Longitudinal Substance Initiation Outcomes for a Universal Preventive Intervention Combining Family and School Programs

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This study evaluated the substance initiation effects of an intervention combining family and school-based competency-training intervention components. Thirty-six rural schools were randomly assigned to 1 of 3 conditions: (a) the classroom-based Life Skills Training (LST) and the Strengthening Families Program: For Parents and Children 10 –14, (b) LST only, or (c) a control condition. Outcomes were examined 1 year after the intervention posttest, using a substance initiation index (SII) measuring lifetime use of alcohol, cigarettes, and marijuana and by rates of each individual substance. Planned intervention-control contrasts showed significant effects for both the combined and LST-only interventions on the SII and on marijuana initiation. Relative reduction rates for alcohol initiation were 30.0% for the combined intervention and 4.1% for LST only.

There are several compelling reasons for rigorously evaluating multicomponent family and school interventions designed to delay the initiation of substance use, particularly the use of alcohol, cigarettes, and marijuana. First, recent epidemiological studies demonstrate that there is extensive use of these three substances among young adolescents in the United States (Johnston, O’Malley, & Bachman, 2000). Also, early initiation of substance use has been linked to higher prevalences of substance-related and other problem behaviors in adolescence and adulthood (Jessor, 1993; Kandel & Yamaguchi, 1993). The case of early alcohol use illustrates this point: Survey findings indicate that lifetime alcohol dependence rates of people who initiated alcohol use by age 14 were four times higher than those who started at age 20, and the odds of lifetime dependence decreased by 14% with each additional year of delayed initiation (Grant & Dawson, 1997). In addition, people who started drinking before 14 years of age were significantly more likely to be injured while under the influence (Hingston, Heeren, Jamanka, & Howland, 2000). Finally, early initiation of substance use is associated with staggering economic and related societal costs (Harwood, Fountain, & Livermore, 1999; Spoth, Day, & Guyll, in press).

Etiological research has guided the substantive foci and developmental timing of interventions designed to delay substance use. This research has shown that powerful risk and protective factors originating in family and school socializing environments contribute substantially to delayed initiation of substance use (Hawkins, Catalano, & Miller, 1992; Mrazeck & Haggerty, 1994; Resnick et al., 1997). Combining universal family-focused and school-based interventions can positively influence these two primary socializing environments of youth in a synergistic fashion, building youth competencies and enhancing positive youth development (Spoth, Greenberg, & Bierman, 2000; Spoth & Molgaard, 1999) and thereby reducing youth risk for adolescent substance use and related conduct problems. Research also has shown that interventions introduced during the pre- and early adolescent developmental stages are particularly appropriate.

In the study we present in this article we combined two previously tested, theory-based interventions. The interventions were the Iowa Strengthening Families Program (Spoth, Redmond, & Shin, 2001; Spoth, Reyes, Redmond, & Shin, 1999), now revised and called the Strengthening Families Programs: For Parents and Youth 10 –14 (SFP 10 –14) and Life Skills Training (LST; Botvin, Baker, Dusenbury, Botvin, & Diaz, 1995). In combination, these two interventions address a broad range of empirically supported family-, school-, and peer-related etiological factors for substance initiation. In addition to the broad-based etiological grounding of the interventions and their prior empirical support, there are several indicators of their potential preventive benefits. Most notable is that their universal design offers the advantage of intervening with populations that encompass a greater proportion of individuals who will become disordered as adults than do clinical subpopulations (Durlak, 1998; Offord, Kramer, Kazdin, & Harrington, 1998). A search of the literature revealed no randomized, controlled study that evaluated the delayed-initiation effects of a combination of such interventions. The present study addressed this gap in the research. We hypothesized that (a) a combined LST + SFP 10 –14 intervention would result in lower levels of long-term initiation of substance use relative to a control condition, (b) the LST-only intervention also would result in lower levels of initiation relative to the control condition, and (c) the combined LST + SFP 10 –14 would show stronger effects than the LST-only condition.

