

Pathways explaining the reduction of adult criminal behaviour by a randomized preventive intervention for disruptive kindergarten children

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Objective: This study aimed to identify the pathways through which a preventive intervention targeting young low-SES disruptive boys could result in lower crime involvement during adulthood. **Method:** The preventive intervention was implemented when the children were between 7 and 9 years and included three components (i.e. social skills, parental practices, teacher support). Participants ($N = 250$) were randomly allocated to the intervention or to a control group. The tested pathways included antisocial behaviour, school engagement, parental supervision and friends' deviancy, both during early and middle adolescence. Crime involvement was assessed in early adulthood. **Results:** The intervention reduced adult criminal involvement via reduced early and middle adolescent antisocial behaviours. **Conclusion:** This study adds to the small group of studies that have examined the mechanisms through which early preventive interventions might impact distal outcomes. **Keywords:** Early intervention, disruptive behaviour, explanatory pathways, criminal record, males.

Introduction

Longitudinal studies have shown that disruptive (i.e. aggressive-oppositional-hyperactive) kindergarten and elementary school boys are at risk of violence and other forms of criminal activities during adolescence and adulthood (Farrington, 1995). Different explanatory developmental pathways have been suggested, including deviant peers, poor parenting, school disengagement/failure and homotypic personal dispositions such as antisociality. The role of any specific pathway, however, differs from one model to another. Different targeted preventive interventions aiming to prevent criminal involvement by reducing early disruptive behaviours have shown partial success (Farrington & Welsh, 2003). However, few, if any, of these studies have tested whether their impact on distal outcomes, such as criminal involvement in adulthood, was mediated through pathways compatible with one or the other of these explanatory models.

Developmental models

According to the Personal Dispositions Model (Krueger et al., 2002; Moffitt, 1993; Tremblay, 2010) disruptive youth are at risk of later criminal behaviour because their disruptive behaviours remain stable during childhood and foster the adoption of an

antisocial lifestyle during adolescence and adulthood. Disruptive-antisocial youth might experience problems with parents, peers and school. However, these problems are considered as by-products of their disruptive-antisocial lifestyle and not consequential with respect to their risk of experiencing problems with the law. According to this model, a reduction in children's disruptive behaviour should be sufficient to prevent serious antisocial behaviour. In contrast, the Socialization Model suggests that non-behavioural mediators are necessary throughout development to prevent disruptive children from transitioning into adult criminals. These mediators relate to risks in family processes, peers' deviancy and school disengagement (Jessor et al., 2003; Lipsey & Derzon, 1998). In consequence, the Socialization Model implies that an intervention program must decrease one or several of these putative risk factors – in addition to any potential decrease of disruptive behaviours – to reduce the risk of later criminal behaviour.

The case of the Montreal Longitudinal-Experimental Study (MLES)

The MLES was initiated in 1984 and included a prevention program for disruptive boys with three components delivered over a 2-year period when the boys were aged 7–9 years old: social skills training in a small group format involving a majority of prosocial

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peers, family visits and teacher management skills (see Tremblay et al., 1992b; for more details). Recently, Boisjoli, Vitaro, Lacourse, Barker, and Tremblay (2007) reported significant long-term effects of the preventive intervention on criminal records by early adulthood. The psychosocial pathways through which these long-term effects were achieved remain unknown, however. As a consequence, it is not known whether the program achieved its impact on criminal behaviour through a personal pathway, in accordance with the Personal Dispositions Model, or whether additional pathways were involved, in accordance with the Socialization Model.

Putative pathways

The four pathways examined in this study include one behavioural disposition pathway and three socio-environmental pathways (one school-related, one family-related and one peer-related), to cover the three major proximal spheres of socialization during childhood and adolescence.

Behavioural disposition pathway (antisociality). Early disruptiveness has been found to predict later antisocial behaviour during adolescence. In turn, antisocial behaviour is an important predictor of criminal behaviour during adulthood (Cairns, Cairns, & Neckerman, 1989; Farrington, 1995). In consequence, the impact of a prevention program for disruptive boys on distal outcomes such as adult crime involvement could not be possible without a reduction in antisocial behaviour. Moreover, this initial reduction – once achieved through, for example, instructional strategies to the child and/or changes in the child's environment – could be sufficient to account for the impact of a preventive intervention on criminal involvement. Additional or alternate pathways, however, would be required according to the Socialization Model.

Family-related pathway (parental supervision). According to Patterson and his collaborators (Larzelere & Patterson, 1990), parental supervision is an important aspect of parental practices that is linked to adolescents' antisocial behaviour and that predicts later criminal behaviour. As a result, an early preventive intervention should not impact later criminal behaviour without improving parent supervision in a sustained manner throughout adolescence.

