Promoting Positive Adult Functioning Through Social Development Intervention in Childhood

Long-term Effects From the Seattle Social Development Project

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Objective: To examine the long-term effects of the Seattle Social Development Project intervention in promoting positive adult functioning and preventing mental health problems, crime, and substance use (including tobacco, alcohol, and other drugs) at 21 years of age.

Design: This nonrandomized controlled trial followed up participants to 21 years of age, 9 years after the intervention ended. We compared the following 3 intervention conditions: a full 6-year intervention (grades 1 through 6); a late 2-year intervention (grades 5 and 6 only); and a no-treatment control condition.

Setting: Eighteen public elementary schools serving diverse neighborhoods, including high-crime neighborhoods, of Seattle, Wash.

Participants: A sex-balanced, multiethnic sample of 605 participants across the 3 conditions who completed interviews at 21 years of age (94% of the original sample in these conditions).

Interventions: Teacher training in classroom instruction and management, child social and emotional skill development, and parent training.

Main Outcome Measures: Self-reports of functioning in school and work, emotional and mental health, and crime and substance use at 21 years of age and official court records.

Results: Broad significant effects on functioning in school and work and on emotional and mental health were found. Fewer significant effects on crime and substance use were found at 21 years of age. Most outcomes had a consistent dose effect, with the strongest effects in subjects in the full-intervention group and effects in the late-intervention group between those in the full-intervention and control groups.

Conclusions: A theory-guided preventive intervention that strengthened teaching and parenting practices and taught children interpersonal skills during the elementary grades had wide-ranging beneficial effects on functioning in early adulthood.

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The transition to early adulthood is a challenging time for many young people. Young adults make consequential decisions about their life course, with much uncertainty about their livelihood and close relationships. This period is marked by vulnerability to emotional and mental health problems, relatively high although decreasing risk for involvement in crime, and increasing problems with use of tobacco, alcohol, and other drugs (hereafter referred to as substance use).

Studies have found long-term effects of selective interventions in early childhood for children from families in poverty providing evidence that preventive interventions in early childhood can have enduring effects in promoting positive adolescent and adult outcomes.

Universal preventive intervention at ages 6 through 11 years is appealing because virtually the entire population of children can be reached through elementary schools. Yet less is known about the long-term preventive effects of intervention during the elementary years. Tremblay and colleagues found that a 2-year intervention initiated with disruptive kindergarten boys from low socioeconomic neighborhood schools reduced rates of delinquency through 15 years of age when compared with control subjects. However, we are aware of no studies of universal interventions in the elementary grades that have demonstrated long-term effects in adulthood. The present study examines whether an intervention administered universally in the elementary grades improved functioning in early adulthood, 9 years after the intervention ended. It focuses on the domains of positive functioning in school and work, emotional and mental health, and crime and substance use at 21 years of age.
The Seattle Social Development Project (SSDP) included a multicomponent intervention guided theoretically by the social development model. The model hypothesizes that families and schools that provide youths with opportunities for involvement, that ensure that youths develop competency or skills for participation, and that consistently reinforce effort and skillful participation produce strong bonds between young people and these social units. The model hypothesizes that, in turn, strong bonds of attachment and commitment to prosocial family and school set children on a positive developmental trajectory, resulting in more positive outcomes and fewer health-risk behaviors later.

Previous studies of the SSDP intervention package have found significant effects at various stages across broad outcomes, including less aggressiveness and antisocial behavior among boys and less self-destructiveness among girls at the end of grade 2; less initiation of alcohol use and delinquency, better family management and family bonding, and better school bonding by the start of grade 5; less initiation of cigarette use and more classroom participation and school bonding among low-income girls and improved social skills, school bonding, and school grades among low-income boys at the end of grade 6; and improved achievement test scores at the end of grade 6. Although the intervention ended after grade 6, by 16 and 18 years of age school bonding was significantly higher in the full-intervention group compared with the control group. At 18 years of age, the full-intervention group reported significantly less lifetime violence, less lifetime sexual activity, less heavy alcohol use, less school misbehavior, and improved school achievement compared with controls.

