The Effects of the Fast Track Program on Serious Problem Outcomes at the End of Elementary School

Conduct Problems Prevention Research Group

Abstract

This study examines the effects of the Fast Track program, which is a multicomponent, intensive intervention for children with early-onset conduct problems and continues from 1st grade through high school. Prior research has shown that Fast Track produces small positive effect sizes on children's social and behavioral outcomes at the end of 1st and 3rd grades in comparison to control children. This study addresses the important question of whether this intervention reduces cases of serious problems that can occur during the 4th- and 5th-grade years. Fast Track did have a significant but modest influence on children's rates of social competence and social cognition problems, problems with involvement with deviant peers, and conduct problems in the home and community, compared to children in the control condition. There was no evidence of intervention impact on children's serious problems in the school setting at Grades 4 and 5. This evaluation indicates that Fast Track has continued to influence certain key areas of children's adjustment throughout the elementary school years, reducing children's likelihood of emerging as cases with problems in their social, peer, or home functioning. The stage is set to examine potential prevention effects on these youths' serious antisocial behaviors during adolescence.

A key characteristic of childhood-onset conduct problems is that they can lead to a subsequent extended and chronic pattern of antisocial behavior across a substantial period of development (Coie, Terry, Lenox, Lochman, & Hyman, 1995). "Early starters" (also described as "life-course persistent") begin their serious externalizing behavior problems as early as entry into elementary school (Moffitt, 1993; Patterson, Reid, & Dishion, 1992). Although risk-prediction research indicates that approximately 50% of these children do not progress to severe antisocial behavior (e.g., represent false positives in risk prediction), most seriously antisocial adolescents begin with an early starter trajectory (Hill, Lochman, Coie, Greenberg, & Conduct Problems Prevention Research Group [CPPRG], in press; Loeber, Wung, & Keenan, 1993). Because antisocial behavior at a single point is less stable than outcomes observed across multiple time-points (Lahey, Loeber, Burke, Rathouz, & McBurnett, 2002), research has begun to explore risk prediction utilizing indexes of problem behavior outcomes evident at one of several time-point outcomes.

Prior research suggests that teacher and parent ratings of children's behavior problems at elementary-school entry have optimal sensitivity and specificity as screening indexes when

Correspondence concerning this article should be sent to John Lochman, Box 870348, The University of Alabama, Tuscaloosa, AL 35487. jlochman@gp.as.ua.edu. Requests for reprints should be sent to Robert J. McMahon, Seattle Fast Track, University of Washington, 146 North Canal Street, Suite 111, Seattle, WA 98103. mcmahon@u.washington.edu.
Members of the Conduct Problems Prevention Research Group, in alphabetical order, include Karen L. Bierman, Department of Psychology, Pennsylvania State University; John D. Coie, Department of Psychology, Duke University; Kenneth A. Dodge, Center for Child and Family Policy, Duke University; E. Michael Foster, Department of Health Policy and Administration, Pennsylvania State University; Mark T. Greenberg, Department of Human Development and Family Studies, Pennsylvania State University; John E. Lochman, Department of Psychology, The University of Alabama; Robert J. McMahon, Department of Psychology, University of Washington; and Ellen E. Pinderhughes, Department of Child Development, Tufts University.

they predict to multiple time-point behavioral problem outcomes in the next year, rather than to single time-point outcomes (Lochman & CPPRG, 1995), Similarly, when this longitudinal sample was followed into later years, the teacher and parent screening scores proved most sensitive in predicting problems in the home and school setting when the externalizing behavior outcomes were assessed across multiple years in the fourth and fifth grades (Hill et al., in press). Thus, it is important to assess serious conduct problem outcomes across multiple years.

Preventive Interventions

Because of their considerable influence on serious adolescent antisocial and criminal behavior, prevention programs are particularly needed to target early-starting conduct problem youth (CPPRG, in press). These prevention programs should begin early enough to alter the early stages of the developmental trajectory and to avoid the spiral of escalating and more severe behavioral problems over time. Furthermore, recognizing the concurrent difficulties that emerge and interact with problem behaviors over time, such as peer rejection and academic failure, preventive interventions need to influence the multiple causes and the chronic nature of the maladaptive developmental processes (CPPRG, 1992).

The most effective interventions for children with conduct problem behaviors typically have multiple components that address parent and youth processes to reduce the likelihood of later problems (Brestan & Eyberg, 1998). Initial trials involving multicomponent prevention programs show promise (e.g., Pepler, King, Craig, Byrd, & Bream, 1995; Walker, Stiller, Severson, Feil, & Golly, 1998). For example, in an intervention involving social skill training and parent training for second- and third-grade children, researchers (Tremblay, Pagani-Kurtz, Masse, Vitaro, & Pihl, 1995; Vitaro, Brendgen, Pagani, Tremblay, & McDuff, 1999) found that, despite a lack of initial postintervention positive effects, the children had less teacher-rated aggression and less delinquency at a 3-year follow-up than did the control children. Similarly, using a social-cognitive intervention and behavioral parent training with aggressive children at the end of elementary school, the Coping Power program led to lower rates of delinquency, substance use, and teacher-rated problems at a 1-year follow-up for children in the intervention group compared to those in a control group (Lochman & Wells, 2004), Despite these encouraging findings, none of these multicomponent programs focused their implementation specifically on children who showed the highest levels of aggressive and conduct problem behavior at home and school and thus were at greatest risk for life-course persistent antisocial behavior.