Peer-related pathway (deviant peers). Disruptive/antisocial adolescents tend to affiliate with each other (Dishion, Patterson, & Griesler, 1994). In turn, association with deviant peers can foster attitudes and behaviours that favour criminal activities (Dishion et al., 1994). Hence, association with deviant peers increases the likelihood of engaging in an

antisocial lifestyle and detaining a criminal record. According to some authors, affiliation with deviant peers is even a necessary component of the pathway linking early disruptive behaviours to later criminal involvement (Elliott & Menard, 1996). By reducing the association with deviant peers, a preventive intervention could thus diminish the risk of a criminal record for disruptive children, either partially or totally. At the extreme, no long-term effects on criminal involvement might be achieved without a reduction in affiliation with antisocial peers.

School-related pathway (school engagement). School engagement is positively related to perseverance, general adjustment to school, and high school completion (Guay & Vallerand, 1997). In turn, school engagement and its positive consequences are negatively related to antisocial behaviour and affiliation with deviant peers (Reynolds, Ou, & Topitzes, 2004). Consequently, by improving school engagement, an early intervention could lower the probability of intervening risks that could increase the likelihood of being arrested and obtaining a criminal record.

Current study

The present study examined the relative contribution of the four pathways described above to explain how the MLES reduced the likelihood of a criminal record at the beginning of adulthood. To see which of the Socialization or the Personal Dispositions Models would be supported, the following question was addressed: Does each of the four intervening variables (i.e. antisociality, school engagement, parental supervision, peer deviancy) throughout adolescence contribute to explaining, either directly or indirectly, the impact of an early intervention on criminal records or is the personal disposition/antisociality explanatory pathway sufficient?

The different pathways were examined at two successive phases: late childhood/early adolescence (i.e. between 10 and 13 years of age) and middle/late adolescence (i.e. between 14 and 17 years of age). This was done for two reasons: First, to test for possible transactional, i.e. cross-lagged, links between the pathways; second, to see whether the role of the variables involved in each pathway would change across the two developmental periods. According to most developmental models of criminality (e.g. Patterson, DeBaryshe, & Ramsey, 1989), personal dispositions such as antisociality and family-related factors should play a more important role during the earlier developmental period, whereas peers and school-related factors should play a more important role during middle/late adolescence. However, recent evidence suggests that peers may be important even during childhood with respect to externalizing problems, and that the role of parents does not disappear during adolescence

(Snyder et al., 2008; Warr, 1993). Two control variables (i.e. parents' occupational prestige and boys' initial level of disruptiveness) were also included because the experimental and control groups were not perfectly equivalent despite random assignment. Given the importance of these two variables with respect to outcomes such as criminality in non-restricted samples (Huesmann, Eron, Lefkowitz, & Walder, 1984), we preferred including these two control variables to eliminate any possible bias.

Method

Participants

Behaviour ratings of male students (mean age 6.1 years; $SD = .32$) were obtained from 87% of the kindergarten teachers from 53 schools in lower socio-economic areas in Montréal, Canada at the end of the 1984 school year. A total of 1,161 boys were rated. That number was reduced to 895 after eliminating subjects who did not meet additional selection criteria: (a) ethnicity (only boys with Canadian-born parents whose first language was French were included); and (b) education (only boys whose parents had 14 years or less of schooling were included). The purpose of these additional selection criteria was to create a homogenous sample through methodological control.

Selection instrument

Boys were assessed by their kindergarten teacher using the disruptiveness scale of the Social Behaviour Questionnaire (SBQ; Tremblay et al., 1991) (see description below). From the total sample, boys with a score above the 70th percentile ($n = 250$) on the disruptiveness scale were considered for participation in the preventive intervention. This cut-off was used because it proved clinically significant in regard to later criminal behaviour (see Tremblay et al., 1992a) and because it resulted in a sufficient number of participants based on a power analysis.

Group formation

The 250 boys were randomly, although not equally, assigned to one of three groups [i.e. prevention ($n = 69$), attention-control ($n = 123$) or control ($n = 58$)], by drawing the names from a box until the necessary number was obtained. The number of participants in each group was determined by available resources in line with the goals of each experimental condition. The attention-control group was equivalent to a no-treatment sensitization/contact control group. The boys and their families in this group were observed during lab and home visits but received no special intervention. The control group was a no-treatment, no-contact control group. Given that no differences were found between the two control groups on any outcome during adolescence or early adulthood (see description of measures below), they were combined into a single control group for later analyses. After randomization, 172 families of the original 250 (69%) agreed to participate in the study (46 in the intervention group and 126

in the combined control group). Criminal records (see below) were available for all participants, including the 78 disruptive boys whose family did not agree to participate. Longitudinal data were also available for many of them. Hence, all original 250 participants were included in the intent-to-treat (ITT) analyses to preserve initial internal validity. The study design and all instruments were approved by the Institutional Review Board and the school board administrators. Informed consent was obtained from all participants at each new data wave.