Analyses of sexual behavior outcomes comparing the full-intervention group with controls found that the full-intervention group had significantly fewer sexual partners, a marginally reduced risk for initiation of intercourse (P = .10), and significantly fewer pregnancies and births to female subjects by 21 years of age; significantly increased condom use at last intercourse among single adults; and significant reductions in the prevalence of sexually transmitted disease among African American subjects by 21 years of age.

Herein we examine the effects of the SSDP interventions in the elementary grades on positive adult functioning, mental health, crime, and substance use at 21 years of age. As in previous analyses, an important question is whether delivering the intervention package during the full course of elementary school (full intervention) had greater effects than delivering the intervention for just 2 years in grades 5 and 6 (late intervention). We compared the 2 intervention conditions with a no-treatment control group 9 years after the end of the interventions.

METHODS

SAMPLE AND DESIGN

Beginning in 1981, the intervention was initiated among grade 1 students in classrooms randomly assigned to receive the intervention in 8 public schools serving high-crime areas in Seattle, Wash. These students and those in control classrooms in the 8 schools were followed up prospectively until 1985. When these children entered grade 5, the study was expanded to include grade 5 students in 10 additional schools. All 18 schools were then assigned nonrandomly to conditions in the fall of 1985, and thereafter all grade 5 students in each school received the intervention according to their school's intervention assignment (10 schools assigned to the intervention, 5 schools assigned to the control condition, and 3 schools assigned to parent training only). This resulted in a nonrandomized controlled trial with 4 conditions. The full-intervention group (n = 156) consisted of students who received at least 1 semester of intervention in grades 1 through 4 and at least 1 semester of intervention in grades 5 and 6, with an average dose of 4.13 years of intervention exposure. The late-intervention group (n = 267) consisted of those who received the intervention during grades 5 and 6 only, with an average dose of 1.65 years of exposure. The parent-training only group (n = 141) was offered only the "Preparing for the Drug Free Years" curriculum during grades 5 and 6 and is not discussed herein. The control group (n = 220) received no intervention. The late-intervention and control groups included a mix of students from the original control classrooms in grades 1 through 4 and students added to the panel at grade 5. Twenty-four participants in the longitudinal study could not be classified into any of these groups because they left participating schools before spending at least 1 semester there.

Parents of 808 grade 5 students (77% of the population of 1053 grade 5 students in the 18 schools) consented to participate in the longitudinal follow-up study. Of the 808, 643 were assigned to the full-intervention, late-intervention, and control groups described in this section. In the spring of 1996, when participants were 21 years of age, 605 of those 643 were successfully interviewed and constitute the sample undergoing analysis herein (n = 144 for the full-intervention group; n = 256 for the late-intervention group; and n = 205 for the control group). All phases of the study were approved by the Human Subjects Review Committee at the University of Washington, Seattle. Participants were informed about the nature of the interviews and provided consent before participation in the study at 21 years of age.

This sample consisted of 303 women and 302 men. Ethnic identification was 43% white American, 25% African American, 22% Asian American, 6% Native American, and 3% other ethnic groups. As children, 56% of participants were eligible for the school free-lunch program at some point in grade 5, 6, or 7, on the basis of federal poverty status.

ATTRITION AND INTERNAL VALIDITY

Ninety-four percent of participants in the full-intervention, late-intervention, and control groups were successfully interviewed at 21 years of age. At that time, the overall distribution of participants in the intervention conditions did not significantly differ for those lost to attrition vs the analysis sample (P = .26). In this sample, the distribution of participants into the intervention and control groups was not significantly different with respect to sex (P = .99), or proportion living in a disorganized neighborhood (P = .78). Of particular importance to internal validity is residential stability, given the requirement that full-intervention students attend project schools at some point in grades 1 through 4 and in grades 5 and 6, whereas some controls were added to the study at grade 5. Analyses comparing the full-intervention and control groups found no significant differences in mean years living in Seattle (by grade 6, F = .26; F = .15), mean number of residences lived in (from 5-14 years of age, F = 1.26; P = .26), proportion of single-parent homes (during grade 5, \( \chi^2 = 0.00; P > .99 \)), or proportion living in a disorganized neighborhood at 16 years of age (eg, rundown housing, crime, gangs,
OUTCOME MEASURES

