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Disruptive behavior, peer association, and conduct disorder: Testing the developmental links through early intervention

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Abstract

We tested three competing models regarding the role of deviant friends in the trajectory linking early disruptiveness with later conduct problems through the use of a preventive intervention program. The program was implemented during the second and third grade. One model predicted that the program would positively affect later conduct problems by facilitating nondeviant peer association during early adolescence. The second model predicted a direct impact of the program on later conduct problems through the reduction of early disruptiveness. The third model predicted an interaction between postintervention disruptiveness and association with less deviant friends. The results showed that the program's effects on later conduct problems were mediated by the reduction in disruptiveness and by the association with less deviant friends. However, the positive effect of associating with less deviant friends depended on whether children's disruptiveness had been reduced or not by their participation in the program, thus supporting the third model. We recommend using intervention studies to test developmental models.

It is established that early disruptive (i.e., aggressive and hyperactive-impulsive) behaviors predict later adjustment problems referred to by authors as delinquency, antisociality, or conduct disorder (CD) depending on their disciplinary perspective (e.g., criminology, psychology, psychiatry)[1] (Farrington, 1994; Loeber, Green, Keenan, & Lahey, 1995; Moffitt, 1990; Tremblay, Pihl, Vitaro, & Dobkin, 1994; White, Moffitt, Earls, Robins, & Silva, 1990). These findings motivated researchers to prevent or reduce the later outcomes of disruptiveness by reducing early disruptive behaviors. Most of these preventive interventions focused directly on children's behaviors by teaching social-cognitive skills incompatible with disruptive behaviors or indirectly through the teaching of educative skills to parents (see Kazdin, 1987; Peters & McMahon, 1996; Reid, 1993). However, none of the programs targeting disruptive children actually examined their impact on the prevalence of later conduct disorder assessed according to DSM criteria. Most authors determined the impact of their preventive interventions on de-

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1. Indeed, instruments designed to assess delinquency, antisociality, and conduct disorder often share many items, many of which refer to aggressive behavior, violence, theft, vandalism, and truancy (see for example conduct disorder items in DSM-IV; delinquency items used by Elliott, Huizinga, & Menard, 1985; or antisociality items proposed by Patterson, 1992).

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linquent or antisocial behaviors assessed according to a dimensional perspective. Because the DSM is becoming more widely accepted as a diagnostic tool, it becomes necessary to establish whether a prevention program could reduce the prevalence of childhood onset conduct disorder (which may prove the most resistant to treatment). By extension, no study analyzed the process through which CD could be prevented, if at all. This is surprising in the face of the insistence of several authors regarding the importance of process variables in the models of developmental psychopathology and the possibility of using preventive intervention studies to test them (Cicchetti & Toth, 1992; Kellam & Rebok, 1992; Loeber & Farrington, 1995; Parker & Asher, 1987; Robins, 1992; Spilton Koretz, 1991).

One possible way that an intervention program aimed at reducing early disruptive behaviors can prevent later CD might be through its impact on the association with nondeviant friends. According to this "Peer Influence" model, deviant friends play a causal role on the trajectory leading to later conduct disorder or delinquency (Elliott, Huizinga, & Ageton, 1985; Farrington et al., 1990). In contrast, nondeviant friends influence peers not to engage in antisocial behaviors (Brown, Lohr, & McClenahan, 1986; Clasen & Brown, 1985). Consequently, an intervention program aimed at reducing disruptive behaviors and improving parenting skills should lead to fewer cases of conduct disorder because reduction of disruptive behaviors would increase access to nondeviant friends (or less deviant friends in comparison with a control group). The program should also help parents increase their monitoring skills, thereby positively influencing their children's selection of friends. In any case, if successful in preventing later CD, the program should at first foster positive associations with less deviant friends. These positive associations would then mediate the impact of the program on later conduct problems. In other words, the association with less deviant friends is a necessary and sufficient condition to prevent later conduct problems according to the Peer Influence model.

Other theorists hold a different view about the role of peers in the trajectory leading to later antisocial behavior. According to the proponents of the "Individual Characteristics" model, childhood disruptive behaviors independently lead to antisocial behavior and to incidental association with deviant peers (Gottfredson & Hirschi, 1990). In this view, association with deviant friends, although a consequence of disruptive behavior, does not help explain later CD (Coie, Terry, Zabriski, & Lochman, 1995). A relationship between these two variables can exist, but this relationship is viewed as spurious and attributable to a common link with the same third variable (i.e., disruptiveness). The Individual Characteristics model predicts that a reduction in early disruptive behaviors through the use of a prevention program should lead directly to less conduct disorder. It could also lead to affiliation with less deviant friends because children tend to be attracted to each other because of their behavioral similarities (Cairns, Cairns, Neckerman, Gest, & Gariépy, 1988). Affiliation with less deviant friends should not play, however, a role in mediating the effects of the program on later conduct disorder. In other words, association with less deviant friends is neither a necessary nor a sufficient condition for the program to achieve its preventive goal.

The position expressed by Moffitt (1993) is somewhat intermediate between the Peer Influence and the Individual Characteristics models. Deviant friends are needed for the adolescence-limited/late-onset conduct disordered individuals. However, presence of deviant friends is not required for life-course-persistent/early-onset conduct disordered adolescents. Given that indicated prevention programs target young children who are already disruptive, we can assume that some of these children already belong to the life-course-persistent/early-onset category, in which case the Individual Characteristics model would apply.

The "Peer–Individual Interactional" model is yet another theoretical position intermediate between the Individual Characteristics and the Peer Influence models. According to the version of this model described by Patterson, Dishion, and their collaborators (Dishion, 1990a; Dishion, 1990b; Dishion, French, &

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Patterson, 1995; Patterson, DeBaryshe, & Ramsey, 1989), deviant friends play a moderating rather than a mediating role. Deviant friends are not necessary for disruptive children to become conduct disordered. However, disruptive children who associate with deviant friends will be at higher risk for CD. Hence, association with deviant friends amplifies the link between early disruptiveness and later conduct disorder. Two sets of predictions can be derived from this model: The preventive effect of an early intervention on later CD through the reduction of disruptive behaviors should be enhanced by the association of less disruptive children with nondeviant friends. In other words, the children who already benefited from the intervention would be further helped by associating with less deviant friends. Reduction in disruptive behaviors is considered the putative mediator linking the intervention program to reduced conduct disorder. This mediating process is, in turn, moderated (i.e., amplified) by an association with less deviant friends.