Preventive intervention program

The three foci of the preventive intervention were based on a literature review addressing early intervention with disruptive children before 1984. The first focus concerned social skills training for the disruptive boys (Michelson, Sugai, Wood, & Kazdin, 1983). The social skills training intended to promote changes in behaviour towards peers, which should result in more social acceptance and less affiliation with antisocial peers. Training was offered at school, but outside the classroom, in small groups of four to seven children, with a ratio of three prosocial children for one disruptive child in each group. Prosocial children were same age boys referred by the teachers on the basis of their behavioural skills and leadership qualities. Nine sessions of social skills training, based on other programs (Michelson et al., 1983) were offered during the first year. The second year included 10 sessions of problem solving and self-control strategies.

The second focus, parent training in effective child rearing, was based on the *Oregon Social Learning Center* model (Patterson, 1982) and included: (a) a reading program for parents, (b) training parents to monitor their child's behaviour, (c) training parents to positively reinforce their child's prosocial behaviour, (d) training parents to punish effectively without being abusive, (e) training parents to manage family crises, and (f) helping parents to generalize what they have learned. Work with the parents was planned to last for two school years with one session every 2 weeks.

The third focus was information and support for teachers concerning the target boys. The intention of this third component was to improve teachers' management skills of behaviour problems in the classroom and set up individualized behaviour management programs for the target boys.

Work with children, parents and teachers were carried out by four therapists, two child-care workers, one psychologist and one social worker, all working full time. Each of these therapists had a caseload of 12 families. The team was coordinated by a fifth professional who worked on the project half-time. The intervention program lasted two school years, from September 1985 to June 1987. Boys were 7 years of age when the intervention started and 9 years of age when it ended.

Implementation assessment

To evaluate program exposure, the therapist responsible for each child-family-teacher unit indicated at the

end of each training session whether or not the session had taken place and the percentage of content that had been delivered in the session. Over 85% of the participating children attended a minimum of two third of the social skills training sessions. The maximum number of sessions given to the parents was 46 with a mean of 17.4 sessions for the duration of the program, including parents who discontinued their participation in the program. Seventy-five per cent of the parents covered at least two third of the content and objectives of the planned training program. Meetings with teachers were fewer than planned (i.e. about 50% of teachers participated in at least one meeting). Consequently, less than half of the teachers implemented a behaviour management plan in their classroom. Social skills training sessions were taped and used for weekly feedback and to maintain integrity of the program across therapists. Finally, to assess potential differentiation effects, we asked parents in the intervention and the control groups at the end of each intervention year to report on all the professional interventions that their child received at school or outside school. No differences were found between the groups.

Measures

Occupational prestige (control variable). Parental occupational prestige was established using fathers' and mothers' occupational status at pretest. This score is based on the average income and average education level associated with occupations in Canada (Blisshen, Carroll, & Moore, 1987). The mean parental occupational status across children was 35.29 ($SD = 7.70$).

Children's disruptiveness (selection and control variable). This variable was assessed by teachers using the SBQ disruptiveness scale (Tremblay et al., 1991) when children were in kindergarten. This scale ($\alpha = 0.93$) assesses three types of behaviour: aggression (three items), oppositional behaviour (five items) and hyperactivity (two items).

Antisocial behaviour (intervening variable). Antisocial behaviour was assessed every year between the ages of 10 and 17 years with the 17-item Self-Reported Antisociality Questionnaire (SRAQ) (LeBlanc & Fréchet, 1989). At each time of assessment, the participants reported whether they had been involved in a variety of antisocial acts, such as interpersonal violence (five items; e.g. 'beat someone up for no reason'), theft (seven items; e.g. 'stole \$100 or more') and vandalism (five items; e.g. 'intentionally destroyed someone's property') over the past 12 months. They indicated how frequently they had engaged in each act, with the following possible responses: 1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *often*. Responses were summed at each time point. Internal consistency over the age ranges was high ($\alpha = .82-.89$). For this measure, as for all other measures to follow, except for the outcome, two scores were created (one from ages 10 through 13 and one from ages 14 through 17) by averaging four consecutive years. Stability coefficients for two consecutive years were $>.40$ for all variables.