The Fast Track prevention program is a multisite, multicomponent intervention program targeting those children at the highest risk for life-course persistent conduct problems (CPPRG, 1992). Preliminary findings suggest that the Fast Track multiple-gate screening in kindergarten, which uses teacher and parent ratings, is effective at identifying children at risk for sustained trajectories of conduct problems. For example, in one study the screening effectively predicted externalizing behavior problems across the first-grade year, with sensitivity (i.e., accurate prediction of cases) of .51 and specificity (i.e., accurate prediction of non-cases) of .90 (Lochman & CPPRG, 1995). However, even at this early outcome point, 30% of the children identified as at-risk in kindergarten appeared to be false positives, showing no evidence of serious behavior problems at the end of Grade 1, suggesting that risk status was not firmly established for at least a portion of the high-risk sample. The Fast Track screening has shown greater specificity than sensitivity when predicting both short-term outcomes and outcomes at the end of elementary school (Hill et at, in press). However, sensitivity is sufficient (sensitivity rates of .5 to .6 for teacher- and parent-rated externalizing problems and child-reported delinquent behaviors) to identify the majority of children who will develop serious conduct problems by the end of elementary school. In addition, although false positive rates increase as the outcome points become more distant from the initial screening period, the false positive

rates still remain below 50% for externalizing behavior problems (47%) and self-reported delinquency (44%) across the fourth-and fifth-grade period.

The Fast Track preventive intervention design targets the primary risk factors for antisocial behavior, including poor parenting practices, deficient social problem-solving and emotional coping skills, poor peer relations, weak academic skills, disruptive classroom environments, and poor home–school relations, with components that address social and classroom risk factors (Bierman, Greenberg, & CPPRG, 1996) as well as family risk factors, including problematic communication between parents and school (McMahon, Slough, & CPPRG, 1996). Intervention begins in first grade and continues into middle and high school (i.e., through 10th grade), although the focus of this article is on child conduct problems at the end of elementary school.

At the end of the first grade, in comparison to the high-risk control children, high-risk intervention children displayed significantly greater improvements in behavior (by parent and teacher report) and significantly lower rates of aggressive, oppositional behaviors at school (by teacher report; CPPRG, 1999a). In addition, the intervention children showed better adaptation, with lower rates of special education service use (according to school record review), more positive peer interactions (by observer ratings), higher social preference (by sociometric nominations), and improved social–cognitive and emotion skills (assessed by child interviews). Parents were observed to interact more warmly during observed parent–child interactions in the home; they were rated by observers as using more appropriate and consistent discipline; and they had more positive involvement with the school, as reported by teachers. In addition, improvements in general classroom behavior and classroom functioning indicated important universal preventive effects for all students (CPPRG, 1999b).

Analyses of program outcomes at the end of third grade provided evidence, with small effect sizes, for the continuing positive outcomes from Fast Track (CPPRG, 2002a). By the end of Grade 3, intervention children were continuing to display reductions in conduct problem behavior, as indexed by lower teacher ratings of conduct problems and lower rates of special education service use. Parent reports of children's aggressive behavior also decreased in comparison to the control group. In a "person-centered" analysis completed at the end of Grade 3, children were identified as "clinical cases" on the basis of self-report, parent-report, and teacher-report measures of children's psychopathology and behavior problems. Children assigned to the Fast Track preventive intervention were significantly more likely to be "case free" than were children in the control group.

Mediation analyses have provided support for the proposed developmental model of early-starting antisocial behavior. Those analyses have demonstrated links between Fast Track intervention effects on proximal risk and protective factors (parent reports of aggressive behavior, peer social preference, association with deviant peers) and teacher-rated social and academic competence improvements at the end of fourth grade (CPPRG, 2002c). Specifically, the mediation analyses indicated that Fast Track intervention effects by third grade on reductions in parents' harsh physical discipline practices, improvements in children's aggressive and prosocial behavior at home and school, reductions in children's hostile attributional biases, and improvements in children's social problem-solving skills all contributed to significant behavioral outcomes evident in fourth grade.

Purpose of This Study

This study examines the impact of Fast Track intervention on children's problematic functioning in four domains (social competence and social–cognitive functioning, involvement with deviant peers, behavioral functioning in home or community context, and behavioral and academic functioning in the school context) across the final 2 years of elementary school (fourth

and fifth grades). We anticipate that children's serious conduct problems can vary across years and that some children with serious conduct problems would not be considered a "case" each year (Coie et al., 1995; Lahey et al., 2002). Caseness analyses have particular relevance for clinical applications and permit useful within-individual analyses (e.g., Farrington, Loeber, Yin, & Anderson, 2002). In addition, we determine if the intervention effects are generalizable across gender, site, cohort, and racial groups. Thus, this study hypothesizes that, relative to the control condition, the Fast Track intervention will produce significantly lower levels of problematic caseness across the fourth- and fifth-grade years in the four key domains.