Measures were based on participants’ self-reports and court records at 21 years of age. Eight measures related to school or work at 21 years of age were created. Constructive engagement summed the average number of hours per week engaged in school and/or work in the past year to a maximum of 40 (including 14 full-time homemakers). Total hours were divided by 10 to create a continuous 0- to 4-point scale. The following 2 related dichotomous measures of school completion were computed: high school graduate (or general equivalence degree) and 2 or more years of college. A measure of the degree to which those who had been students in the past year were integrated at school was computed (coded 0- to 4-point scale; reliability coefficient $\alpha = 0.55$). School integration used the mean of 6 items assessing hours spent in classes, interaction with and bonding to other students, and opportunities for and participation in school activities, clubs, and planning. Employment status in the past month was coded from 0 (unemployed) to 4 (full-time employment, student, or homemaker). Among those currently employed at the time of the survey, total years at the present job was calculated. The mean of 2 items was computed to assess the extent of responsibility on the job among those who had been employed at any time in the past year (coded 0-6; $\alpha = 0.54$). A measure of constructive self-efficacy was based on the mean of 6 items concerning perceived opportunities for getting a good education, finding a job with a future, making a contribution on the job, and making a decent living (coded 1-4; $\alpha = 0.76$).

INTERVENTION

The intervention included the following 3 components: teacher training, child social and emotional skill development, and parent training. These are summarized in Table 1 and described further elsewhere.19,20 Each year during grades 1 through 6, teachers in the full-intervention condition received 5 days of in-service training in a package of instructional methods,21 including proactive classroom management,22 interactive teaching,23 and cooperative learning.24 Teachers of students in the late-intervention condition received training in these methods when these students were in grades 5 and 6. Structured observations25,26 indicated greater use of the targeted instructional and management methods in the intervention conditions than in the control condition (65% of intervention teachers were above the mean in implementation, vs 40% of control teachers). Positive effects of implementation of the project’s instructional methods on students’ social development and achievement during the elementary grades have been reported elsewhere.17 In addition, grade 1 teachers in the full-intervention group received instruction in the use of a cognitive- and social skills–training curriculum,27,28 and, during grade 6, a study consultant provided students in the full- and late-intervention groups with 4 hours of training in skills to recognize and resist social influences to engage in problem behaviors.29 On a voluntary basis, parents of children in the full-intervention group were offered a 7-session curriculum in child behavior management skills,30,31 and a 4-session curriculum in skills for supporting their children’s academic development,32 when children were in grades 1 through 3. During grades 5 and 6, parents of children in the full- and late-intervention groups were offered a 3-session curriculum designed to strengthen their skills to reduce their children’s risks for alcohol and other drug use and other problem behaviors.33 Parents of 43% of children in the full-intervention group attended at least 1 parenting class.

<table>
<thead>
<tr>
<th>Table 1. Seattle Social Development Project Interventions</th>
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<tr>
<td><strong>Intervention Component</strong></td>
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<tr>
<td>Teacher training in classroom instruction and management</td>
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<tr>
<td>Interactive teaching</td>
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<td>Cooperative learning</td>
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<td>Child social and emotional skill development</td>
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<td>Interpersonal problem-solving skills</td>
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<td>Refusal skills</td>
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<td>Parent training</td>
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<tr>
<td>Observe and pinpoint desirable and undesirable child behaviors; teach expectations for behaviors; provide consistent positive reinforcement for desired behavior; provide consistent and moderate consequences for undesired behaviors</td>
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<tr>
<td>Academic support skills</td>
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<td>Skills to reduce risks for drug use</td>
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A measure of poor emotional regulation was created from the mean of 8 items assessing expressions of distress and anger (coded 1–4; α = 0.72). Mental health problems at 21 years of age were assessed with a version of the Diagnostic Interview Schedule using a computer algorithm that conformed to the criteria specified by the DSM-IV. Measures of mental health problems were computed in 2 ways. First, a sum of the number of symptoms reported was computed for generalized anxiety symptom count (coded 0–6; α = 0.90), social phobia symptom count (coded 0–3; α = 0.75), depressive episode symptom count (coded 0–9; α = 0.93), and suicide thoughts (coded 0–4; α = 0.58). Second, dichotomous measures were computed for generalized anxiety diagnostic criteria met, social phobia diagnostic criteria met, and depressive episode diagnostic criteria met using DSM-IV criteria.