School engagement (intervening variable). School engagement was measured every year between the ages of 10 and 17 years, covering the periods of early adolescence and middle adolescence. The scale consisted of three items from a self-administered questionnaire ($\alpha = .70$ from 10 to 13 years of age; $\alpha = .80$ from 14 to 17 years of age). The scale included such statements as 'How important is it for you to get good grades?', 'How far do you want to go with your studies?', 'How much effort do you put in your schoolwork?' For each statement, the participant indicated on a four-point scale (i.e. from 1 to 4) how true it was for him.

Parental supervision (intervening variable). Parental supervision was measured using eight items from a self-reported questionnaire administered yearly between the ages of 10 and 17 years (average $\alpha = .66$ from 10 to 13 years of age; average $\alpha = .69$ from 14 to 17 years of age). The scale includes items such as 'Do your parents know where you are when you are not at home?', 'Do your parents know who you are with, when you are not at home?', and 'Is there a house rule concerning the time you have to come in at night'. Each item was rated from 1 to 4, with higher scores reflecting a higher level of parental supervision.

Association with deviant peers (intervening variable). This variable was measured using peer ratings from ages 10 to 13 years and self-reported questions administered yearly between the ages of 14 and 17 years. At 10–13 years of age, the scale comprised four items (average $\alpha = .72$). The four items referred to the level of disruptiveness of the participant's first four nominated friends in the classroom, as rated by their classmates through the use of the Pupil Evaluation Inventory disruptiveness items (Pekarik, Prinz, Liebert, Weintraub, & Neale, 1976). At 14–17 years of age, the scale was composed of two items ($\alpha = .69$). Participants were asked 'During the past 12 months, were you part of a group or a gang that did reprehensible acts?' and 'How many of your friends were arrested by the police?'

Criminal record (outcome measure). Criminal records were obtained from official files in 2003 (when participants were 24 years of age). Of the 250 participants in the prevention or control groups, 74 (29.6%) had obtained a criminal record by age 24 years. Criminal records included one or more type of offences (the prevalence for each category is shown in parentheses): crimes against persons (e.g. homicide; 17.9%); property crimes (e.g. arson; 31.2%); other criminal code offences (e.g. prostitution; 25.5%); motor vehicle related offences (e.g. impaired driving; 8.8%); drugs and narcotics related offences (e.g. drug trafficking; 16.4%).

Results

Model tests were performed via path analysis using *Mplus* Version 6.0 (Muthén & Muthén, 2011). All models were corrected for non-normal distributions by maximum likelihood estimation with robust standard errors (MLR). Of the 250 youth, 4.4% ($n = 11$) were missing for the age 10–13 assessments of delinquency, parental supervision, school engagement

and association with deviant peers. At the age 14 and 17-year assessments, attrition for these variables was between 16% and 18% (i.e. $n_s = 41\text{--}44$). Participants with missing data were included in the analyses via Full information Maximum Likelihood estimation. Model fit was determined through the Comparative Fit Index and Tucker–Lewis Index [comparative fit index (CFI) & TLI; acceptable fit 0.90–0.95; Bentler & Bonnett, 1980] and root mean square error of approximation (RMSEA; acceptable fit 0.00–0.08; Browne & Cudeck, 1993).

All 250 participants in the original sample were included in an ITT analytic strategy, whether they received the intervention or not. This approach simulates a real-world application of the program where certain participants drop out of the program or do not participate at all in the intervention that is offered to them. More importantly, it respects the initial random assignment of the participants in the intervention and control conditions.

Preliminary analyses

Prior to the structural equation modelling, initial logistic regressions were performed to examine the direct effect of the intervention on criminal record ($\beta = -.65$; $OR = 0.52$; Wald $\chi^2 = 3.68$; $p = .055$), controlling for parental prestige and initial disruptiveness. Although not significant at $p < .05$, the effect of the intervention on criminal records was nevertheless considered to be clinically significant in light of the difficulty to prevent this kind of outcome. Hence, the first criterion for testing mediating effects was considered to be met, namely that the intervention affects the outcomes (Baron & Kenny, 1986). Nevertheless, these effects do not mean that all intervention boys were free of problems. Specifically, 21.7% had a criminal record by age 24 years. However, more boys from the control condition (32.6%) had a criminal record.

Table 1 illustrates the bivariate correlations among all study variables. As can be seen, the intervention affected all of the four intervening variables, during at

least one development period. These variables were also significantly related to the outcome. In consequence, they qualified as putative mediators and were kept for the subsequent SEM analyses.