There is, yet, another interpretation of the Peer–Individual Interactional model as proposed by Vitaro, Tremblay, Kerr, Pagani, and Bukowski (1997). Here, children's disruptiveness would moderate the influence of friends' deviancy on later CD. In support to this perspective, Vitaro et al. (1997) reported data showing that moderately disruptive children were adversely influenced by deviant friends by becoming more delinquent over a 1-year interval. A similar tendency was found for highly disruptive children, but it was not significant. Nondisruptive children, however, were at low risk of becoming delinquent regardless of their association with deviant friends. These findings suggest that if disruptiveness is reduced by an intervention program, children would be at reduced risk of CD regardless of whether they associate with deviant friends or not. Conversely, when disruptive behaviors still remain high after the intervention, associating with less deviant friends (relative to the control group) may still play a role in lowering the risk for later conduct disorder in the same way that the presence of deviant friends could increase it.

Both versions of the Peer–Individual Interactional model predict that the impact of the program on later CD is mediated through the combined efforts of a reduction of disruptive behaviors and the fostering of friendships with nondeviant peers. However, the ways in which these two strategies operate is open to question. In version (a), association with nondeviant friends moderates the effect of postintervention disruptiveness on later CD. In version (b), however, postintervention disruptiveness moderates the effect of nondeviant friends on later CD. The demonstration of the way the program influences selection of less deviant friends is not required to test the Peer–Individual Interactional model. What is required by this model, however, is that children's postintervention disruptiveness interacts with their friends' deviancy in predicting later CD.

Tremblay and colleagues (Tremblay et al., 1991b; Tremblay, Pagani–Kurtz, Mâsse, Vitaro, & Pihl, 1995) tested a prevention program with disruptive boys and their families that successfully reduced disruptive behaviors over the short term. The program included social-cognitive-skills training and a parenting-skills training component with 7- to 9-year-old boys. However, they did not examine whether the program reduced the prevalence of CD assessed according to DSM criteria and whether the association with less deviant friends mediated or moderated the effects of the program on later CD. This study examines the impact of the program on the sequence linking early disruptiveness, friends' characteristics, and later conduct disorder in light of the predictions made according to the Peer Influence, the Individual Characteristics, and the Peer–Individual Interactional models. More specifically, the objectives of the present study were, first, to show that an early multicomponent intervention aimed at reducing disruptive behaviors during childhood (i.e., considered as a proximal effect) can prevent or at least decrease the prevalence of CD during early adolescence (i.e., considered as a distal effect). The second goal was to examine whether the distal impact of the program on risk of CD (if confirmed) worked through (a) the reduction of children's disruptive behaviors only (compatible with the Individual

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Characteristics model); (b) through the association with less deviant friends only (compatible with the Peer Influence model); or (c) through the combined reduction of children's disruptiveness and selection of less deviant friends in an interactive manner (compatible with the Peer–Individual Interactional model).

Method

Participants

The 73 boys who participated in this study were from a sample of 904[2] kindergarten boys whose disruptiveness was assessed by their teachers. In kindergarten, the participants attended 53 schools located in low socioeconomic areas of Montreal, Canada. Their mean age was 6.0 years ($SD = .30$). All the boys' parents were French-speaking, Caucasian, and had fewer than 14 years of schooling (average years of schooling = 10.5). In addition, the participants' familial average SES level was lower than the national norm as indicated by the parents' scores on the Blishen and McRoberts (1976) occupational prestige scale (occupational prestige averaged across both parents or of working parent = 38.56, SD = 10.03, compared with 42.08, $SD = 12.09$ for a representative sample of parents with sons of the same age living in the Province of Quebec). The 13% of boys who lived in families on social welfare or unemployment insurance received the minimum score on the scale (i.e., 17.8). These selection criteria produced a relatively homogeneous socially disadvantaged sample. Two-thirds (67.9%) of the children lived in an intact family (i.e., with their two biological parents), whereas the others lived in a nonintact family (i.e., all other cases).

Selection instrument

When the 904 boys in the original sample were in kindergarten, teachers assessed their behavior using the Preschool Behavior Questionnaire (PBQ; Behar & Stringfield, 1974). A factor analysis of PBQ scores from the present study, confirmed the original two factors: disruptiveness and anxiety-withdrawal. Each item was scored by the teacher on a 0 to 2 scale depending on how applicable it was to the child. The reliability and validity of the PBQ have been established with kindergarten, first, and second grade children (Behar & Stringfield; Campbell & Cluss, 1982; Hoge, Meginbir, Khan, & Weatherall, 1985; Rubin, Moller, & Emptage, 1987; Rutter, 1967; Tremblay, Desmarais–Gervais, Gagnon, & Charlebois, 1987).

The French translation of the PBQ has been back-translated into English, and English speaking teachers have judged the similarity between the original items and their back-translated counterparts. All items obtained high mean scores (>4) on a five-point scale.

Group composition

From the original sample of 904 boys, those who received scores above the 70th percentile on the PBQ disruptiveness scale ($n = 259$) in kindergarten were classified as disruptive and designated as at risk for CD. Even though this cut-off point is not particularly stringent, it has been used successfully to predict serious maladjustment in this sample (Tremblay et al., 1994).

Of the 259 disruptive children, 135 were randomly selected to participate in the present study.[3] Parents were given the opportunity to participate in the program before the boys were randomly assigned to either the intervention group (IN group) or to the no treatment-control group (CO group). The parents of 84 (62.2%) of the boys accepted to participate in the intervention program. The 51 boys whose parents refused to participate in the program did not significantly differ on disruptiveness ratings collected in kindergarten from those

2. Initially, the sample included 1,034 boys from low SES areas. After eliminating the non-French speaking boys of European origin and those whose parents had more than 14 years of schooling and whose occupational prestige scores were one standard deviation above the national norm, this number was reduced to 904.

3. The remaining 124 disruptive children composed an intensive observation group. These children were observed regularly at school, at home, and at the laboratory. They were not included in the analyses because of missing data on diagnostic interviews for a large proportion (approximately 30%) of them.

