skill development through contingent encouragement and scaffolding strategies observed during the 10-minute teaching task. The measure comprised 11 Likert-scale items (e.g. breaks task into manageable steps, reinforces success, prompts appropriate behavior, corrects appropriately). Cronbach's alphas were .69, .73, .81, .70, and .67 from baseline to 30 months. Intra-class correlation coefficients (ICCs) of coder agreement were .73, .67, .66, .48, and .76, respectively.

*Problem-solving outcome* was a scale score of global coder ratings made following each of the three problem-solving interactions involving a mother-identified issue. Nine Likert-scale items were averaged to compute the scale score (e.g. solution quality, extent of resolution, likelihood of follow through, apparent satisfaction). Cronbach alphas ranged from .87 to .92 across the three topics and five waves of assessment. ICCs were .77, .81, .76, .84, and .79.

*Monitoring* comprised five items rated by coders and parent interviewers. Coders rated how skilled the mother was in supervising the child, keeping close track of the youngster's behavior, and obtaining information from the child. Interviewers rated how well the mother knew what the boy does on a day-to-day basis and tracked antisocial behavior. Cronbach alphas for the scale score were .72, .64, .71, .70, and .55.

*Negative reinforcement* was defined as frequency of conflict bouts initiated by the mother that were terminated by the child. Bouts began when the mother introduced an aversive behavior following a period of at least 12 seconds of interaction without aversive behavior by either party. For example, the mother gave the child a command, the child shouted a refusal, the mother withdrew the command, and the interaction became neutral. In this sense, the child escaped the aversive situation provided by the mother by introducing his own aversive behavior, which resulted in the mother's backing down and thereby negatively reinforcing the boy's use of aversive behavior. ICCs were .78, .58, .47, .68, and .60.

*Negative reciprocity* was measured with the Haberman binomial  $z$  score (Gottman & Roy, 1990), reflecting the conditional likelihood that the mother reciprocated the child's aversive behavior with an aversive behavior of her own. ICCs were .65, .74, .54, .63, and .67.

*Inept discipline* was based on ratings made by coders after observing the interaction tasks. The discipline score was the mean of 13 items, scaled from 1 to 5, indicating poor erratic discipline. Sample items rated whether mother was overly strict and authoritarian, used nagging or nattering to get compliance, expressed anger/hostility while disciplining, seemed indecisive or

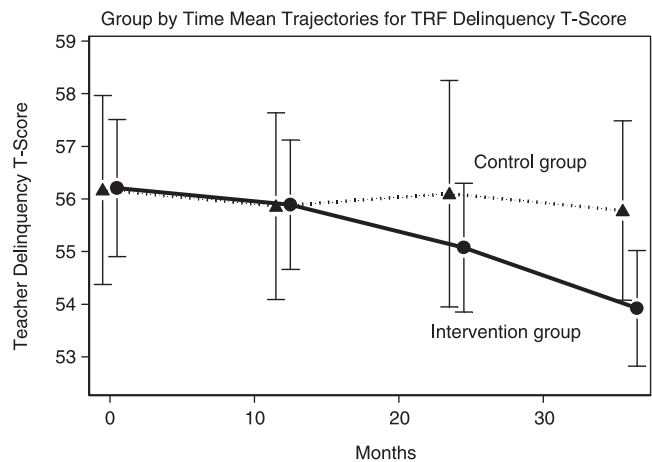
unsure when disciplining, used inappropriate discipline. Cronbach alphas were .91, .92, .92, .92, and .91. ICCs were .70, .85, .78, .77, and .88.

*Relevant control variables* included (a) number of months separated, to control for variance in divorce adjustment; (b) maternal antisocial characteristics measured by scales 4 (psychopathic deviate) and 9 (hypomania) on the MMPI (Hathaway & McKinley, 1943), to control for individual personality differences for mothers and to serve as a proxy for genetic influence; (c) boys' age to control for differences in development; and finally (d) socioeconomic status measured by the mean of standardized measures of years of education and occupational status. Occupational status was based on nine categories coded from the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975).

## Results

First, we evaluated missing data over time. Data at each assessment wave could be missing due to attrition or partially completed assessments (e.g. participant left items blank, refused to answer particular items, etc.). We conducted a missing values analysis on Level 1 repeated measures, as well as on Level 2 predictors of growth. Little's chi-square test indicated that the data was missing completely at random ( $MCAR \chi^2 = 1463.07$ ,  $df = 1439$ ,  $p = .32$ ).