Model testing

The model fit the data well, $\chi^2 (3, N = 250) = 24.80$, $p = .37$, CFI = 0.99, Tucker–Lewis Index = 0.98, RMSEA = 0.02. As expected, participation in the prevention program was significantly related to less antisociality in early adolescence, association with less deviant peers and higher school engagement (see Figure 1). In addition, all variables showed stability, with the lowest stability observed for parent supervision. Moreover, antisociality in late adolescence was related to a higher risk of crime involvement, whereas parental supervision was related to a lower risk of crime involvement. Finally, antisociality and peer deviancy predicted each other in a reciprocal manner (i.e. each increasing the other).

Indirect effects. We bootstrapped indirect effects 2,000 times with bias corrected confidence intervals. Only one indirect effect was significant: that from the intervention reducing antisocial behaviour at ages 10–13 and 14–17, which, in turn, decreased crime involvement at age 24 ($b = -0.068$, 90% CIs: 0.003–0.184).

Discussion

This study tested whether each of four putative intervening pathways (i.e. antisociality, school engagement, parental supervision, peer deviancy) contributes to explaining, either directly or indirectly, the impact of MLES on the presence of a criminal record in young adulthood. The different pathways were examined at two successive phases after the end of the preventive intervention: late childhood/early adolescence (i.e. between 10 and 13 years of age) and middle/late adolescence (i.e. between 14 and 17 years of age).

Table 1 Bivariate correlations among all study variables

	1	2	3	4	5	6	7	8	9	10	11
1. Participation in the intervention											
2. Occupational prestige	-0.03										
3. Initial level of disruptiveness	-0.04	-0.01									
4. Antisociality (10–13)	-0.11*	-0.09	0.11*								
5. Antisociality (14–17)	-0.16*	-0.02	0.05	0.61**							
6. School engagement (10–13)	0.12*	0.16*	-0.06	-0.35**	-0.47*						
7. School engagement (14–17)	0.03	0.19**	-0.08	-0.26**	-0.42**	0.25**					
8. Parental supervision (10–13)	0.04	0.12*	-0.01	-0.29**	-0.24**	0.26**	0.25**				
9. Parental supervision (14–17)	0.09*	0.13*	0.02	-0.22**	-0.27**	0.12	0.26**	0.15**			
10. Deviant peers (10–13)	-0.13*	-0.08	0.02	0.09**	0.07	-0.16*	-0.12*	-0.16**	-0.06		
11. Deviant peers (14–17)	-0.16*	-0.12*	-0.01	0.30**	0.25**	-0.14*	-0.16**	-0.02	-0.10	0.08	
12. Criminal record	-0.11†	-0.20**	0.04	0.14**	0.05	-0.14*	-0.14**	-0.22**	-0.10	0.12**	0.07

* $p \leq .05$; ** $p < .01$; † $p = .09$.

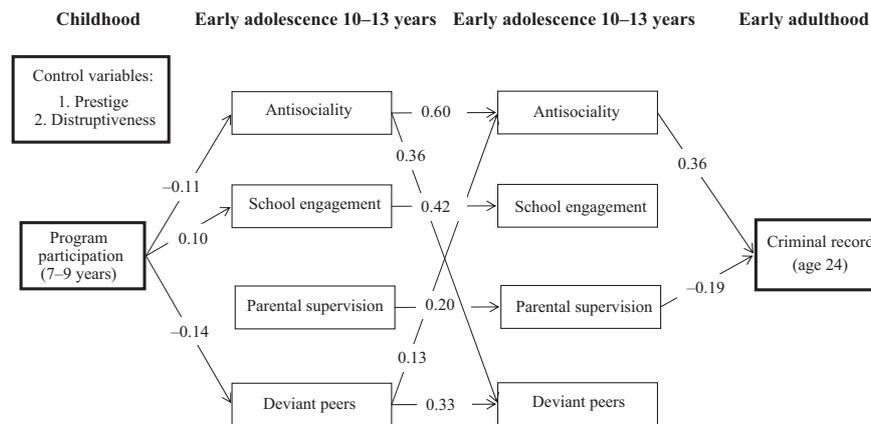


Figure 1 Path-analytic model for criminal record. Numbers indicate significant standardized estimates. To simplify the figure, the within-time associations are not shown