Method

Recruited Schools and Participants

Participants in the study were seventh graders enrolled in 36 randomly selected rural schools in 22 contiguous counties in a midwestern state.
Criteria for selection of the initial pool of schools were: 20% or more of households in the school district within 185% of the federal poverty level; community size (school district enrollment under 1,200); and all middle-school grades (6–8) taught at one location. A randomized block design guided the assignment of the 36 schools to the three experimental conditions. After we matched the schools and randomly assigned them to conditions, we contacted school officials and informed them of the experimental condition to which their schools had been assigned. All seventh-grade students in participating schools were recruited for participation. The participation rates for the assessments and interventions are described in Table 1. On average, 46 students in each school completed the pretest. Slightly over half of the students were male (53%), and the majority of participants were Caucasian (96%).

Procedure

The in-school data collection conducted in classrooms required 40–45 min to complete. Students were assured that their responses to the questionnaires would be kept confidential and that their participation was voluntary. Two forms of the questionnaires with identical questions in varying order were administered in each classroom to enhance the privacy of the respondents. In addition, each student exhaled into a balloon that was then connected to a carbon monoxide meter to provide a carbon monoxide reading. This bogus pipeline procedure encourages honesty in answering smoking-related questionnaire items. The same data collection procedures were used across all data collection points.

Multicomponent intervention. The two empirically supported preventive interventions that were combined to form the multicomponent intervention are described next.

SFP 10–14. The SFP 10–14 (Molgaard, Kumpfer, & Fleming, 1997) is based on the biopsychosocial model (DeMarsh & Kumpfer, 1986) and other empirically based family risk and protective factor models (Kumpfer, Molgaard, & Spoth, 1996; Molgaard, Spoth, & Redmond, 2000). The long-range goal of SFP 10–14 is to reduce youth substance use and other problem behaviors. Intermediate goals include the enhancement of parental skills in nurturing, limit setting, and communication, as well as youth prosocial and peer resistance skills. Detailed descriptive information on this intervention can be found in reports cited earlier (Kumpfer et al., 1996; Spoth et al., 2001). The seven SFP 10–14 program sessions were conducted in the evenings once each week for 7 consecutive weeks when the youth were in the second semester of seventh grade. Each session included a separate, concurrent 1-hr parent and youth skills-building curriculum, followed by a 1-hr family curriculum during which parents and youth practiced the skills learned in their separate sessions. There were 129 participating families in 22 groups in 12 schools. Attendance data are presented in Table 1. Each team of facilitators was observed two or three times to assess their adherence to the intervention protocol. Adherence averaged greater than 92%, and interrater agreement varied by an average of only 2.4%.

Families were invited to participate in four booster sessions while the youth were in the eighth grade, 1 year after the initial SFP 10–14 sessions. The booster sessions were similar to the first set of sessions in their emphasis on enhancing protective factors for substance use and other problem behaviors and on the reduction of risk factors. Observer-based adherence assessments were comparable to the initial sessions.

LST. LST (Botvin, 1996, 2000) is a universal preventive intervention program based on social learning theory (Bandura, 1977) and problem behavior theory (Jessor & Jessor, 1977). The primary goals of LST are to promote skill development (such as social resistance, self-management, and general social skills) and to provide knowledge encouraging the avoidance of substance use. Students are trained in the various LST skills through the use of interactive teaching techniques, including coaching, facilitating, role modeling, and feedback and reinforcement, plus homework exercises and out-of-class behavioral rehearsal. A detailed description of the program can be found in Botvin et al.’s (1995) and Botvin, Baker, Renick, Filazzola, and Botvin’s (1984) articles. The 15-session program was conducted during 40- to 45-min classroom periods when students were in the seventh grade. A member of the project staff observed each classroom teacher on two or three occasions while the LST program was being taught to assess adherence to program content. The mean observer rating for all classroom observations was 85%; the observers differed by an average of 13.6% in their ratings.