Aggregate trajectories for TRF delinquency T-scores are plotted in Figure 3 by group condition. The graph displays pairwise means and their 95% confidence intervals. At each time point, any mean for one group falling outside the confidence intervals of the other group represents a statistically significant difference at the .05 level.



**Figure 3** Group by time trajectories of TRF delinquency T-scores.

**Table 2** Mediation model for growth in delinquency baseline to 36 months

Predictors	Model 1	Model 2	Model 3
Initial status $\pi_{0i}$	56.04***	56.03***	55.41***
Time-growth rate $\pi_{1i}$	-0.47***		
Intercept $\beta_{10}$		3.10	3.65
Group condition $\beta_{11}$		-0.78*	-0.61
Months separated $\beta_{12}$		-0.03	-0.04
Boys' age $\beta_{13}$		-0.35	-0.43*
Maternal antisocial $\beta_{14}$		-0.25	-0.28
Socioeconomic status $\beta_{15}$		-0.18	-0.06
Effective parenting factor $\pi_{2i}$			-1.10***
Deviant peer association $\pi_{3i}$			1.72*

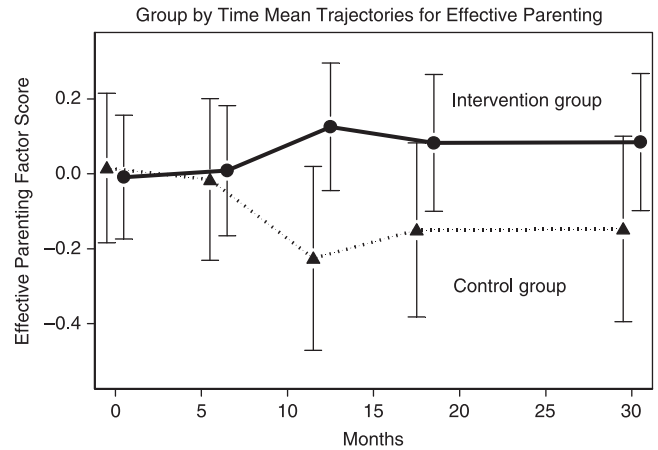
\*\*\* $p < .001$ ; \*\* $p < .01$ ; \* $p < .05$ .

Delinquency exhibited a pattern of linear change with the experimental and control groups beginning to diverge at 24 months and becoming significantly different at 36 months, using one-tailed directional hypotheses for expected effects ( $M = 53.9$ ,  $SD = 5.6$  for experimental condition,  $M = 55.7$ ,  $SD = 6.6$  for controls,  $t = 1.81$ ,  $p < .05$ ). We next conducted multivariate models to test group differences in the rate of change. In addition, the multivariate models specified mediation tests beginning with the plotted intervention effect on delinquency. Results are presented in Table 2. Parameters are estimated with unstandardized coefficients.

Overall, the fitted linear slopes indicated that the intervention significantly reduced delinquency over time and, further, the intervention operated through hypothesized mechanisms. First, Model 1 in Table 2 presents an unconditional model specifying the intercept and rate of change for the whole sample. The baseline intercept and growth rate over time for the sample were both significantly different from zero ( $\pi_{0i} = 56.04$  and  $\pi_{1i} = -.47$ ,  $p < .001$ ), meaning the sample averaged scores in the clinical range at baseline, and over time the sample decreased by nearly half a point on the T-score each year for 3 years.

Model 2 then entered effects of the group condition controlling for relevant predictors of adjustment. The linear rate of change in delinquency for the experimental group was a significantly greater decline than for the control group ( $\beta_{11} = -.78$ ,  $p < .05$ ). The effect translated to approximately 10% of a standard deviation over time. None of the control variables was associated with delinquency growth rates.

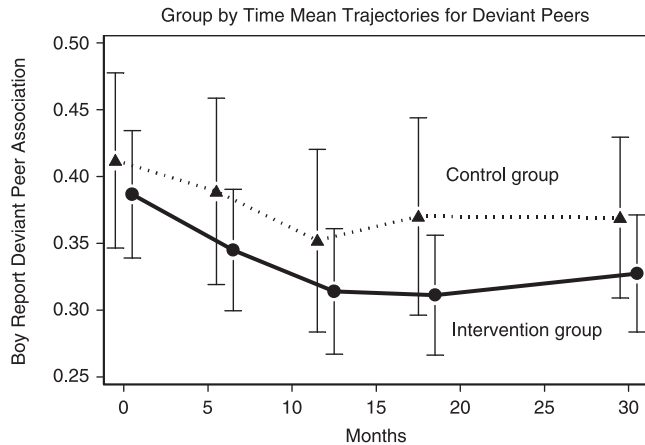
To evaluate the mediational hypothesis, Model 3 then entered the hypothesized mechanisms of parenting and deviant peers specified as time-varying covariates. Model 3 demonstrated mediation of the intervention effect on delinquency because the intervention effect was now nonsignificant and the intervention was associated with changes in the intervening mechanisms.