Direct effect of the intervention on the outcome variables

Despite using a stringent ITT approach to data analysis, the direct impact of the preventive intervention was nearly significant with a p -value equal to .055. In light of the difficulties in treating conduct problems and preventing their costs to individuals and to society (Cohen & Piquero, 2009), these results could also be considered clinically significant. Yet, the proportion of boys in the intervention group who had a criminal record remained high. It is important to remember, however, that the boys who participated in this study were at high risk for later maladjustment by virtue of their low socio economic status (SES) background, their parents' limited education and their personal characteristics. In addition, some were partially or not at all exposed to the program. In this context, it is not surprising that a 2-year, three-component prevention program did not eliminate all risk factors in the boys' environment. In other words, a limited preventive intervention has limited effects in a difficult environment. Therefore, future preventive interventions should (a) add new proven components to eliminate additional risk factors or put in place additional beneficial factors, (b) increase their duration, (c) use booster programs during sensitive transition periods to trigger developmentally relevant positive mediators or protective factors, and (d) offer more incentives to participants to increase compliance and adherence to the program.

Effect of the preventive intervention on the putative intervening variables

As expected, the preventive intervention reduced participants' antisocial behaviour and their propensity to affiliate with deviant peers at both developmental periods. It also increased participants' school engagement. In line with the program components,

these effects were likely achieved through an increase in children's socio-cognitive or self-control skills and-or through changes in parents' skills and teachers' or peers' attitudes towards the target boys during the application of the program. However, the mediating role of these likely proximal beneficial changes on the link between the preventive intervention and intervening variables of interest (i.e. antisocial behaviour, parent supervision, school engagement and friends' deviancy from ages 10 through 17 years) could not be documented because no measures were taken before the end of the program.

The lack of a direct effect of the prevention program on parents' supervision during the 10–13 years period deserves a comment. It is possible that the prevention program emphasized more other aspects such as parent-child bonding and behaviour management techniques than parental supervision. Another possible explanation is that low SES parents with disruptive children did not acquire or did not maintain newly acquired supervision skills with their children, perhaps because of cultural norms or personal problems. In either case, it is important to note that the preventive intervention nevertheless affected crime involvement without influencing parental supervision.

Pathways to criminal record

The intervention reduced participants' antisocial behaviour as well as their engagement towards school and their propensity to affiliate with deviant peers. Nevertheless, only a reduction in antisocial behaviour operated as a mediator in the final pathway linking program participation to reduced criminal records. These results are in line with the Personal Dispositions Model. They are also in line with studies showing that deviant peers are important for moderately at risk boys but not for high risk boys, who are probably similar to the young disruptive boys who participated in the prevention

program (Vitaro, Tremblay, Kerr, Pagani, & Bukowski, 1997). This does not mean, however, that additional nonmeasured intervening variables did not play a role. For example, it is possible that other important aspects in children's lives such as acceptance by normative peers, attachment to parents or classroom norms towards antisocial behaviour played a mediating role.

Strengths and limitations

The present study has several strengths. For example, different informants were used for the intervening variables and the outcome variable, thus avoiding inflated links due to shared method variance. In addition, a mean average score over 4 years was used for most of the intervening variables, which were likely more representative than single time measures. A dynamic model was also included whereby the intervening variables could play a different role at two consecutive developmental periods. Finally, the present study included an important and relatively 'objective' outcome during early adulthood (i.e. criminal record) and four possible pathways that reflected four important areas of functioning.

Despite these strengths, the present study also has several limitations, which have to be considered when interpreting the findings. First, although we found a nearly significant link between participation in the prevention program and criminal record, only a small part of the variance on the outcome was explained by program participation. These results may be partly due to the inclusion of participants who were not actually exposed to the program (through ITT analyses) or the incomplete implementation of some program components. The failure to implement the teacher component in particular deserves a comment. In this study, the classroom component was presented to the teachers in reference to the targeted boys only. Given that most teachers had only one target boy in their classroom, they might have perceived the implementation of the suggested component as not cost-effective. Instead of presenting teachers with strategies that address problems with individual children, it might be preferable in the future to present them with strategies that address general problems in the classroom, such as the good behaviour game (Kellam et al., 2008). The results may also reflect the inability of a 2-year/three-component program to prevent long-term problems for all participants living in high risk environments or the presence of moderator variables. Moreover, the intervening variables measured in the present study only explained a small part of the overall effect of the intervention program on the outcome variable. Other potentially relevant process

variables that were not included in the present study (e.g. less rejection by normative peers or a better relationship with significant adults) should be assessed in future research. It is important to acknowledge, however, that a complete integration and test of all relevant putative pathways or moderator variables is probably unrealistic, especially in light of the limited sample size of the present study.