A measure of any crime in the past year was computed from any self-report of a crime across 15 items assessing vandalism, breaking and entering, theft, possession of stolen goods, assault, robbery, sale of illegal drugs, and white-collar crimes. A measure of high variety of crime was created by identifying those in the top 90th percentile who reported having committed multiple different types of crimes in the past year. Other crime measures included having been arrested in the past year and having sold illegal drugs in the past year. Substance use measures included any substance use and was based on a dichotomous coding of any use across 10 substances (tobacco or alcohol use in the past month, or marijuana or other illicit drug use in the past year). High variety of substance use identified those in the top 90th percentile of number of different substances used. A final item asked about the degree to which alcohol or other substance use interfered with life or everyday activities (coded from 0 [no use] to 5 [very much]).

Past year and lifetime court charges included any noncriminal, misdemeanor, or felony record from official Washington State and national Federal Bureau of Investigation files (survey nonrespondents included).

**ANALYSIS**

Participants’ ultimate intervention designation was based on school-level assignment at grade 5. We examined the possibility of school-level effects. We calculated intraclass correlations and conducted analysis of covariance tests of school effects, controlling for intervention condition (average number of participating students per school, 44.46; SD, 10.02). Across all outcome measures, 2 of 25 intraclass correlations exceeded 0.02 in magnitude, and the corresponding 2 analyses of covariance indicated a significant school effect. Differences between schools were found only for high variety of crime (p = .03; F[13,377] = 2.18; P = .01) and lifetime court charges (p = .03; F[13,373] = 2.31; P = .01). Overall, these results approximated what would be expected by chance. We concluded that the level of possible school effects observed was not sufficient to substantially bias results. Therefore, we conducted analyses at the individual level.

We conducted conservative intent-to-treat analyses for this report in that intervention assignment was tested rather than the extent to which teachers and parents learned and implemented the intervention components. We do not have data on student differences before the intervention to use as covariates.

**RESULTS**

**MULTIVARIATE ANALYSES**

A multivariate analysis of variance (MANOVA) was conducted to assess overall intervention effects across multiple dependent variables. All outcome measures described in the “Methods” section were included in the MANOVA, with the exception of 3 outcomes that were applicable only to analysis subsamples (integrated at school, years at present job, and responsibility on the job). The MANOVA results indicated that, compared with the control group, the full-intervention group had a significant overall effect across 22 dependent measures (Wilks λ, F[22,322] = 2.52; P < .001). These results indicate a significant multivariate effect and provide overall control for type I error rate in the significant univariate findings presented in this section. A similar MANOVA comparing the late-intervention group with controls indicated a marginally nonsignificant effect (Wilks λ, F[22,432] = 1.41; P = .10).

**POSITIVE FUNCTIONING IN SCHOOL OR WORK**

As shown in Table 2, those in the full-intervention group demonstrated significantly better functioning in school or at work at 21 years of age across 7 of the 8 outcomes examined, compared with controls. Full-intervention participants spent significantly more hours per week in school or at work at 21 years of age, compared with controls (32.1 hours vs 28.4 hours). They were significantly more likely to have graduated from high school (91% vs 81%) and to have completed 2 or more years of college (14% vs 6%). Among those attending school at 21 years of age, full-intervention participants reported being significantly more integrated in classes and activities and with other students. Full-intervention participants reported significantly more current employment at 21 years of age, compared with controls. Among those reporting current employment, the full-intervention group had significantly more longevity at their present job, compared with controls (4.96 vs 3.85 years), and had more responsibility at their primary job in the past year, although this latter finding was significant only at P = .08. Differences in constructive self-efficacy indicated that full-intervention participants saw their prospects for a good education and a decent job as promising; controls were significantly less optimistic about their prospects.