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whose parents accepted to participate (refused: $M = 13.01$, $SD = 4.34$; accepted: $M = 14.38$, $SD = 4.42$, $t = 1.68$, $p = .10$). They did not differ on parental occupational prestige, education level, nor on family configuration (i.e., intact/nonintact). The remaining 84 boys were randomly assigned in the IN or the CO group. However, 11 boys were excluded from the analysis (4 IN, 7 CO) because of incomplete data on all measures, yielding a final sample of 73 boys (39 IN, 34 CO). The 11 boys that were lost because of missing data on some of the measures (mostly the outcome variable) did not differ from the 73 boys who remained in the study on teacher-rated disruptiveness in kindergarten nor any of the sociofamilial variables.

No differences were found between the 39 IN and the 34 CO boys who remained in the study on preintervention teacher-rated disruptiveness, $t(71) = .12$, $p = .91$, or preintervention anxiety-withdrawal, $t(71) = -.12$. Similarly, no differences were found between the two groups with respect to family configuration, parental occupational prestige, maternal age at the birth of the first child, or parental education. Parents had completed the Child-Rearing Attitude Questionnaire (PC-RA; Falender & Mehrabian, 1980), when their child was 6 years old. Consequently, we also compared the IN and CO groups on the three scales of the PC-RA (i.e., exasperation, arousal, and authority). No significant differences were found. Nonetheless, since these concepts have been shown to predict later conduct disorder and influence the outcomes of intervention programs (Kerr, Tremblay, Pagani, & Vitaro, 1997; Tremblay, Charlebois, & Gagnon, 1986; Velez, Johnson, & Cowen, 1989), the PC-RA scales were considered as covariates in subsequent analyses to avoid biasing the estimates of the mediation process tested (Judd & Kenny, 1981). However, because of the high intercorrelations between the scales and our desire to reduce the number of covariates, only the exasperation scale of the PC-RA was used.

Intervention program

The intervention program was implemented over a 2-year period, from ages 7 to 9 years (typically during Grades 2 and 3). In current terminology, the intervention could be called an "indicated" preventive intervention because it targeted boys with adjustment problems (Mrazek & Haggerty, 1994). Even though the initial screening took place at the end of kindergarten, considerable time was required to adjust the logistics of the intervention; therefore, the intervention program did not begin before the children were in Grade 2. In Grade 1, 73% of the children were still rated above the 70th percentile on the PBQ disruptiveness scale by their teachers. Equal proportions of CO and IN participants scored above the 70th percentile.

The prevention program included components that, at that time, were believed to most likely alter disruptive behaviors (Kazdin, 1987). Because many disruptive children are deficient in social skills and problem solving strategies, it was believed necessary to teach them these skills (Richard & Dodge, 1982). It was expected that they would become less disruptive if they learned alternate appropriate behaviors (Milan & Kolko, 1985). If they became less disruptive, then conventional peers should be less likely to reject them and they should begin associating with less deviant friends (Cairns et al., 1988; Coie, Belding, & Underwood, 1987). Improvement of parental skills (i.e., use of reinforcement contingencies and sustained supervision) was also selected as a strategy to reduce disruptive behaviors at home and influence IN boys to select less deviant friends (Loeber & Dishion, 1983).

Social and problem solving skills training was implemented at school in small groups. Four trained professionals (two child care workers, one social worker, and one psychologist) conducted the sessions. In each group there were three or four teacher-nominated prosocial boys and one or two target boys. Including the prosocial boys in the sessions served two purposes. First, they were positive models and reinforcement agents. Second, their presence allowed the target children to participate without being stigmatized by classmates. For about half of the IN boys, sessions were held once a week for 45 min during classtime. For the other half, they were held during lunch time or after school, de-

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pending upon arrangements with teachers. No differences were found between these two subgroups of IN boys in their behavioral attributes, family characteristics or outcome measures (to be described later).

During the first year of the prevention program, nine prosocial skills were taught over nine training sessions. Some were how to invite a bystander to play; how to ask "why"; how to give a compliment; how to help. These were inspired by existing programs (Michelson, Sugai, Wood, & Kazdin, 1983; Schneider & Byrne, 1987). The 10 second-year training sessions were devoted to problem solving and self-control skills (Kettlewell & Kaush, 1983; Meichenbaum, 1977). Some stimulus situations for these sessions were how to react to teasing, how to react when angry, what to do if other children refuse to play. For each situation, the children reviewed ways to define the problem, identified the intentions of the instigator, analyzed their feelings if they were in the role of the victim, suggested different action plans to solve the problem, anticipated their consequences, selected one action plan and, finally, reinforced themselves for their cognitive work. Verbal instructions, coaching, modeling, behavior rehearsal, and positive (verbal and material) reinforcement were all used. Children were encouraged to use their newly learned skills before the next training session. At the following meeting, the children were reinforced for having performed their new skills in the interim. Teachers and parents were informed through one-page letters of the new skills learned by the children during each session. They were encouraged to praise the child for using these new skills as often as possible.

Parenting skills training was adapted from the program developed by the Oregon Social Learning Center (Patterson, Reid, Jones, & Conger, 1975). Briefly, parents were first taught to recognize, observe, and record their children's problem behaviors. Next, they were taught to define appropriate behaviors and to set clear objectives for their child. Third, they learned how to use verbal and material reinforcers in a systematic and contingent manner to reinforce the child's appropriate behaviors. Parents also learned to punish inappropriate behavior systematically and moderately through the use of short time-out periods. Response–cost strategies involving the use of naturally occurring consequences for inappropriate behavior were also used (i.e., if the child broke something that did not belong to him or her, then he or she had to replace it). Parents were encouraged to monitor their children's behavior outside the home. Finally, parents were taught how to manage family crises through problem solving and how to use negotiation strategies in everyday situations. The skills were taught through a descriptive booklet, modeling and coaching by the trainers, role playing, and verbal reinforcement.

Parents participated in an average of 17.4 sessions (SD = 13.2, MD = 15). The maximum was 47. Six families participated in only two training sessions. For most of the families, the number of training sessions depended on how well the therapist believed the parents had mastered the targeted skills. For 14 families, however, the training ended prematurely because the parents were unmotivated. Parenting skills training sessions were held in the boys' homes by the same four professionals who conducted the social and problem solving sessions at school.