Another limitation concerns the fact that only a single-source assessment (i.e. based on official records) for criminality in early adulthood was used in the present study. Although official records are reliable indicators, their interpretability is limited. For example, although crimes against a person and crimes against property both represent a criminal offence, they might reflect different forms of aggression and might therefore result from different risk factors (Lacourse et al., 2002). A single source and a single instrument were also used for each of the intervening variables. This made it impossible to create latent variables through the use of a multi-method and multi-informant procedure. A final limitation concerns the fact that the sample was restricted to French-speaking, low SES males, which necessarily restricts the generalizability of the findings.

Summary and conclusions

Despite these limitations, the present study shows that a limited (i.e. 2-year/three-component) preventive intervention can have a lasting, though incomplete, impact on later social adaptation if it succeeds in modifying key factors. Within the context of a low SES sample, it seems clear that personal characteristics are the most relevant key factor (i.e. mediator) when criminal record is the outcome. In providing empirical support for existing theoretical models of problem behaviour, this research also contributes to our knowledge regarding the developmental pathways leading to criminality.

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Key points

- Multi-component preventive interventions can mitigate the predictive link between early disruptive behaviours and later criminality.
- Different pathways could explain this mitigating effect: one pathway involves changes in antisocial behaviour (i.e. the Personal Dispositions pathway) whereas the other pathway involves additional key mediators such as parents, peers and school-related behaviour (i.e. the Socialization pathway).
- Results showed that the Personal Dispositions pathway was sufficient to explain the impact of the preventive intervention on later criminal behaviour. However, many disruptive children remained unaffected by the preventive intervention.
- Innovative strategies are needed to increase the chances of engaging at risk children and their families in preventive interventions. Innovative components are also needed to more effectively reduce these children's risk for later criminal behaviour. Socialization agents such as parents, teachers and peers can be used to achieve initial changes but don't seem to be required for these initial changes to translate in reduced criminal behaviour in a low SES context.

References

- Baron, R.M., & Kenny, D.A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182.
- Bentler, P.M., & Bonett, D.G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88, 588–606.
- Blishen, B.R., Carroll, W.K., & Moore, C. (1987). The 1981 socioeconomic index for occupations in Canada. *Canadian Review of Sociology and Anthropology*, 24, 465–488.
- Boisjoli, R., Vitaro, F., Lacourse, E., Barker, E.D., & Tremblay, R.E. (2007). Impact and clinical significance of a preventive intervention for disruptive boys: A 15-year follow-up. *British Journal of Psychiatry*, 191, 415–419.
- Browne, M.W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen, & J.S. Long, (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.
- Cairns, R.B., Cairns, B.D., & Neckerman, H.J. (1989). Early school dropout: Configurations and determinants. *Child Development*, 60, 1437–1452.
- Cohen, M., & Piquero, A. (2009). New evidence on the monetary value of saving a high risk youth. *Journal of Quantitative Criminology*, 25, 25–49.
- Dishion, T.J., Patterson, G.R., & Griesler, P.C. (1994). Peer adaptations in the development of antisocial behavior: A confluence model. In L.R. Huesmann, (Ed.), *Aggressive behavior: Current perspectives* (pp. 61–95). New York, NY: Plenum Press.
- Elliott, D.S., & Menard, S. (1996). Delinquent friends and delinquent behavior: Temporal and developmental patterns. In J.D. Hawkins, (Ed.), *Delinquency and crime* (pp. 28–67). Cambridge, England: Cambridge University Press.
- Farrington, D.P. (1995). The Twelfth Jack Tizard Memorial Lecture: The development of offending and antisocial behaviour from childhood: Key findings from the Cambridge Study in Delinquent Development. *Journal of Child Psychology and Psychiatry*, 36, 929–964.
- Farrington, D.P., & Welsh, B.C. (2003). Family-based prevention of offending: A meta-analysis. *The Australian and New Zealand Journal of Criminology*, 36, 127–151.
- Guay, F., & Vallerand, R.J. (1997). Social context, student's motivation, and academic achievement: Toward a process model. *Social Psychology of Education*, 1, 211–233.
- Huesmann, L.R., Eron, L.D., Lefkowitz, M.M., & Walder, L.O. (1984). Stability of aggression over time and generations. *Developmental Psychology*, 20, 1120–1134.
- Jessor, R., Turbin, M.S., Costa, F.M., Dong, Q., Zhang, H.C., & Wang, C.H. (2003). Adolescent problem behavior in China and the United States: A cross-national study of psychosocial protective factors. *Journal of Research on Adolescence*, 13, 329–360.
- Kellam, S.G., Brown, C.H., Poduska, J.M., Ialongo, N.S., Wang, W., Toyinbo, P., ... & Wilcox, H.C. (2008). Effects of a universal classroom behavior management program in first and second grades on young adult behavioral, psychiatric, and social outcomes. *Drug and Alcohol Dependence*, 95, S5–S28.
- Krueger, R.F., Hicks, B.M., Patrick, C.J., Carlson, S.R., Iacono, W.G., & McGue, M. (2002). Etiologic connections among substance dependence, antisocial behavior, and personality: Modeling the externalizing spectrum. *Journal of Abnormal Psychology*, 111, 411–424.
- Lacourse, É., Côté, S., Nagin, D.S., Vitaro, F., Brendgen, M., & Tremblay, R.E. (2002). A longitudinal-experimental approach to testing theories of antisocial behavior development. *Development and Psychopathology*, 14, 909–924.
- Larzelere, R.E., & Patterson, G.R. (1990). Parental management: Mediator of the effect of socioeconomic status on early delinquency. *Criminology*, 28, 301–323.
- LeBlanc, M., & Fréchette, M. (1989). *Male criminal activity from childhood through youth: Multilevel and developmental perspective*. New York, NY: Springer-Verlag.
- Lipsey, M.W., & Derzon, J.H. (1998). Predictors of violent or serious delinquency in adolescence and early adulthood: A synthesis of longitudinal research. In R. Loeber, & D.P. Farrington, (Eds.), *Serious and violent juvenile offenders: Risk factors and successful interventions* (pp. 86–105). Thousand Oaks, CA: Sage.
- Michelson, L., Sugai, D., Wood, R., & Kazdin, A.E. (1983). *Social skills assessment and training with children: An empirically based handbook*. New York, NY: Plenum Press.
- Moffitt, T.E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, 100, 674–701.
- Muthén, L.K., & Muthén, B.O. (2011). *Mplus User's Guide* (6th edn). Los Angeles, CA: Muthén & Muthén.
- Patterson, G.R. (1982). *Coercive family process*. Eugene, OR: Castalia Press.
- Patterson, G.R., DeBaryshe, B.D., & Ramsey, E. (1989). A developmental perspective on antisocial behavior. *American Psychologist*, 44, 329–335.
- Pekarik, E.G., Prinz, R.J., Liebert, D.E., Weintraub, S., & Neale, J.M. (1976). The Pupil Evaluation Inventory: A sociometric technique for assessing children's social behavior. *Journal of Abnormal Child Psychology*, 4, 83–97.