Method

Participants

Three annual cohorts of behaviorally disruptive target children ($n = 891$) and their parents were identified in kindergarten in four communities using a multistage screening procedure consisting of teacher and parent ratings (Lochman & CPPRG, 1995). Children who scored in the top 15% within a site on the behavioral risk score ("high risk") were invited to participate in a longitudinal study, which began with in-home interviews in the summer preceding Grade 1 matriculation. For this study, parent and child interviews, parent daily reports of child aggressive behavior, teacher assessments, and school record reviews were collected following Grades 4 and 5 to comprise the outcome domains.

The mean age of the high-risk children was 6.5 years ($SD = 0.48$) at the time of identification. Across all sites, the sample was 51% African American, 47% European American, and 2% of other ethnicity (e.g., Pacific Islander and Hispanic). Sixty-nine percent were boys. Fifty-eight percent of the high-risk children came from single-parent families, 29% of the parents were high school dropouts, and 35% of the families were in the lowest socioeconomic class as determined by Hollingshead scoring.

Because part of the intervention involved a school-based intervention, entire elementary schools ($n = 54$) were assigned to either the intervention or the control conditions. Within each site, data on the demographics for each school were obtained (e.g., size, percentage of students who received free or reduced-price lunch, ethnic composition, achievement scores), and the participating schools at each site were divided into matched sets. These sets were randomly assigned to intervention and control conditions. In the intervention condition, there were 445 children in 191 first-grade classrooms. In the control condition, there were 446 children in 210 first-grade classrooms. Intent-to-treat analyses were conducted with all participants regardless of families' level of participation in the intervention.

The normative sample consisted of 387 children who were selected from the first cohort class rosters of kindergarten children attending the control schools at each of the four sites (Lochman & CPPRG, 1995). A stratified random sample of these children was identified to provide a normative frame of reference for the development of the intervention and control groups. Each year this normative sample was administered the same set of measures as was given to the high-risk children and their parents and teachers.

Intervention Procedures

Indicated Interventions—Parents and children in the high-risk intervention condition were offered interventions in three domains: parent groups with home visiting, academic tutoring, and social-skill training. Parent and child group interventions were conducted during a weekly, 2-hr "enrichment program" held at the school building on Saturdays or weekday evenings. During the first 60 min in Grade 1 of this enrichment program, high-risk target children met in "friendship groups" of five or six led by educational coordinators and co-leaders (see

Bierman et al., 1996, for more details). At the same time, parents met in a group led by family coordinators to discuss parenting strategies that would support child school adjustment and improve child behavior (see McMahon et al., 1996). After the parent and child groups met, parent–child pairs spent 30 min together each session, participating in positive cooperative activities and practicing positive parenting skills with staff support (the Parent–Child Sharing Time).

Group meetings were held weekly during Grade 1 for 22 sessions, biweekly during Grade 2 for 14 sessions, and monthly during Grades 3 through 5 for 9 sessions each year. Several additional group meetings were included at the end of fifth grade to prepare children and parents for the transition to middle school. In addition to the group meetings, individual support was provided through peer pairing and home visiting to children and parents to help them generalize the skills presented in the group setting and to address individual needs. Academic tutoring, designed to promote reading skills, was also provided by paraprofessional tutors. During Grades 1 and 2, tutors worked with children three times each week for half-hour sessions during school hours (two for reading, one for peer pairing). In Grade 1, the children were also tutored during the enrichment program. Children and families received a standard level of these services (home visiting, tutoring, and peer pairing) in Grade 1. In subsequent years, criterion-referenced assessments were used to adjust the dosage of these components to match the level of functioning of each family and child (CPPRG, in press). Starting in Grade 4, a mentoring program was added to provide same-gender, same-race role models to promote children's positive identity development, if indicated by the criterion-referenced assessments.

Only a few families (6% of the sample) declined to initiate participation in the parent or child groups in Grade 1, and, of the 94% participating, 79% of the parents and 90% of the children attended at least 50% of the sessions offered. The number of children and parents unable to participate in the intervention (primarily due to moves out of the area) increased very gradually across the years. By fifth grade, the last year of the elementary school phase, 43 of the 445 intervention families (10%) were unable to participate in intervention.

Intervention fidelity was ensured by several procedures. First, all intervention components were manualized. Second, program developers conducted regular cross-site training and supervisory telephone calls. Third, at weekly staff meetings at each site, intervention staff practiced and prepared for upcoming session activities. Fourth, intervention staff members were observed as they delivered intervention throughout the year by the clinical supervisor, and the staff members were given specific feedback about their adherence to the program and about their skills in delivering intervention.

Universal Intervention—In addition to the indicated interventions, the children and their classmates in the intervention schools received a universal intervention designed to promote a more competent and less aggressive social ecology, focusing on social and emotional development. The first two grades of this curriculum were revised from a curriculum used by Kusche and Greenberg (1994), and the third- through fifth-grade curricula were developed for Fast Track to be theoretically consistent with the earlier curricula. Teachers implemented this classroom-level program throughout the year, teaching an average of two to three lessons per week (see Bierman et al., 1996, for more details).