Table 1
Participation by Condition for Assessments and Interventions

<table>
<thead>
<tr>
<th></th>
<th>Assessments</th>
<th>Control</th>
<th>Total</th>
<th>% Prior wave</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LST + SFP 10–14</td>
<td>LST only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>% Prior wave</td>
<td>N</td>
<td>% Prior wave</td>
<td>% Prior wave</td>
</tr>
<tr>
<td>Pretest</td>
<td>549 621</td>
<td>494 1,664*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest</td>
<td>517 94</td>
<td>583 94</td>
<td>463</td>
<td>94</td>
</tr>
<tr>
<td>Follow-up</td>
<td>453 88</td>
<td>503 86</td>
<td>416</td>
<td>90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interventions</th>
<th>% Attending &gt;50% of sessions</th>
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<tbody>
<tr>
<td>LST</td>
<td>1,170* 94*</td>
</tr>
<tr>
<td>LST booster</td>
<td>956* 75*</td>
</tr>
<tr>
<td>SFP 10–14</td>
<td>129 38*</td>
</tr>
<tr>
<td>SFP 10–14 booster</td>
<td>90 26*</td>
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</table>

* In fact, a total of 1,673 students completed the pretest assessment. However, 9 of these students subsequently moved from a school in one condition to a school in another condition. Because these students could not be assigned to one of the experimental conditions, their data are not counted in this sample summary. " Number assessed excludes students who refused consent; were absent for testing; or, for posttest and follow-up assessments, were not evaluated in the previous wave. Among the number of students enrolled in the relevant grade. Among the 341 assessed families (62% of eligible families in the condition) who were actively recruited for the SFP 10–14 program. Among the 129 families who participated in at least one session.
Students also participated in five LST booster sessions when they were in the eighth grade. As in the first year, the overall thrust of the booster sessions was to promote skill development, primarily social resistance skills, self-management skills, and generic social skills. Adherence was again assessed; observers differed by an average of 13.3% in their ratings, with a mean observer-rated adherence of 82%.

**Measures**

Self-reported lifetime use of alcohol, cigarettes, and marijuana was obtained from the classroom-administered questionnaire described in the Procedure section, consistent with the literature on the validity of such measures (e.g., Botvin et al., 1995; Elliott, Ageton, Huizinga, Knowles, & Canter, 1983; Williams et al., 1995). The individual items were (a) “Have you ever had a drink of alcohol?”, (b) “Have you ever smoked a cigarette?”, and (c) “Have you ever smoked marijuana (grass, pot) or hashish (hash)?” All three items were answered using a yes-no format and coded with 1 for “yes” and 0 for “no.” Inconsistent reports in lifetime substance use were corrected. In cases where a student reported a lifetime use behavior at one data collection point but reported no such use at a later collection point, the later report was corrected to reflect the previously reported initiation of that behavior. For analytic purposes, lifetime use measures were adjusted to control for baseline use. These adjusted lifetime use measures, called new-user rates, indicate whether use was initiated since baseline.

We examined the three lifetime use items individually and summed them to form the substance initiation index (SII). Reliability (K–R 20) for the SII at the follow-up assessment was .55, and test–retest reliability was .79.1 Prior studies have reported the use of similar substance use indexes (Spoth, Redmond, & Lepper, 1999; Spoth et al., 2001).

**Analyses**

We used a multilevel (mixed model) analysis of covariance (using SAS Proc Mixed with restricted maximum likelihood estimation and listwise deletion of missing data) to test for intervention effects on the SII. Because assignment to treatment conditions was made at the school level, school was incorporated as a random effect in these analyses. Also, for this reason, new-user analyses for specific substances were conducted at the school level, based on the proportions of new users in each school.

Because only initiation measures were applied in the outcome analysis for this article, we considered posttesting to be the baseline time point; that is, the analyses examined differences in substance initiation after delivery of the interventions. Using the posttest as baseline avoids confounding postintervention initiation behaviors with those that may have occurred before intervention began or before a sufficient portion of the intervention had been delivered. In addition, in this study pretests were typically conducted several months prior to intervention; posttests generally followed the intervention by approximately 1 month. The pretest proportion of dual biological parent families (aggregated to the school level) was included as a covariate in all outcome analyses. This covariate was included because of the significant pretest difference found for this variable (no significant pretest condition differences were found for any other variable—see Pretest Equivalence section).

**Results**

**Pretest Equivalence**

We assessed the pretest equivalence of the sample on sociodemographics and outcome measures. There was no evidence of inequivalence on the four outcome measures (SII, new users of alcohol, cigarettes, and marijuana); however, despite the school matching procedures and the confirmation of the homogeneity of the blocks from which schools were assigned, there was evidence of inequivalence on one of the sociodemographic factors: proportion of dual biological parents. The control group appeared to be at a lower level of risk (it contained more dual-parent families than the two intervention groups) at the time the study was initiated. As described earlier, this variable was included as a control variable in the subsequent outcome analyses. The results of the analyses of pretest equivalence are presented in Table 2.