Those in the late-intervention group reported fewer significant differences compared with controls in school and work functioning at 21 years of age. Late-intervention participants who were attending school at 21 years of age reported significantly better integration at school than controls, and they reported significantly more constructive self-efficacy than did controls at 21 years of age. Late-intervention participants reported consistently better functioning than controls across 6 of the remaining 6 school- and work-related measures, but these differences did not reach statistical significance.

**EMOTIONAL AND MENTAL HEALTH**

At 21 years of age, full-intervention participants reported significantly better regulation of emotions, compared with controls, as well as significantly fewer symptoms of social phobia and fewer thoughts about suicide. Effects of the full intervention on reducing symptoms and diagnostic criteria for depressive episode approached but did not achieve significance at P < .05. The late-intervention participants reported significantly fewer sui-
cidual thoughts, and significantly fewer met diagnostic criteria for depressive episode at 21 years of age, compared with controls. No significant effects were found for either intervention group on generalized anxiety symptoms or diagnostic criteria or on social phobia diagnostic criteria. Although the differences were not always significant, the late-intervention group reported fewer problems than controls across all emotional and mental health outcomes, and the full-intervention group reported fewer problems than the late-intervention group for all outcomes except depressive diagnostic criteria met.

**CRIME AND SUBSTANCE USE**

Full-intervention group participants were significantly less likely to be involved in a high variety of crime, to have sold illegal drugs in the past year, and to have an official lifetime court record at age 21 years. They were also less likely to have used a substance in the recent past (alcohol or tobacco in the past month or any other illicit drug in the past year), but this finding did not achieve statistical significance (P = .09). Subsequent analyses examining different substances separately found no significant effects of the full- or the late-intervention condition, compared with controls, for past month alcohol or tobacco use or for past year marijuana or other illicit drug use. Only 1 significant effect was found for the late-intervention participants when compared with controls; they were less likely to have sold illegal drugs in the past year. No significant effects were found for either intervention group for committing any crime in the past year, having been arrested in the past year, using a high variety of substances, using substances at a level that interfered with one’s life or everyday activities, or having a court charge in the past year. Although effects reaching statistical significance were limited, the full-intervention group reported less crime and substance use across all measures in Table 2, with the exception of high variety of substance use.

**INTERACTIONS WITH SEX, POVERTY, AND ETHNICITY**

Interactions of the effects of the full-intervention vs control condition and late-intervention vs control condition with sex, poverty, and ethnicity were examined for each outcome in Table 2. Three significant interactions with sex were found. A significant effect of the full intervention on reduced generalized anxiety symptoms was found for women (1.35 vs 2.16 symptoms in the control group).
group; \( P = .02 \), but not for men (1.08 vs 1.00 symptoms in the control group; \( P = .77 \)). Women in the late-intervention condition also reported fewer generalized anxiety symptoms compared with women in the control group (1.62 vs 2.16 symptoms; \( P = .08 \)), whereas men in the late-intervention group reported somewhat more symptoms than men in the control group (1.36 vs 1.00 symptoms; \( P = .15 \)). Although the prevalence in both groups was low, women in the full-intervention group were significantly more likely to have been arrested in the past year, compared with women in the control group (7\% vs 1\%; \( P = .04 \)). At the same time, the arrest rate among men in the full-intervention group was substantially lower than among men in the control group (14\% vs 23\%; \( P = .14 \)). No significant interaction effects were found for childhood poverty. Interactions with ethnicity were examined next, controlling for childhood poverty, and comparing African American, Asian American, Native American, and other ethnic groups with white American subjects as the reference group. Only 1 significant interaction was found. White American subjects in the full-intervention group reported more constructive engagement than those in the control group (mean, 3.37 vs 3.05; \( P = .11 \)), whereas Asian American subjects in the full-intervention group reported somewhat less constructive engagement than their control counterparts (mean, 2.97 vs 3.40; \( P = .11 \)). Asian American subjects were unique in this regard. All other ethnic groups in the full-intervention condition reported substantially more constructive engagement than their control counterparts (eg, means of African American subjects, 3.15 vs 2.23; \( P = .01 \)).