Instruments for assessing the proximal effects and the potential mediating variables

Teacher ratings of post-intervention disruptiveness. Teachers rated the boys' behavior at the end of the 2-year program. This took place in the Spring when the boys were 9 years old. They used the Social Behavior Questionnaire (SBQ; Tremblay, Loeber, Gagnon, Charlebois, Larivée, & LeBlanc, 1991a). The SBQ is similar to the PBQ, but is more appropriate for older children. Given that the prevention program was aimed at reducing aggressive-hyperactive-inattentive behaviors, and many items on the SBQ disruptiveness scale do not assess aggressiveness or hyperactivity-attention deficits, a new subscale was constructed (Tremblay et al., 1991a). It comprised three physical aggressiveness items (i.e., fights with

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other children; bullies other children; kicks, bites, hits other children) and the three hyperactivity-inattention items (i.e., squirmy, fidgety, does not keep still; easily distractible; cannot keep his attention concentrated on one thing very long). By selecting these specific items, we constructed a scale that includes two dimensions (i.e., aggressiveness and hyperactivity) which are highly predictive of later externalizing problems when combined (Loeber & Dishion, 1983; Loeber & Farrington, 1995). Each item was scored from 0 to 2, depending on how well it described the child. Subscale scores were then computed by summing scores on the six items. For simplicity, this subscale will be referred to as the postintervention disruptiveness scale. Cronbach's α was .76 at age 9 years.

Peer ratings of friends' characteristics. The Pupil Evaluation Inventory (PEI; Pekarik, Prinz, Liebert, Weintraub, & Neale, 1976) was used to gather classmates' assessments when the boys were 10, 11, and 12 years old. The PEI contains 34 short behavior descriptions grouped into three scales; aggressiveness-disturbance (20 items), social-withdrawal (nine items), and likability (five items). Participants' classmates (boys and girls) nominated up to four boys in the classroom who best fit each descriptor. PEI assessment took place near the end of the school year at the same time teachers completed the SBQ.

The item "those who are your best friends" was used to identify mutual friends (i.e., boys who had been rated as a best friend by a classmate and who, in turn, had rated the classmate as one of their four best friends) (Bukowski & Hoza, 1989). Since only boys could be nominated, all mutual friends were boys. When participants had more than one mutual friend, average scores were computed across mutual friends. Each year, between 50 and 60% of boys who had a mutual friend had more than one. The PEI aggressiveness-disturbance scale was then used to assess mutual friends' characteristics. The aggressiveness-disturbance scale includes 20 items, such as "those who are mean and cruel to others" and "those who say they can beat everybody up" (αs at age 10 years = .94; age 11 years = .97; age 12 years = .96). Scores were standardized within each classroom. Mutual friends' scores were averaged across ages 10, 11, and 12 years. As demonstrated by Berndt and Keefe (1995), composite friends' scores may exert a stronger effect than single best friends' scores because they capture more of the influences on preadolescents and adolescents. Twelve boys had no mutual friend at either of the two ages (seven in the CO and five in the IN group). To avoid losing these participants, the scores of their first unilateral friend were averaged across ages 10, 11, and 12 and used in the analyses.

Instrument for measuring the outcome variable: Conduct disorder

The Diagnostic Interview Schedule for Children (DISC-2; Shaffer, Fisher, Piacentini, Schwab–Stone, & Wicks, 1991) was used when participants were 13 years old. The DISC-2 is a structured interview designed to assess symptoms over the past 6 months. An earlier version of the DISC-2 has proven valid (Costello, Edelbrock, & Costello, 1985).

The DISC-2 was administered to the boy and one parent, usually the mother. Cohen, Velez, Kohn, Schwab–Stone, and Johnson (1987) recommend that information originating from different sources should be pooled at the symptom level. Accordingly, DSM-III-R diagnoses (American Psychiatric Association, 1987) were computed using total number of symptoms originating from the child or the mother. This method was used in most studies combining information by both informants (Piacentini, Shaffer, Fisher, Schwab–Stone, Davies, & Gioia, 1993) and has proven to be as effective as more sophisticated statistically derived procedures in aggregating data from multiple informants (Bird, Gould, & Staghezza, 1992). Conduct Disorder diagnosis was computed using the scoring algorithm supplied by the authors of the DISC-2. A cutoff of two symptoms instead of three was adopted, however, in order to obtain sufficient cases in the prevention and control conditions. Because the number of possible symptoms in DSM-IV for a CD diagnosis have increased

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by two and because these two additional symptoms refer to physical aggressiveness which, by age 13 years, could still be applicable to many of our participants (particularly those in the control group), the use of two symptoms with DSM-III-R criteria does not excessively dilute the clinical significance of resulting CD diagnoses.

Results

Overall analytical strategy

To examine the potential mediating effects of children's postintervention disruptiveness and their friends' aggressiveness on the effect of the intervention program on children's risk for a CD diagnosis in early adolescence, hierarchical regression analyses were conducted. According to Judd and Kenny (1981) and Baron and Kenny (1986), the following criteria need to be met to demonstrate a mediating process: (a) participation in the program would have to significantly impact on the mediators (i.e., children's disruptiveness and/or friends' aggressiveness), (b) the effect of the program on the outcome (i.e., CD) should be reduced once the mediator(s) is(are) added to the regression equation, while each mediator should significantly predict the outcome (perfect mediation would be obtained if the effect of the intervention program is almost reduced to zero when the potential mediator(s) is(are) included in the model). In the first set of regressions, the impact of the program on the potential intermediate variables was tested. Specifically, the children's disruptiveness at age 9 years (i.e., postintervention disruptiveness) was first regressed on their previous participation in the intervention program. In addition, the effect of the intervention program on the aggressiveness of children's friends across ages 10, 11, and 12 years was tested. By doing so, we also determined whether the reduction of children's disruptiveness mediated the impact of the program on friends' aggressiveness. In the next set of regressions, we tested whether postintervention disruptiveness or postintervention friends' aggressiveness mediated (separately or in a combined manner) the impact of the program on the distal outcome (i.e., later conduct disorder). An interaction term between the boys' postintervention disruptiveness and friends' aggressiveness was added to the equation to test the possibility that friends' aggressiveness moderated the link between postintervention disruptiveness and later CD or that boys' postintervention disruptiveness moderated the link between friends' aggressiveness and later CD. For the sets of analyses that consider the intermediate variables as outcomes, linear multiple regression was used. For the other sets of analyses that use CD diagnosis as the outcome, a hierarchical logistic regression analysis was conducted. Throughout all analyses, the children's preintervention disruptiveness and anxiety-withdrawal scores as well as their family configuration, and maternal age at birth of first child and educational attitudes (through the use of the PC-RA exasperation scale) were controlled. In all statistics, the collinearity statistics indicated that there was no multicollinearity problem among the variables.