**Differential Attrition**

We conducted analyses to rule out differential attrition by examining Condition × Dropout Status interactions at the posttest and at the follow-up assessment on all the demographic and outcome variables. No significant Dropout × Condition interactions were found from pre- to posttesting, or from posttesting to the

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1 The predictive validity of the SII measure has been assessed with data from a separate longitudinal study conducted with a similar population (N = 667). In this study, the SII assessed in the 7th grade was significantly and positively associated with past-month cigarette smoking, past-month alcohol use, past-month marijuana use, and aggressive–hostile behaviors assessed in the 8th grade. SII assessed in the 8th grade was significantly and positively associated with past-month cigarette smoking, past-month alcohol use, past-month marijuana use, and aggressive–hostile behaviors assessed in the 10th grade.
follow-up assessment, for any outcome or sociodemographic measure.

**SII**

The mean SII score was lowest for the LST + SFP 10–14 condition, the next highest score was in the LST condition, and the highest score was in the control condition. Planned contrasts showed significant differences between the LST + SFP 10–14 and control conditions and between the LST and control conditions. The difference between the LST + SFP 10–14 and LST-only conditions was not significant. These results are summarized in Table 3.

**New-User Rates**

We examined new-user rates of the individual types of substance initiation to assess intervention effects in greater detail. For each of these items, we calculated the percentage of users who initiated use between the posttest and follow-up assessment. We also calculated relative reduction rates, or the percentage difference in the proportion of new users in the intervention group relative to the control group. The results showed that, as would be expected, the same pattern of findings was observed for the individual lifetime use measures as was observed in the case of the SII; that is, in every case the LST + SFP 10–14 condition showed the lowest new-user rate. Note that the relative reduction rate for the LST + SFP 10–14 condition was 30.0% for alcohol initiation; the same rate for the LST condition was 4.1%. Alcohol new-user rates in the LST + SFP 10–14 condition were significantly different than both the control condition and LST condition rates. New-user rates for marijuana were significantly lower for the LST and LST + SFP 10–14 groups, as compared with the control condition. There were no significant findings associated with cigarette initiation (see Table 3).

**Discussion**

Although the LST + SFP 10–14 students consistently demonstrated lower levels of initiation than did the LST-only students, differences between the two intervention conditions attained significance only for the alcohol new-user rate. A possible explanation of this finding is based on two interrelated observations. First, with the exception of alcohol, there were generally low base rates and slow rates of growth in substance use over the year following intervention in all study conditions, limiting the range of observed differences between the conditions at the follow-up assessment. This limitation was compounded by apparent LST effects slowing the growth of substance use in both intervention conditions, further reducing differences in initiation rates in the two intervention conditions. Further follow-up assessments are planned to evaluate the continuing effects of the interventions on substance use. Prior research conducted on an earlier version of the SFP 10–14 intervention demonstrated that changes in substance use trajectories produced an increasing effect of the intervention over time; that is, substance use increased at a greater rate for the control group individuals than for the intervention group over a period of 4 years of follow-up analyses, yielding widening intervention–control group differences over a period of several years (Spoth et al., 2001).

Findings concerning alcohol initiation are particularly noteworthy, given that alcohol was the substance of choice in the targeted population. Alcohol shows the highest overall level of use and is also a “gateway” substance, which can increase the likelihood of advanced substance use, including illicit drugs (Graham, Collins, Wagalter, Chung, & Hansen, 1991; Kandel & Yamaguchi, 1985, 1993; Spoth, Reyes, et al., 1999). In the case of alcohol initiation, the combined intervention produced the strongest findings, with the LST + SFP 10–14 students showing significantly lower rates of initiation than either the LST-only students or the controls. This finding is consistent with prior research on family-focused interventions in a similar population in which alcohol effects were found more consistently than tobacco and marijuana effects (Spoth et al., 2001; Spoth, Reyes et al., 1999). Although preliminary, results to date suggest that the family-focused intervention component may be particularly important in preventing the initial transition into alcohol use.