Assessment Procedures

Four sources of information were used: parents, teachers, school records, and the children themselves. During the summer following each academic year (Grades 4 and 5), trained interviewers conducted home assessment interviews with all parents and children. Interviewers were not instructed about the condition of the families they were assigned to interview. Interviewers read the various measures to the primary caregivers or child and recorded their

responses. The items for the measures can be found at www.fasttrackproject.org. During that interview, in addition to other measures, parents reported on child behavior problems exhibited during the previous 24-hr period (Parent Daily Report; Chamberlain & Reid, 1987). Parents were then recontacted by phone on two occasions over the next 2 weeks to make additional daily reports of child behavior problems. Parents received $75 for participating in these 2- to 3-hr home interviews.

In the spring of each year, teachers completed the Teacher Observation of Classroom Adaptation–Revised (TOCA-R; Werthamer-Larsson, Kellam, & Wheeler, 1991) and the Teacher Ratings of Child Behavior Change (CPPRG, 1999a). Teachers received $ 10 per child for completing these measures. Data on special education diagnoses were collected from school records in the period just following the end of the academic year.

Outcome Measures—Four dichotomous outcome measures were derived from the Grades 4 and 5 assessment batteries. Each variable captured the diagnosis of ongoing clinical *caseness* with respect to a domain of possible difficulties (see CPPRG, 2002a). The domains included social cognition and competence problems, peer deviance, home and community problems, and school problems. Each domain was characterized by a set of variables and was created on a conceptual basis.[1] In each year, the variables were standardized to have a mean of zero and a standard deviation of 1. A continuous measure of each domain was created by taking the average of the standardized variables in the domain. The continuous domain measures for Grades 4 and 5 combined were created by averaging standardized versions of the continuous domain measures in each individual grade. The caseness cutoff was set at 1 *SD* above the mean of the normative sample, as in our prior research (CPPRG, 2002a), for these combined measures.

Social cognition and social competence problems: Two scores, social cognitive difficulties and teacher-rated social competence (reversed), comprised the domain. Social–cognitive difficulties were measured using the What Do You Think instrument, which is an age-appropriate version of the Social Problem-Solving measure (Dodge, Bates, & Pettit, 1990). For this measure, the interviewer read a series of six stories to the child and followed each story with a series of questions. The first three stories involved a problematic peer situation. The last three stories depicted problematic situations involving an interaction with an adult authority figure. Five scale scores, each with one item per story, measured hostile attributions, aggressive–punitive response tendencies, relative endorsement of retribution goals over avoidance and problem-resolution goals, selection of aggressive versus nonaggressive responses, and anticipated effectiveness of aggressive versus nonaggressive responses. A total social—cognitive problems score was calculated as the mean of the standardized subscale scores (Grade 4, α = .79; Grade 5, α = .80). The Social Competence–Teacher instrument (CPPRG, 1999a) assessed academic competence (5 items; e.g., "work toward goals") and prosocial behavior and emotion regulation (12 items), as well as change in the two competence areas over the course of the year (Grade 4, α = .66; Grade 5, α = .69). Teachers rated each of the items first for the child's current competence and then for the amount of change in that item over the school year. The academic competence items were included in this domain because they represented behavioral competencies rather than behavioral problems and because teachers' ratings of these academic behavioral competencies were more highly correlated with the other social competence and social competence change items (correlations

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[1]Although the measures were organized in the four domains on a conceptual basis, the measures were found to generally correlate significantly within the social cognition/social competence, peer deviance, home/community context, and school academic and behavior problem context domains (number of significant correlations among specific variables within domains and within grade level: 68 significant out of 72 possible correlations, 2 of 2,9 of 12, and 29 of 30, respectively). The average stability of the individual variables within the domains across the 2 years was .36, .62, .52, and .61, for the four domains respectively.

in the .5 to .7 range) than with the teacher-rated and other variables in the school context academic and behavior problem domain.

Peer deviance: Peer involvement in deviant behaviors was measured by the Things That Your Friends Have Done scale (CPPRG, 2000). Respondents rated whether none, some, or most of their friends had been involved in various substance use related (5 items per year) and delinquent (11 items per year) behaviors in the past year. Single factors were extracted in separate analyses for the two domains (constraining the parameter estimates to be equal for the 2 years' items) using the factor analysis of ordinal data facility in M*plus* v2.02 (Muthén & Muthén, 2001). The base measures for the caseness variable were the two factor scores per year.