- Reynolds, A.J., Ou, S.-R., & Topitzes, J.W. (2004). Paths of effects of early childhood intervention on educational attainment and delinquency: A confirmatory analysis of the Chicago Child-Parent Centers. *Child Development, 75*, 1299–1328.
- Snyder, J., Schrepferman, L., McEachern, A., Barner, S., Johnson, K., & Provines, J. (2008). Peer deviancy training and peer coercion: Dual processes associated with early-onset conduct problems. *Child Development, 79*, 252–268.
- Tremblay, R.E. (2010). Developmental origins of disruptive behaviour problems: The 'original sin' hypothesis, epigenetics and their consequences for prevention. *Journal of Child Psychology and Psychiatry, 51*, 341–367.
- Tremblay, R.E., Loeber, R., Gagnon, C., Charlebois, P., Larivée, S., & LeBlanc, M. (1991). Disruptive boys with stable and unstable high fighting behavior patterns during junior elementary school. *Journal of Abnormal Child Psychology, 19*, 285–300.
- Tremblay, R.E., Masse, B., Perron, D., LeBlanc, M., Schwartzman, A.E., & Ledingham, J.E. (1992a). Early disruptive behavior, poor school achievement, delinquent behavior, and delinquent personality: Longitudinal analyses. *Journal of Consulting and Clinical Psychology, 60*, 64–72.
- Tremblay, R.E., Vitaro, F., Bertrand, L., LeBlanc, M., Beauchesne, H., Boileau, H., & David, L. (1992b). Parent and child training to prevent early onset of delinquency: The Montréal-longitudinal-experimental study. In D.J. McCord, & R.E. Tremblay, (Eds.), *Preventing deviant behavior from birth to adolescence: Experimental approaches* (pp. 117–138). New York, NY: Guilford Press.
- Vitaro, F., Tremblay, R.E., Kerr, M., Pagani, L.S., & Bukowski, W.M. (1997). Disruptiveness, friends' characteristics, and delinquency: A test of two competing models of development. *Child Development, 68*, 676–689.
- Warr, M. (1993). Parents, peers, and delinquency. *Social Forces, 7*, 247–264.

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