Effects of the program on the intermediate variables

First, it was examined whether the program had a significant effect on children's postintervention disruptiveness. As shown in Table 1, the program had a significant effect even after controlling child-related and family-related preintervention variables, $\beta = -.27$, $p = .05$, and the overall F test reached, albeit marginal, statistical significance, $F = 2.26$, $p = .09$. Thus, children who participated in the intervention program were less disruptive at age 9 years than the children in the control group.

Next, the effect of the intervention program on the aggressiveness of children's friends was examined. As can be seen in Table 2, participation in the program showed a significant effect on friends' aggressiveness, $\beta = -.28$, $p < .05$, and the amount of overall explained variance was significant, $F = 2.58$, $p < .05$. Thus, children in the intervention group had less aggressive friends at ages 10, 11, and 12 years than children in the control

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Table 1. *Hierarchical multiple regression analysis to test the effect of the intervention program on boys' disruptiveness at age 9 years*

Step	Predictor	*B*	*SE B*	β	R^2	ΔR^2
1[a]	Family configuration	0.75	0.77	0.12	0.08	
	Mother's age at birth of first child	0.03	0.10	0.01		
	Boys' preintervention anxiety-withdrawal	0.36	0.28	0.16		
	PC-RA exasperation scale	0.17	0.15	0.08		
2	Family configuration	0.65	0.75	0.10	0.14*	0.06
	Mother's age at birth of first child	–0.02	0.10	–0.05		
	Boys' preintervention disruptiveness	0.36	0.27	0.16		
	Boys' preintervention anxiety-withdrawal	0.17	0.15	0.13		
	PC-RA exasperation scale	0.17	0.15	0.14		
	Program participation	–1.68	0.76	–0.27**		

[a]Control variables.
*$p \leq .10$. **$p \leq .05$.

Table 2. *Hierarchical multiple regression analysis to test the mediating effects of children's disruptiveness at age 9 between the effect of the intervention program and the aggressiveness of children's friends across ages 10, 11, and 12 years*

Step	Predictor	*B*	*SE B*	β	R^2	ΔR^2
1[a]	Family configuration	0.05	0.17	0.04	0.02	
	Mother's age at birth of first child	–0.01	0.02	–0.03		
	Boys' preintervention disruptiveness	0.06	0.06	0.12		
	Boys' preintervention anxiety-withdrawal	–0.01	0.03	–0.03		
	PC-RA exasperation scale	0.01	0.03	0.04		
2	Family configuration	0.03	0.17	0.02	0.09*	.07**
	Mother's age at birth of first child	–0.02	0.02	–0.09		
	Boys' preintervention disruptiveness	0.06	0.06	0.12		
	Boys' preintervention anxiety-withdrawal	0.01	0.03	0.02		
	PC-RA exasperation scale	0.01	0.03	0.04		
	Program participation	–0.38	0.17	–0.28**		
3	Family configuration	0.00	0.16	0.00	0.15**	0.06**
	Mother's age at birth of first child	0.00	0.02	–0.08		
	Boys' preintervention disruptiveness	–0.01	0.06	0.08		
	Boys' preintervention anxiety-withdrawal	0.00	0.03	–0.01		
	PC-RA exasperation scale	0.00	0.03	0.02		
	Program participation	–0.29	0.17	–0.22*		
	Boys' postintervention disruptiveness	0.01	0.03	0.24**		

[a]Control variables.
*$p \leq .10$. **$p \leq .05$.

group, even when controlling for family-related and child-related preintervention variables.[4] When, on the next step, children's postintervention disruptiveness was entered

4. A multivariate analysis of covariance including preintervention child-related and family-related covariates was also used to test the effect of the intervention program on postintervention disruptiveness and friends' aggressiveness. The multivariate F was significant, $F(2, 68) = 3.52$, $p < .05$, as well as each univariate F (for children's postintervention disruptiveness: $F[1, 69] = 3.89$, $p = .05$; for friends' aggressiveness: $F[1, 69] = 5.01$, $p < .05$). As expected, IN boys had become less disruptive than CO boys after the intervention (adjusted M to the covariates = 5.08 vs. 6.53). IN boys also associated with less deviant friends than CO boys (adjusted $M = –.19$ vs. .17). On the other hand, children's postintervention disruptiveness and friends' aggressiveness were moderately but significantly correlated ($r[68] = .29$, $p < .05$).

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into the equation, disruptiveness significantly contributed to the prediction of friends' aggressiveness, $\beta = .24$, $p < .05$, and the amount of explained variance increased from 9% to 15%. After inclusion of children's disruptiveness in the model the effect of the program on friends' aggressiveness was somewhat reduced ($\beta = -.22$, $p > .08$). The change in standardized betas associated with the program variable (i.e., from −.28 to −.22) after inclusion of children's postintervention disruptiveness, however, was not statistically significant, which indicated that the effect of the program on friends' aggressiveness was direct rather than being mediated by children's postintervention disruptiveness. The significance of the difference between the two betas was tested through a procedure that is similar to the test of overlap for confidence intervals (Pedhazur, 1982), with the additional advantage of being a conditional test which is less affected by the nonindependence of the two parameter estimates and by the partial confound between the mediator and the mediated variable: First, the independent variable (i.e., the intervention program) was weighted by its initial effect on the outcome (i.e., friends' aggressiveness). This new variable then substituted the original unweighted independent variable as predictor in a regression equation, which naturally yields an unstandardized regression coefficient of $\beta = 1$ for the predictor. In the next step, the potential mediator variable (i.e., boys' postintervention disruptiveness) was included. The difference between the effect of the independent variable on the outcome with and without the potential mediator in the model was assessed next in the following manner: if the unstandardized regression coefficient of the weighted predictor in the regression equation that includes the potential mediator significantly differs from 1 (through the use of a *z* score test), the effect of the independent variable on the outcome differs significantly depending on whether the potential mediator variable is included in the model or not. Following this procedure, an asymptotic one-sided *z* score test showed that the weighted regression coefficient of the program obtained after the inclusion of children's postintervention disruptiveness was not significantly different from 1.