Home and community problems: The home and community problems domain included indicators from a parent-rated problem behavior score and a youth self-report problem behavior score. Parents' ratings on the 15 oppositional–aggressive behavior items of the Parent Daily Report (Chamberlain & Reid, 1987; $\alpha = .81$) were collected by telephone on each of three separate days and averaged to provide an assessment of child aggressive and oppositional behavior at home. Ratings of change in the child's behavior over the past year were collected using the Parent Ratings of Child Behavior Change instrument (CPPRG, 1999a) during the in-home interview to yield a measure of child conduct problem improvement (10 items, $\alpha = .89$). Child reports of involvement in problem behaviors were collected using the Things That You Have Done scale, which is based on the National Youth Survey (Elliott, Huizinga, & Ageton, 1985). On the Things That You Have Done scale, respondents indicated the number of times in the past year they were involved in substance use related (5 items per year) and other delinquent (19 items per year) behaviors. Because of low incidence of reports in these grades, the delinquent behavior items were first dichotomized (no report vs. any report) then subjected to a single-factor categorical data factor analysis, resulting in factor scores. Because of the low frequencies of substance use, the substance-use component was simply a dichotomous indicator of any substance-use report (alcohol, tobacco, marijuana, inhalants, or hard drugs).

School context academic and behavior problems: The measure of school context problems included two components, classroom aggressive behavior and academic risk. The TOCA-R Authority Acceptance (Werthamer-Larsson et al., 1991) scale was used for the former: 10 items on aggression, disruption, and disobedience to adults, $\alpha = .94$. An academic risk variable was created by standardizing and summing testing and school records, including Woodcock–Johnson (Woodcock & Johnson, 1990) reading score, having an individualized education plan, having been retained in school, or having failed reading or math.

Management of Missing Data—Rates of attrition and missing data more generally have been very low. Following recent developments in the methodological literature, we handled missing data through multiple imputation (Allison, 2002; Little & Rubin, 2002; Schafer, 1999). Multiple imputation has many advantages over alternatives, such as listwise deletion or mean imputation (Little & Rubin, 2002). In essence, multiple imputation uses information from earlier waves of data collection and on other outcomes at the same wave to fill in missing data. The imputation model used here included treatment status, gender, race, site, and cohort; 25 continuous baseline covariates (described later); the component variables for the Grade 4 and 5 derived outcome measures; and 15 other variables that were not used in these analyses. Missing data were imputed using NORM v.2.03. NORM uses Markov Chain Monte Carlo estimation for continuous variables. For categorical variables, generated values were rounded to the nearest legitimate response; for continuous variables, the range of generated values was truncated to match the possible legitimate score distribution. To preserve any interactions

between intervention status and the other variables, the imputation was conducted separately for the intervention and control groups.

The imputed values have desirable properties. For example, they reflect both the unexplained variance in the imputed variables as well as sampling error in the strength of the relation among the variables in the imputation model. To capture the effects of this latter uncertainty, 10 complete datasets are created. Ten imputations should be more than ample given the degree of missing information in these analyses (Schafer, 1997). Separate analyses were performed using each dataset, and, following standard practice, the results of these analyses were combined to produce a single estimate of the treatment effect and its standard error using Rubin's (1987) rules.

Combining estimates across datasets is a key feature of multiple imputation—the variation across imputations. If an analyst simply analyzed a single imputed dataset as if it were complete data, he or she would be ignoring a critical aspect of model uncertainty—the fact that the data were initially incomplete. This would produce standard errors that were too small, suggesting that the estimates were more precise than they actually are.

Covariates—As in prior analyses of Fast Track outcomes, 25 additional baseline variables were included in the analyses described in the following (see CPPRG, 2002a, 2002c), These variables were identified based on theoretical and empirical research on the antecedents of conduct problem behaviors. They include measures of children's baseline behavior problems, social–cognitive processes, social competence, cognitive abilities, family socioeconomic status, maternal depression, life stress, family relations, and neighborhood environment.[2] These variables were measured using kindergarten teacher reports and parent and child interviews.

The inclusion of these covariates reflects recent methodological research (Angrist & Hahn, 1999; Murray & Blitstein, 2003; Raudenbush, 1997). They serve four functions: They improve the precision of the estimates of treatment effects, guard against any departures from randomization, reduce the role of any remaining intraclass correlation stemming from the original sampling scheme, and protect against differential attrition. Regarding the latter, the multiple imputation techniques used for handling missing data (described previously) presume attrition in the study is missing at random (Little & Rubin, 2002; Schafer, 1997). This assumption means that the likelihood that data are missing depends only on observed characteristics included in the model (and not on unobserved values of the partially observed variables). Adding covariates expands the number of missing data mechanisms that could be considered missing at random and therefore makes the assumption more plausible.[3]

Results

Analysis Strategy

The four Grade 4 and 5 outcome variables were examined separately for intervention effects using a multiple logistic regression model. Each analysis included intervention status as the primary predictor, four effect-coded predictors for the design variables (race [African American vs. non-African American], sex, site [four categories], and cohort [three categories]), 25 centered continuous covariates, and multiplicative interaction terms for intervention status

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[2]A listing of the baseline covariate measures and the table of mean and standard deviations of the component variables for the domains can be obtained from John Lochman.
[3]To determine if collinearity among the covariate variables was a notable issue, the correlations among covariates were examined and found to be of modest magnitude; therefore, they do not influence the examination of the main effects that are the focus of the analyses.

with each of the other predictors. These interactions represent potential forms of moderation and were tested first. Analyses of the main effects of intervention status then followed.