**Figure 4** Group by time trajectories of effective parenting construct.

The Level 1 parenting change coefficient indicated that for every one unit of change on the factor score, there was a decrease of just over one full unit on the delinquency T-score ( $\pi_{2i} = -1.10$ ,  $p < .001$ ). For every unit increase in the change in deviant peer score, there was a corresponding increase of nearly 2 units on the delinquency T ( $\pi_{3i} = 1.72$ ,  $p < .05$ ). This meant that both change in parenting and deviant peer association each obtained unique prediction on growth in delinquency. Comparison of the HLM deviance parameters for the estimates between Models 2 and 3 indicated a significant improvement by entering the hypothesized mediators. Thus, the intervention had a significant impact on decreases in delinquency, and this effect was nonsignificant upon entering changes in parenting practices and deviant peer association.

We next examined the intervention impact on the hypothesized mediators. Plots for the parenting factor scores and the deviant peer scores are presented in Figures 4 and 5. For the parenting factor, the greatest divergence in mean level between the two groups occurred at 12 months. Each group then began to level off out to 30 months. Significant cross-sectional differences occurred at 12 months ( $M = .13$ ,  $SD = .96$  for experimental condition,  $M = -.23$ ,  $SD = 1.03$  for controls,  $t = -2.37$ ,  $p < .02$ ) and a marginal difference in parenting occurred at 18 ( $p < .07$ ) and 30 months ( $p < .07$ ). Although visually there appeared to be some departure from linearity around 12 months, both HLM and repeated measures ANOVA revealed significant linear trends but not significant quadratic trends.

The observed means and group trajectories displayed initial declines and a leveling off on the measure of deviant peers. There was a marginal cross-sectional difference between group conditions at 18 months ( $M = .13$ ,



**Figure 5** Group by time trajectories of boy-reported deviant peers.

SD = .96 for experimental condition,  $M = -.23$ ,  $SD = 1.03$  for controls,  $t = -1.42$ ,  $p < .08$ ) – differences that approached marginal effects at 12 and 30 months. In the next step of the analyses, it was demonstrated that the fitted linear trends were significantly different from zero and significantly different between the group conditions. That meant that although there were few follow-up differences on deviant peers, the rate of change slope scores differed between the group conditions.

Multivariate analyses assessing intervention effects on growth trajectories for mediators are presented in Table 3. Because parenting was a factor score, initial status was not significantly different from zero, while it was for deviant peers ( $\pi_{0i} = .39$ ,  $p < .001$ ). For predicting growth, the data indicated significant differences for the intervention group relative to the control in both effective parenting and deviant peer association after controlling for relevant predictors. In Model 2, for example, the intervention group showed a greater rate of improvement over 30 months relative to the control group ( $\beta_{11} = .11$ ,  $p < .05$ ), and at the same time showed a decrease in deviant peer association relative to the controls ( $\beta_{11} = -.03$ ,  $p < .05$ ).

None of the control variables was associated with growth in deviant peers; however, several predicted change in parenting. Mothers with younger children and higher socioeconomic status displayed greater improvements over time. Conversely, maternal antisocial characteristics were associated with decreases in effective parenting.

In summary, the data in Table 3 demonstrated a significant intervention impact on change in the specified mediators. In the final step of the analyses, we entered growth in parenting as a time-varying predictor of deviant peer association. This model (not shown) produced

**Table 3** Intervention effect on growth in effective parenting and deviant peers baseline to 30 months

Predictors	Growth in parenting	Growth in deviant peers
<b>Initial status <math>\pi_{0i}</math></b>	0.05	0.39***
<b>Time-growth rate <math>\pi_{1i}</math></b>		
Intercept $\beta_{10}$	0.53**	0.01
Group condition $\beta_{11}$	0.11*	-0.03*
Months separated $\beta_{12}$	0.00	0.00
Boys' age $\beta_{13}$	-0.08**	-0.00
Antisocial characteristics $\beta_{14}$	-0.05*	-0.01
Socioeconomic status $\beta_{15}$	0.08***	0.00

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

a marginally significant effect ( $\pi_{1i} = -.02$ ,  $p < .09$ ). Taken together with findings in Table 2, the intervention reduced delinquency, and that impact was accounted for by a significant improvement in the intervening mechanisms of parenting and deviant peer association. Change in both parenting and deviant peer association over time, in turn, obtained independent contributions to the prediction of delinquency controlling for age, months separated, SES, and maternal antisocial qualities.