Effect of the intervention program on CD and the mediating effects of children's postintervention disruptiveness and friends' aggressiveness

The rationale for testing the mediating effects of children's postintervention disruptiveness and friends' aggressiveness on the effect of the intervention program on children's risk of developing CD was comparable to the one used in hierarchical linear multiple regression analysis. However, because the dependent variable is dichotomous, odds ratios instead of regression coefficients are commonly used to explore the effects of the independent variables on the outcome. The odds of an event are defined as the ratio of the probability of an event occurring to the probability of the event not occurring. Thus, the odds ratio associated with a specific predictor variable represents the ratio by which the odds of being diagnosed with CD change when the predictor increases by one unit, and when all other predictors remain constant. If this value is higher than 1, the odds are increased, whereas a value lower than 1 indicates that the odds are decreased. For the logistic regression, regression coefficients, standard errors, odds ratios, partial correlations, and χ^2 values for model improvement after entrance of the putative mediators are presented in Table 3.

The results of the two tests of mediation using each intermediate variable separately are not reported for sake of simplicity because each variable separately did not significantly mediate the impact of the program on later conduct disorder (in accordance with the procedure described previously). Instead, the results obtained when both intermediate variables were included as potential combined mediators are presented.

As shown in Table 3, participation in the program had a marginally significant effect on later CD, reducing the risk of a CD diagnosis by more than half, even after controlling for preintervention family- and child-related variables. Specifically, while 14 boys (41%)

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Table 3. *Hierarchical logistic regression analysis to test the combined mediating effect of children's postintervention disruptiveness and friends' aggressiveness on the effect of the program on the risk of CD in early adolescence*

Step	Predictor	*B*	*SE*	Wald	Odds Ratio	Improv. χ^2
1[a]	Family configuration	–0.02	0.52	0.00	0.97	
	Mother's age at birth of first child	–0.06	0.07	0.70	0.94	
	Boys' preintervention disruptiveness	0.04	0.19	0.05	1.04	
	Boys' preintervention anxiety-withdrawal	–0.09	0.11	0.69	0.91	
	PC-RA exasperation scale	–0.01	0.10	0.00	0.99	
2	Family configuration	–0.06	0.54	0.01	0.94	3.24*
	Mother's age at birth of first child	–0.09	0.08	1.44	0.91	
	Boys' preintervention disruptiveness	0.05	0.20	0.06	1.04	
	Boys' preintervention anxiety-withdrawal	–0.06	0.11	0.27	0.94	
	PC-RA exasperation scale	–0.01	0.11	0.00	0.99	
	Program participation	–0.97*	0.55	3.13	0.38*	
3	Family configuration	–0.25	0.60	0.18	0.78	10.39***
	Mother's age at birth of first child	–0.08	0.09	0.78	0.93	
	Boys' preintervention disruptiveness	–0.08	0.22	0.14	0.92	
	Boys' preintervention anxiety-withdrawal	–0.11	0.13	0.74	0.89	
	PC-RA exasperation scale	–0.07	0.12	0.33	0.93	
	Program participation	–0.35	0.62	0.32	0.70	
	Boys' postintervention disruptiveness	0.21**	0.11	3.68	1.23**	
	Friends' aggressiveness	0.89**	0.46	3.77	2.43**	
4	Family configuration	0.30	0.62	0.23	0.74	4.40***
	Mother's age at birth of first child	–0.04	0.09	0.25	0.96	
	Boys' preintervention disruptiveness	–0.08	0.23	0.12	0.92	
	Boys' preintervention anxiety-withdrawal	–0.15	0.14	1.17	0.86	
	PC-RA exasperation scale	–0.08	0.13	0.37	0.92	
	Program participation	–0.48	0.17	4.02	0.62	
	Boys' postintervention disruptiveness (*B*)	0.26**	0.12	4.43	1.30**	
	Friends' aggressiveness (*F*)	–1.58	1.29	1.50	0.21	
	BXF	0.34**	0.65	0.54	1.41**	

[a]Control variables.
*$p \leq .077$. **$p \leq .05$. ***$p \leq .01$.

of the control group met the criteria for a CD diagnosis in adolescence, this was true for only 9 (23%) of the boys in the intervention group. When children's postintervention disruptiveness and friend's aggressiveness were included on the third step of the equation, both variables were positively related to an increased risk of later CD. More importantly, with the inclusion of those two variables in the model, the effect of the program on later CD was reduced from $B = -.97$, $p = .08$ to $B = -.35$, $p = .57$. The statistical significance of this reduction was tested by the procedure described previously. An asymptotic one-sided *z*-score test revealed that the regression coefficients of the program before and after inclusion of children's postintervention disruptiveness and friends' aggressiveness tended to be different from each other, $z = -1.00$, $p = .08$ (one-tailed test). Because of low power and high error terms, this result did not reach statistical significance. Nevertheless, we elected to consider this result as indicating that the effect of the intervention program tended to be mediated by the combined effects on children's disruptiveness and their friends' aggressiveness for the following reasons: First, we followed Tukey's (1991) suggestion to consider *p* values up to .15 as indicative of a "trend" about the direction of an effect. Robins (1992) expressed a similar view about effects of prevention experiments

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that are in a positive direction although not statistically significant. Second, Baron and Kenny (1986) warned that the presence of measurement error in the mediator can produce an underestimate of the effect of the mediator and an overestimate of the effect of the independent variable on the dependent variable, thus running the risk of overlooking successful mediation (p. 177). To support the importance of the trend in the mediation effect, we tested the significance for the indirect effect of the program on the dependent variable (i.e., CD status) via the mediators (i.e., postintervention disruptiveness and friends' aggressiveness) using a formula provided by Baron and Kenny. The indirect effect of the program was marginally significant, $t(71) = 1.32$, $p = .08$. This marginal mediation effect was in turn reflected in the change in the program's odds ratios that went from .38 without friends' aggressiveness and boys' postintervention disruptiveness to .70 after inclusion of both variables.