Correlations Among Domains

Analyses indicated that the four domains were moderately intercorrelated. However, the correlations appeared sufficiently independent to be examined as separate domains: social cognition–social competence with peer deviance, home–community problems, and school academic and behavior problems (rs = .37, .29, and .48, respectively); peer deviance with home-community problems and school academic and behavior problems (rs = .39 and .32, respectively); and home/community problems with school academic and behavior problems (r = .09).

Tests of Interactions

The first step in the analysis for each outcome was an F test of the null hypothesis that the coefficients on each of the interactions between the intervention indicator and the 25 baseline variables equals zero. This test showed no significant interaction effects for any outcome (p > .40). These interaction terms were omitted from subsequent analyses. Next, interactions between intervention status and the categorical design variables were examined separately for each outcome. None of these effects were significant (p > . 10).

Intervention Effects

Analyses with caseness domain scores—The final tests of intervention effects were based on the logistic regression models with treatment, the design variables, the 25 continuous covariates, and the interactions of intervention with the design variables as predictors. Intervention status was a significant predictor of three of the four outcome variables—social cognition and social competence problems, peer deviance, and home and community problems. Odds ratios and test statistics appear in Table 1, with model-implied probabilities of caseness for each group. Odds ratios below 1.0 indicate that there is a reduction in poor outcomes for intervention children. We can reject the hypothesis that the intervention has no effect for the three outcome domains of social cognition and social competence problems, peer deviance, and home and community problems; however, these effects are modest in size. The probabilities are adjusted for the other regressors in the model—they are the probabilities implied by the model parameter estimates where all other predictors are held to the sample mean. The expected probabilities of the intervention group are 6 to 7 percentage points less than the control group for the three domains with significant effects (.16 vs .23; .12 vs .18; .22 vs .29; see Table 1). The actual unadjusted prevalence rates for these three domains also are provided in Table 1 and are reduced to levels closer or equal to the prevalence rates for the normative group. Note that the domains' prevalence rates for the normative sample are set by having a cutoff 1 *SD* above the normative sample's mean.

To assist with the interpretation of these domain scores, we examined the rates at which cases and noncases engaged in some of the clinically meaningful behaviors captured by the domain scores in fifth grade. Relative to control children, intervention children had lower rates of cases on three of the four domains. Of the children who were identified as cases within the peer deviance domain (across both the intervention and control conditions), 42.3% had at least some friends who were involved in stealing items over $50, 50.3% had at least some friends who carried weapons, 33.8% had at least some friends who were using marijuana, and 74.2% had at least some friends who were involved with the police. The comparable percentages for the noncase children were: 2.0%, 7.5%, 0.9%, and 22.7%, respectively. Of the children who were identified as cases within the home and community problem domain, 20.1% had physically attacked another person, 24.1% had used coercive threats against others, 13.0% had engaged in shoplifting, 6.1 % had committed arson, 13% had committed property destruction, 4.8% had

stolen something worth between $5 and $50 dollars, and 9.4% had used tobacco. The comparable percentages for non-case children in this domain were 8.1%, 7.0%, 3.5%, 0.4%, 1.6%, 0%, and 0%, respectively. Intervention children had a lower rate of cases in these domains and thus were engaging in lower rates of delinquent behaviors and had less involvement with deviant friends who were involved in delinquent and substance-using behaviors.

Analyses with continuous domain scores—Although the primary purpose of the analyses was to examine intervention effects on caseness, we also examined intervention effects on the four continuous domain scores. Those analyses reveal a relatively similar pattern of results (see Table 2). Significant intervention effects were obtained for the social cognition/ social competence problem domain, $t(1777) = 2.78$, $p < .001$, and the home and community problems domain, $t(4849) = 2.33$, $p < .02$. A nonsignificant trend for an intervention effect was found for the peer deviance domain, $t(1700) = 1.64$, $p < .10$, in comparison to the significant effect on the caseness variable for this domain. Effect sizes for these comparisons were below the .20 cutoff for small effects (.18, .15, .11; Cohen, 1988). As with the corresponding caseness analyses, the test for intervention effects on the school context academic and behavioral problems domain was not significant, $t(3018) = 1.15$.

Discussion

The Fast Track intervention had significant but modest influence on three of four outcome domains across the fourth- and fifth-grade years. Fast Track produced reductions of 6 to 7 percentage points in the likelihood that high-risk children would emerge as cases with problems in the domains of social competence and social cognition difficulties, peer deviance, and conduct problem behavior in the home and community setting. When compared to the base rates of control children having problems in these domains, Fast Track produced a one fourth (home and community problems) to one third (social competence and social cognition problems; peer deviance) reduction in children's risks for problematic outcomes at the end of elementary school. These results were supported by analyses of the continuous domain scores for social competence and social cognition problems and for home and community problems, with effect sizes of .15 to .18. A trend for an intervention effect was found on the continuous domain score for the peer deviance domain. There were no intervention effects in either the caseness or continuous variables analyses for academic and behavioral outcomes in the school setting.