## Discussion

Prevention efforts are providing cumulative evidence of efficacy in curbing growth in delinquency, particularly studies involving behavioral parent management training and multi-modal interventions (Farrington & Welsh, 2003; Lipsey & Wilson, 1993; Tremblay, LeMarquand & Vitaro, 1999). Researchers have recently argued for evaluating developmental theories and mediating or moderating mechanisms within experimental designs (Brown & Liao, 1999; Vitaro *et al.*, 2001). The current report tested theory-based mechanisms of delinquency for a prevention sample of mothers experiencing divorce. No intervention was done directly with children; therefore, experimental impacts operated through mothers. Consistent with theoretical expectations, effect sizes for the intervention were small on the distal child outcomes but were stronger for the targeted parenting mechanism. Effect size analyses on the ODS have shown a strong effect in the first 12 months and a medium effect over 3 years for parenting (DeGarmo *et al.*, 2004).

The theory specified that parents provide a proximal influence on children and, across development, deviant peers become an additional proximal influence. Prevention hypotheses were generally supported. First, the intervention produced benefits to delinquency and the hypothesized mechanisms, parenting practices, and deviant peer association. Second, benefits to the mechanisms

were significantly associated with change in delinquency. Third, including the mediators in the full model made nonsignificant the path from the intervention to child delinquency. The data were trajectories of change from baseline to 30 months for parenting practices and deviant peer association, and from baseline to 36 months for delinquency.

Strengths in the research design and current analysis included random assignment to experimental or no-intervention control groups, and the measures were based on multiple methods and multiple agents. There was no agent overlap between the mediators and the outcome in the model, thus mismatching indicators reduced influence of method bias in the models. Teachers were different at each assessment and were blind to which families participated in intervention. The parenting construct included theoretically derived observational measures of discipline, problem solving, positive involvement, skill encouragement, and monitoring. The multilevel models employed a flexible analytical tool that reliably evaluates intervention and control group trajectories.

In terms of direct beneficial impact to families as well as society, these data underscore the importance of prevention efforts with at-risk families during the developmental periods of early delinquent behaviors. Empirical evaluations of the coercion model have shown the emergence of early-start offending by the age of 14. At 3 years from baseline, the boys in this sample were 10.8 years old on the average, ranging from 9.1 to 13.6 years of age. Prior studies have also demonstrated that the best predictor of violent behavior is frequent criminal behavior of all types, and the best predictor of frequent criminal behavior is delinquency that begins prior to or during early adolescence (Patterson & Yoerger, 1999). The persistent physical fighting, stealing, and noncompliance displayed by early starters are the most frequent reasons that children and adolescents are brought into child mental health clinics in the United States (i.e. up to 50% cited in Reid, Eddy, Fetrow & Stoolmiller, 1999). The current study sample is soon moving into the most critical years where early arrests will occur. Using official arrest records, it is expected that the intervention will buffer adolescent risk factors in even longer-term follow-ups.

Changes in parenting obtained a unique impact on growth in delinquency, and parenting effects on delinquency were not mediated by change in deviant peer association. We believe that prior parenting has a stronger influence than general social learning models have argued, and that changes in parenting should be evaluated in concert with developmental onset of peer influence. A future question for exploration in the ODS has to do with understanding mechanisms producing

intervention effects on deviant peer association. When testing the hypothesis that benefits to parenting practices would explain the change in boy-reported deviant peer association we found a marginal effect. Since the intervention was provided to mothers and not their sons, other mother-generated factors may have stimulated this positive outcome.

Limitations to the current study could be addressed in future research with divorced families. For example, theoretical and methodological advances in studies of deviancy training have included observations of peer interactions to measure reinforcement contingencies for deviance. Further specification through adolescence should evaluate distinctive growth in overt versus covert trajectories and, finally, official offense records are needed to evaluate the model through adolescence. Finally, there remain comparatively few long-term follow-up studies of prevention trials (Tremblay *et al.*, 1999; Wolchik *et al.*, 2002). Potential benefits involving long-term follow-up of prevention trials outweigh costs of assessing families, compared to studies without interventions. This is particularly relevant for understanding how intervention mechanisms operate across the life course.

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