On the final step, the interaction term between children's postintervention disruptiveness and friends' aggressiveness was included in the model. As shown in Table 3, the interaction term significantly contributed to the prediction of later CD. At the same time, the effect of children's postintervention disruptiveness on CD remained significant whereas the effect of friends' aggressiveness on CD was no longer significant after the inclusion of the interaction term. Those results indicated that children's postintervention disruptiveness moderated the effect of friends' aggressiveness on later CD. The breakdown of the interaction is shown in Figure 1. For children with postintervention disruptiveness scores around the mean[5] (=5.75) and one standard deviation below the mean (2.57), friends' aggressiveness had no effect on later CD above and beyond the control variables and the intervention program. Conversely, for children with postintervention scores one standard deviation above the mean (8.93), friends' aggressiveness had a major impact in predicting later CD, odds ratio = 9.58, $p < .01$. As can be seen in Figure 1, the probability of developing CD was relatively low for these boys, provided they associated with friends whose peer-rated aggressiveness was .5 standard deviation or more below the mean. This probability, however, increased steadily with friends' aggressiveness. It must be acknowledged, however, that the interaction between boys' postintervention disruptiveness and friends' aggressiveness could be partly dependent on the correlation between these two variables. Ranges in friends' aggressiveness scores were somewhat more restricted in the below average (from −1.14 to .98) and average (−1.75 to 1.05) groups than in the highly disruptive group (from −.92 to 2.11). Even more importantly, the range of friends' aggressiveness scores was sufficiently extended in all three window categories (i.e., from −1 *SD* to +1 *SD*). In addition, the correlation between these two variables was only moderate, $r = .31$. Thus, each category included sufficient cases to allow the breakdown of the interaction and its interpretation as partly independent of the correlation between boys' disruptiveness and friends' aggressiveness.

In summary, the present results indicate that the effect of children's participation in the intervention program on their risk of CD diagnosis in later years was mediated by a combined reduction in their disruptive behavior and their affiliation with less aggressive friends as compared to control boys. However, the role of deviant friends differed depending on boys' postintervention disruptiveness scores. For the children whose disruptiveness scores were reduced to the mean or below, friends' aggressiveness played no role with respect to later CD. Because the majority of the children with postdisruptiveness scores below the mean originated from the intervention program (i.e., 62.5% from the IN group vs. 37.5% from the CO group), it can be concluded that the program prevented these boys from becoming CD through a reduction of their disruptive behaviors without further contribution of friends.

Conversely, for the children whose postintervention disruptiveness remained high, associating with deviant friends further increased

5. For comparison purposes, the mean and standard deviation for a normative sample of boys of the same age from the same schools was 4.35 and 2.31, respectively.

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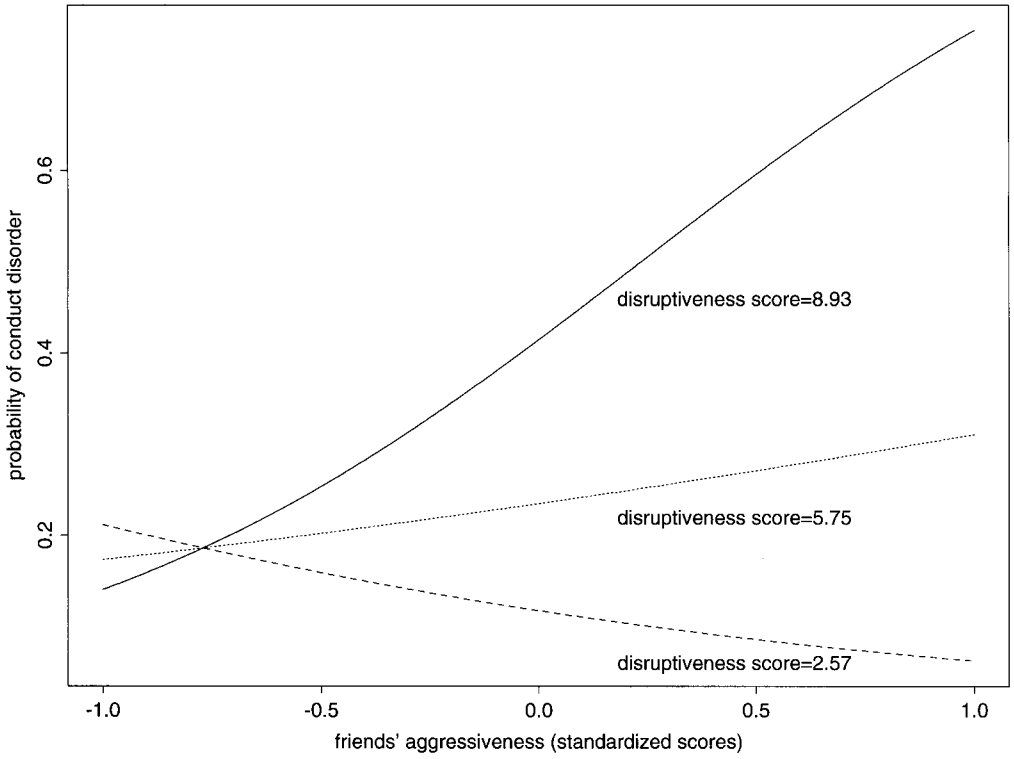


Figure 1. Relation between friends' aggressiveness and probability of conduct disorder according to three levels of boys' disruptiveness: one *SD* above the mean, the mean, one *SD* below the mean. Interaction illustrated for boys in the prevention group from intact families, with all other control variables set to the mean.

their risk for later CD. If, however, they associated with less deviant friends, the risk for later CD decreased. Thus, the program could be beneficial even for the high-disruptive children.

Discussion

The first aim of this study was to show that the intervention aimed at reducing disruptive behaviors through the teaching of social and social-cognitive skills to the children and parental skills to the parents could prevent CD assessed according to DSM-III-R criteria. Results indicated that the program had a marginally significant effect on conduct disorder assessed at age 13 years. The risk of a CD diagnosis for boys who participated in the intervention program was reduced by almost 60%. Even though it did not attain statistical significance, this effect may suggest clinical significance given the difficulties in treating conduct disorder (Kazdin, 1987) and the time elapsed between the end of the program and assessment of conduct disorder.

During this time interval a host of events can take place, some of which might be triggered by the intervention program. Theoretically, these events are responsible for the linkage between proximal and distal effects of the intervention. However, theoretical models do not all agree on the specific processes that may play a critical role in the development, consolidation, or prevention of conduct disorder in disruptive children. An important, yet controversial process, is association with deviant friends.