In the arenas of children's problematic outcomes with peers and in the home and community, the results indicate that the Fast Track program produced continued improvement through the end of elementary school with some of the at-risk children, supporting prior indications of the Fast Track program's effectiveness through fourth grade (CPPRG, 1999a, 2002a, 2002c). More important, these results demonstrate that Fast Track reduces the risk experienced by children with early-onset conduct problems of becoming involved in serious problems evident during the fourth-and fifth-grade years. This effect may lead to reduced levels of costly negative outcomes for some of these children in the years ahead.

Social Competence and Social Cognition Outcomes

Fast Track has assisted high-risk children in reducing levels of problematic social functioning and improving abilities to interact socially with peers and adults by the end of elementary school. This outcome domain of social functioning taps child abilities to reduce hostile attributional biases, aggressive responses to provocation and social problems, retributional goals, positive expectations of the effectiveness of aggressive responses, low rates of prosocial behavior, and poor emotional regulation. In earlier elementary school years, Fast Track

produced small improvements in related areas of social functioning (CPPRG, 1999a, 2002a, 2002c). By the end of first grade, Fast Track produced improvements in children's emotional recognition abilities, emotional coping skills, and problem-solving skills. At this early stage, intervention children had become better accepted by their class-mates, showing more prosocial behaviors, according to both peers and independent observers. The Fast Track children continued to display improvements in social cognitions at the end of third grade, with reduced levels of hostile interpersonal attributions and improved social problem solving skills, and their greater social acceptance by peers was evident through fourth grade.

These results indicate that Fast Track, partially due to these earlier gains, has modestly reduced child risk for serious social problems with peers at the end of elementary school. The Fast Track program has components, such as the children's social skills groups, the peer-pairing sessions, and the PATHS classroom intervention, that are specifically structured to enhance child abilities to more accurately perceive other people's intentions in problematic situations and to solve peer problems more effectively. The overall intervention effect on children's social competence may also be due to the program's work with parents as well as the child-oriented components designed to stimulate child social skill development. The importance of both the parent and child components is suggested by prior findings that changes in child and parent processes mediated program effects (CPPRG, 2002c).

Deviant Peer Group Involvement

Fast Track also led children to be less involved in deviant peer groups, although this intervention effect was stronger in the caseness analyses than in analyses of the continuous domain scores. This pattern of Fast Track children having reduced involvement in deviant peer groups was evident in prior analyses at the end of fourth grade (CPPRG, 2002c). Thus, in the last 2 years of elementary school, children in the intervention group were less involved with peers who carried weapons, were involved in stealing, used marijuana, and were involved with the police. According to the developmental model underlying the Fast Track program, one consequence of children's rejection by their peer group in elementary school is an increased likelihood of becoming involved in deviant peer groups as they approach adolescence. Because of their greater acceptance by their peers in earlier years (CPPRG, 1999a), and because of the intervention's ongoing focus on enhancing children's awareness of the consequences for their actions and on decision-making skills, Fast Track children are better able to avoid becoming involved with deviant peers during the fourth- and fifth-grade years.

Home and Community Outcomes

Prior analyses of Fast Track effects on children's behavior in home and family settings revealed trends in reductions in observed noncompliant behavior by the end of first grade (CPPRG, 1999a), along with significantly lower levels of parent-reported aggressive and disruptive behavior by the end of third and fourth grades (CPPRG, 2002a, 2002c). Consistent with these findings of positive Fast Track effects on parent ratings of children's aggressive behavior during the earlier elementary school years (CPPRG, 1999a, 2002a, 2002c), these results indicate that the Fast Track program reduced rates of child involvement in serious antisocial behavior in their home and community at the end of elementary school. Compared to control children, fewer Fast Track children engaged in serious levels of parent-rated aggressive behavior and self-reported delinquent behavior and substance use during the fourth- and fifth-grade years. The lower caseness rates for Fast Track children indicated there were fewer Fast Track children with problem behaviors such as physically attacking others, stealing or shoplifting, using gateway substances, or engaging in arson or property destruction. The Fast Track children's lower rate of serious levels of conduct problems in the home and community during the final years of elementary school, along with their low rates of involvement with deviant peers and low levels of incompetent peer relations, suggest that the developmental

course toward serious antisocial behavior may have been substantially altered for some Fast Track children.

Academic and Behavioral Outcomes in the School Setting

Contrary to our hypothesis, Fast Track did not influence children's problematic academic and behavioral outcomes in the school setting. The failure of Fast Track to produce an effect on school outcomes at the end of elementary school was unexpected. In contrast, analyses at the end of first and third grade (CPPRG, 1999a, 2002a) revealed that Fast Track children had higher grades, lower levels of teacher-rated conduct problems, and lower utilization of special education services than did control children. At the end of fourth grade, teachers' ratings of children's improvement in academic competence continued to be higher for Fast Track children than for control children (CPPRG, 2002c).

Even with a very comprehensive, multicomponent, multiyear program, the conduct and academic behavioral gains experienced by very high-risk children in the school setting in early elementary school may be transitory, and Fast Track may be incapable of producing reductions in problems in the school setting by the end of elementary school. Alternatively, the results may indicate a temporary developmental lag in Fast Track children's progress in the school setting at this particular age period. For example, Tremblay et al.'s (1995) and Vitaro et al.'s (1999) prevention programs had not produced positive outcomes in children by the end of elementary school but did produce significant positive effects on children's delinquent and aggressive behaviors by the time the children were 12 years of age. Similarly, Fast Track may set the stage for later latent improvement in the middle and high school years in children's school-based academic and behavioral problems through the program's demonstrated effects on child and family outcomes in the school context in the early elementary school years. Future longitudinal research will clarify which of these possibilities account for the lack of intervention effects on this particular domain of school-based problems at the end of elementary school.