In contrast to findings regarding alcohol, marijuana findings supported the importance of the school-based intervention component. LST-only and LST + SFP 10–14 new-user percentages differed little from one another but were significantly lower than control group rates. LST includes content that specifically targets alcohol, tobacco, and marijuana. Marijuana-specific content may produce a stronger effect than the content targeting the other two

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**Table 3**

<table>
<thead>
<tr>
<th>Substance Initiation Index (SII) and New-User Rates at the Follow-Up Assessment</th>
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<tr>
<td>(MISE)</td>
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<tr>
<td>-------</td>
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<tr>
<td>New users (%)</td>
</tr>
<tr>
<td>Alcohol</td>
</tr>
<tr>
<td>Cigarettes</td>
</tr>
<tr>
<td>Marijuana</td>
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</table>

*Note.* SII means are adjusted means from the multilevel analyses of covariance. Tests for new users of alcohol, cigarettes, and marijuana were conducted with school-level new user rates. LST = Life Skills Training; SFP 10–14 = Strengthening Families Program: For Parents and Children 10–14.

* p ≤ .05. ** p ≤ .01, one-tailed test.
substances, but future research will be needed to assess that possibility.

Overall, the positive intervention effects observed are consistent with the research-based principles summarized in the beginning of this article. Both interventions are theoretically based and grounded in etiological research on risk and protective factors. In addition, the interventions were delivered with high fidelity and at a developmentally appropriate point, when students were likely to be exposed to more opportunities to experiment with alcohol and tobacco use but before they progressed to more regular or varied use.

Although the focus of the present analysis was on establishing intervention efficacy on substance initiation outcomes, earlier work suggests that the interventions accomplish these positive effects on substance use through their effects on targeted risk and protective factors hypothesized to mediate substance use outcomes. The LST intervention targets adolescent attitudes and expectancies, beliefs, and competencies, whereas SFP 10–14 primarily targets parent behavior and parent–child interactions. Evaluations of LST have demonstrated effects on a number of relevant variables that mediate program effects, including assertiveness, decision-making skills, social competence, substance expectancies, norms, and refusal intentions (Hansen et al., 1988; MacKinnon et al., 1991; Trudeau, Spoth, Redmond, & Goldberg-Lillehoj, 2001; Wynn, Schulenberg, Maggs, & Zucker, 2000). Evaluations of the SFP 10–14 also have shown effects on relevant mediators, such as intervention-targeted parenting skills (e.g., rules clarification, parent–child communications), parent–child affective quality, and young adolescent refusal skills (Redmond, Spoth, Shin, & Lepper, 1999; Spoth, Redmond, Hockaday, & Yoo, 1996; Spoth, Redmond, & Shin, 1998; Spoth, Yoo, Kahn, & Redmond, 1996).

As suggested in the beginning of this article, there are a number of potential public health benefits of combining family-focused and school-based interventions that are effective in delaying substance initiation. The previously enumerated health and economic costs of early initiation of substances are especially noteworthy in this regard. This study is one of at least two essential steps required to achieve a public health impact; that is, theory-based multicomponent family and school preventive interventions represents a long-term goal of the current program of research.

Several limitations should be kept in mind regarding this study. First, it was conducted in rural midwestern communities among primarily Caucasian students. Approximately 73% of the students lived with both of their biological parents, and approximately 24% qualified for free or reduced-price school lunches. Generalizations to populations with different demographic compositions should be made with caution. In this vein, missing data also should be considered. Reductions in sample size over the course of the study were primarily due to students leaving the study region. Thus, the study findings apply most directly to students having stable places of residence. The degree to which findings generalize to more mobile students is unknown. Also, all measures are self-reported, although self-reported measures of substance use are commonly used in research with this age group and have been found to be reliable (Murray, O’Donnell, Schmid, & Perry, 1987; Oetting & Beauvais, 1990; Pechacek et al., 1984). Finally, results concerning marijuana initiation should be considered carefully. Marijuana showed a low base rate and a relatively slow rate of initiation over the initial course of study. At pretest, only 3% of the students had ever used marijuana; by the follow-up assessment this rate was 10%. Consequently, the percentage differences across conditions are relatively susceptible to the influence of small changes in the numbers of initiators.

References


Kandel, D. B., & Yamaguchi, K. (1985). Developmental patterns of the use of...