These results indicate that the SSDP intervention package in the elementary grades produced broad effects on positive functioning in school and at work and on emotional and mental health at 21 years of age, 9 years after the intervention ended. There were fewer effects on crime and substance use at 21 years of age, although those in the full-intervention group were significantly less likely than controls to be involved in a high variety of crime, to have sold illegal drugs in the past year, or to have received an official court charge in their lifetime.

Fewer significant effects of the late intervention were found. However, the rank of means and prevalence rates for the late-intervention group with respect to the full-intervention and control groups suggests a notably consistent dose effect. Although differences generally were not significant, and MANOVA results were marginally nonsignificant, the late-intervention group reported better functioning in school or work than the control group across 7 of 8 measures, but worse functioning than the full-intervention group across all 8 measures. Similarly, the late-intervention group reported fewer emotional and mental health problems than the control group across all 8 measures examined, but more (or equivalent) problems than the full-intervention group across 7 of the 8 measures. The late-intervention group also reported less crime and substance use than the control group across 5 of 7 measures, and more crime and substance use than the full-intervention group across 6 of 7 measures. Past year and lifetime court charges also showed this pattern. Similar dose effects were found in an earlier examination of intervention outcomes at 18 years of age.19

No evidence of serious threats to the internal validity of this study were found. The full-intervention and control groups did not differ with respect to sex, ethnicity, childhood poverty, family size, proportion of single-parent homes, mothers’ education, residential stability, or neighborhood disorganization. Attrition from the study overall was relatively low and did not differ by condition. Participants were not made aware of their condition assignment and were unlikely at 21 years of age to remember that they had received any special curricula in the elementary grades. Also, although the schools selected for the study served high-crime neighborhoods that included children from families of relatively low socioeconomic status, the intervention package was provided universally to all students in intervention classrooms without regard to individual risk.

The results reported herein are consistent with the hypothesis that a theory-based intervention that improved classroom management and instruction, children’s social competence, and parenting practices during the elementary grades would have positive effects on the education and livelihood of young adults and on their outlook on these domains of life and other indicators of emotional and mental health. These results provide further evidence that early and sustained intervention in the elementary grades can help to put children on a more positive developmental trajectory that is maintained into early adulthood. Previous studies highlighted the importance of improved bonding to school as an immediate result of the intervention package that may have helped to promote and sustain a more positive life trajectory in general.18,19 At 21 years of age, effects of the interventions on positive functioning and mental health appeared more consistent than effects on crime and substance use. This may reflect the fact that the elementary interventions focused largely on strengthening bonding to family and school rather than on explicitly promoting norms or standards against illegal behaviors. It is possible that effects on these variables would have been strengthened by offering curricula during middle school that promoted norms and standards against illegal behaviors. It is also possible that at 21 years of age, the use of various substances is relatively normative, even among those progressing positively in the domains of school and work. Effects on these variables may appear at later developmental points, when substance use becomes less normative.

These findings add to a growing body of research indicating that appropriate intervention during childhood can affect long-term outcomes.6-8,10,11 They argue against the belief that effects of early preventive interventions deteriorate over time in the absence of booster sessions. To the contrary, the present results indicate that universal intervention during the elementary grades to strengthen teaching practices in public schools, strengthen parenting practices in multiethnic urban families, and ensure that children had the emotional and social skills to participate in the social life of elementary school had positive effects on functioning and mental health in early adulthood.
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REFERENCES