Limitations

This intervention research study has several limitations. First, it should be noted that the three domains that had intervention effects were assessed with child, parent, and teacher data, and none of these measurement sources were blind to the children's and families' assignment to intervention conditions. Each of these sources may have been biased to report intervention effects because of their involvement in aspects of the program. It would have been useful to have more objective, behavioral measures of children's functioning during these years. The social cognition and social competence domain score was partially derived from children's responses to hypothetical vignettes and may have been less sensitive to bias effects than the domains, which only relied on ratings or direct self-report. Intervention effects were not found in children's academic and behavioral problems in the school context, which was the only domain that included data from an intervention blind source, archival records from schools. It will be important for future research on Fast Track to explore later effects on archival outcomes from court and school records.

Second, there is a tendency for some children identified as high risk in kindergarten to spontaneously improve, even without intervention. Inaccuracy in risk prediction limits the ability to strongly test intervention effects to some degree. Clear prevention effects can only be found among that proportion of the sample that would have been expected to have negative outcomes. When that proportion is small, it becomes more difficult to measure and document intervention effects with sufficient power. Although sensitivity and specificity of risk prediction would have been enhanced if Fast Track had used a teacher and parent screening system that had extended across both kindergarten and first grade (Hill et al., in press), the Fast

Track kindergarten screening successfully identified a majority of the early-onset conduct problem children, along with some false positive children. Third, we are unable to empirically determine which of the multiple intervention components are most critical in producing the obtained outcome effects. Future research with multi-component programs such as Fast Track should use dismantling designs to determine the relative importance of the various child, classroom, and family intervention components.

Summary

In summary, this study is the first to document the potential of a preventive intervention starting at the time of school entry to reduce the percentage of children with early-onset conduct problems who subsequently display serious conduct problems during a 2-year period at the end of elementary school. Fast Track had a modest influence on children's rates of social competence (including academic competence) and social cognition problems, problems with involvement with deviant peers, and conduct problems in the home and community, although Fast Track did not have an influence on academic and behavioral problems in the school setting. Prior preventive intervention projects have had significant effects on children's conduct problems in early elementary school (Gross, 2003; Walker et al., 1998; Werthamer-Larson et al, 1991), leading to reductions in behavior problems in high-risk children, and these gains have been retained through follow-up assessments years later. Other preventive interventions delivered at specific points in the elementary school years have had long-term follow-up effects on children's later serious conduct problems, delinquency, police arrest, and substance use (Eddy, Reid, Stoolmiller, & Fetrow, 2003; Lochman & Wells, 2004; Tremblay et al., 1995). However, Fast Track is the first preventive intervention to provide comprehensive components throughout the 5-year elementary school period with a very high-risk sample and has produced changes in at-risk children's social and behavioral functioning throughout that entire period of time.

The next critical test of Fast Track effects will occur over the next several years, as the children make the transition into middle school and high school. In their peer groups, they will be exposed to the sharp increases that typically occur in early to mid-adolescence in youths' serious conduct problems, including delinquency and substance use. Future research will determine if Fast Track effects attenuate during this period of increased risk, or whether the solid base of social and behavioral gains experienced by Fast Track youth will further expand and produce continued preventive effects. In addition to having important implications for prevention of serious antisocial behavior, longer term findings at later developmental points will permit tests of the developmental theory underlying Fast Track and can lead to future refinements for preventive intervention design (CPPRG, 2002c).

Acknowledgments

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Table 1

Effects of Intervention

Outcome Problems	Odds Ratio (95% CI)	t	df	p <	Expected Probabilities			Prevalence Rates		
					Control	Intervention		Control	Intervention	Normative
Social cognition and social competence	0.66 (0.40, 0.92)	2.62	1348	.01	.23	.16		.26	.21	.16
Peer deviance	0.61 (0.31, 0.92)	2.50	103	.01	.18	.12		.23	.16	.17
Home and community	0.70 (0.45, 0.95)	2.43	659	.01	.29	.22		.32	.25	.15
School context	1.29 (0.77, 1.81)	1.11	721	ns	.17	.21		.26	.27	.16

Note: CI = confidence interval.

Table 2

Effects of Intervention on Standardized Continuous Variables

Outcome Problems	Estimate	Standard Error	t	df	p <	Effect Size	Cell Means		
							Control	Intervention	Normative
Social cognition and social competence	−.09	.03	−2.78	1777	.01	.18	.18	.01	−.14
Peer deviance	−.05	.03	−1.64	1700	.10	.11	.15	.04	−.15
Home and community	−.07	.03	−2.33	4849	.02	.15	.23	.07	−.34
School context	.03	.03	1.15	3018	ns	ns	.12	.14	−.25