In consequence, the second aim of this study was to test three competing models (i.e., Peer Influence, Individual Characteristics, and Peer–Individual Interactional models). According to the Individual Characteristics model, the intervention program should have achieved

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its preventive effect on conduct disorder through its reduction of disruptive behavior. In contrast, the Peer Influence model predicted prevention would be achieved by modifying the tendency of disruptive children to associate with similarly aggressive friends. As expected, the program had an effect on each hypothesized mediator variable. However, neither of the two putative mediator variables was strong enough on its own to significantly mediate the effects of the program on later CD. The present intervention program triggered both processes and both processes proved necessary to explain the effect of the program on CD during early adolescence. Consequently, neither of the two "pure" theoretical models was supported by the present data. The two processes, however, did not operate equally across different categories of children. For some children, the reduction of CD resulted through the reduction of their disruptive behaviors. For those children whose disruptiveness scores remained high after the intervention, the program reduced their risk for later CD through its impact on their association with less deviant friends. Overall, these results are consistent with the second version of the Peer–Individual Interactional model described previously. Specifically, according to this version, boys whose disruptive behaviors were reduced through the intervention should be less at risk for developing later conduct problems even without the contribution of nondeviant friends (or despite the presence of deviant friends). In contrast, for those who remain disruptive after the intervention, association with less deviant friends may still play an important role in reducing their risk for later CD. The present results support this reasoning. Taken together, reduction in disruptiveness and association with less deviant friends significantly mediate, although not totally, the impact of the intervention program on the prevention of later CD. Moreover, reduction in disruptiveness conditioned the role of association with less deviant friends in this process in a manner compatible with the Peer–Individual Interactional model.

The children whose disruptive behaviors remained high after the intervention (as well as many of those in the control group) can be assimilated to the life-course/early-onset behavior problem children described by Moffitt (1993). The present results suggest that these children can still modify their trajectory, provided that they are exposed to nondeviant friends. The effect of nondeviant friends for the disruptive boys who established such friendships can be explained by the possibility that friendship tends to increase behavioral similarity (Boivin & Vitaro, 1995; Cohen, 1983; Epstein, 1983), through modeling processes or positive reinforcement of conventional values and behaviors. For example, Dishion, Andrews, Patterson, and Poe (1994b; cited in Dishion et al., 1995) reported that normal boys elicit more positive reactions from their friends following normative talk than antisocial boys with their friends. A reversed process of differential reinforcement for normative behavior could be operative if friends are prosocial. Results from Brown and colleagues (Brown et al., 1986; Clasen & Brown, 1985) are in line with these speculations. Disruptive children who associate with less deviant friends might also learn social-problem solving strategies (Brendgen, Bowen, Rondeau, & Vitaro, 1999). These strategies might, in turn, help them resolve conflictual situations they might otherwise have addressed with inappropriate or unacceptable solutions. They might also avoid practicing negative-conflictual interactions which typically represent interactions between disruptive children and their deviant friends (Dishion, Andrews, & Crosby, 1994a).

Surprisingly, few authors tried to influence disruptive children's trajectories by directly manipulating their friendship affiliation (see Feldman & Caplinger, 1983, for an exception, although these authors used nondeviant peers rather than nondeviant friends). One possible explanation for the dearth of such studies may be that such manipulation involves insurmountable practical and ethical considerations. First, some disruptive boys might not have nondeviant friends (or may not have friends whatsoever). Second, iatrogenic effects similar to those reported by Dishion and Andrews (1995) and McCord (1997, April) are possible if nondeviant children are put into contact with disruptive children to serve

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as models or cotrainers and if the ratio is not clearly in favor of the former. Obviously, more research is needed to examine the optimal combination of disruptive/nondisruptive children in a group setting to keep the group's orientation favorable to social norms and effective in influencing disruptive children's behavioral repertoires (Coie & Jacobs, 1993). On the other hand, nondisruptive children (including those who diminish their disruptive behavior through intervention) do not need the help of conventional friends because, supposedly, they have already adopted the positive values and the behaviors incompatible with disruptiveness in addition to having acquired the social-cognitive skills to resolve or avoid social problems.

The finding that the present intervention program fostered selection of friends with less negative characteristics is in need of a tentative explanation. This might occur partly because less disruptive children are attracted to similarly less disruptive others (Cairns et al., 1988). It might also occur because less disruptive children are less likely to be rejected and thus have more access to conventional peers. It is also possible that the intervention program had a partial direct impact on selection of friends because it produced proximity between target boys and their prosocial training partners. However, this possibility can be ruled out because few prevention boys established friendships with their prosocial training partners, some of whom were not in the same classrooms at ages 10 through 12 years because class composition changed each year. Finally, it is possible that intervention boys' parents became more aware or more proficient in monitoring their children's friendships. If confirmed, this effect could result from the program through the parent skills training component. These speculations are based on data presented by Dishion et al. (1991) showing that rejection from conventional peers and poor parental monitoring predicted affiliation with deviant friends, even after controlling for children's initial levels of antisocial behavior.

Parental monitoring and other parenting practices might also have had a direct impact on children's later conduct disorder as suggested by many authors (see Dishion et al., 1995). In this study, this possibility is supported by the fact that the coefficient associated with the intervention program, although significantly reduced after the mediators were added to the regression equation, still retained some (nonsignificant) predictive power and was far from being reduced to zero. In future studies, the mediating role of parental supervision or other potential mediators could be tested in the same way as the present mediators.

Prevention studies should be used more often to test developmental models such as these. However, there are certain challenges in doing so. First, we must ensure that the prevention strategy has a sufficient impact on proximal and distal variables to make the experimental manipulation successful. Second, we must only manipulate the independent variables. Finally, we must assess all the intermediate and process variables that might link the proximal effects to the distal effects. Despite these challenges, this analytic strategy is useful for establishing the causal or mediating roles of variables that appear as risk or protective factors in longitudinal studies.

This study offers some strong methodological features. Different sources of assessment and multiple points of measurement were obtained for each variable. Likewise homogeneous sampling was obtained, which resulted in strong internal validity. However, this study is not without limitations. For example, although the sample was homogeneous, the nature of the sample (i.e., low SES, French-speaking boys) and an attrition rate of above 40% may also limit external validity. The attrition rate, although important, did not, however, bias the final sample of children who participated in the study. In intervention studies in which parents or children are offered participation without having requested it, attrition rates are often in this range or worse (see Kazdin, Mazurick, & Bass, 1991). Another limitation is the use of a reduced criterion to establish caseness in CD diagnosis. A final limitation is the content of the intervention program itself. Because this program was developed and implemented in the mid 1980s, it does not represent the state of the art of present prevention science. More comprehen-

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sive and promising prevention programs are presently being administered and tested. This limitation has few consequences, however, with respect to the objectives of this study because the program we used must be viewed as an experimental manipulation to test three competing developmental theories rather than a formal report of an intervention oriented towards optimal effectiveness.

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