Preventing Adolescent Drug Abuse Through a Multimodal Cognitive-Behavioral Approach: Results of a 3-Year Study

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Students (N = 4,466) attending 56 schools in New York State were involved in a 3-year study testing the effectiveness of a cognitive-behavioral approach to substance abuse prevention. In a randomized block design, schools were assigned to receive (a) the prevention program with formal provider training and implementation feedback, (b) the prevention program with videotaped provider training and no feedback, or (c) no treatment. After pretest equivalence and comparability of conditions with respect to attrition were established, students who received at least 60% of the prevention program (N = 3,684) were included in analyses of program effectiveness. Significant prevention effects were found for cigarette smoking, marijuana use, and immoderate alcohol use. Prevention effects were also found for normative expectations and knowledge concerning substance use, interpersonal skills, and communication skills.

During the two decades since the psychedelic 60s, drug use has become a ubiquitous part of the landscape of adolescent life in this country. It is so commonplace that experimentation with drugs appears to have become part of the normal rites of passage for many youth. Recent evidence suggests that drug use among adolescents has actually declined in the past few years (except for the use of cocaine, which has significantly increased during the same period of time). Still, drug use among American youth is the highest in the industrialized world (Johnston, Bachman, & O'Malley, 1988).

The initiation of drug use occurs during adolescence and is the result of a combination of cognitive, attitudinal, social, personality, pharmacologic, and developmental factors (Blum & Richards, 1979; Braucht, Follingstadt, Brakarsh, & Berry, 1973; Jessor, 1976; Millman & Botvin, 1983; Wechsler, 1976). For many individuals, the use of psychoactive substances is limited to a brief period of experimentation. However, for some individuals, experimentation with tobacco, alcohol, or other drugs eventuates in compulsive patterns of use characterized by psychological and physical dependence. The use of psychoactive substances during childhood and adolescence can lead to academic, social, and emotional problems and interfere with normal psychosocial development. Continued substance use in adulthood can lead to physical, psychological, financial, legal, and interpersonal problems (Newcomb & Bentler, 1988). In addition, increased concern now exists regarding the problem of drug use because of the role that intravenous drug use plays in the transmission of AIDS.

The most widely utilized drug abuse prevention approaches typically rely on (a) the presentation of factual information concerning the adverse consequences of using drugs, (b) efforts to promote personal growth through experiential classroom activities, or (c) involvement in organized youth activities to provide positive alternatives to drug use. Studies evaluating the effectiveness of these approaches have consistently indicated that they do little to impact on drug use behavior (Berberian, Gross, Lovejoy, & Paparella, 1976; Braucht et al., 1973; Dorn & Thompson, 1976; Schaps, Bartolo, Moskowitz, Palley, & Churgin, 1981; Swisher & Hoffman, 1975). There is even some evidence that approaches that attempt to dissuade adolescents from becoming involved with drugs by providing them with factual information concerning the consequences of drug use may actually lead to increased drug use, possibly because such approaches may serve to stimulate curiosity (Swisher, Crawford, Goldstein, & Yura, 1971).

More recent research has involved the testing of several promising prevention approaches that focus primary attention on the psychosocial factors associated with tobacco, alcohol, and drug use. Research conducted by Evans and his colleagues (Evans, 1976; Evans et al., 1978) sparked a major departure from traditional approaches to tobacco, alcohol, and drug abuse prevention. Unlike traditional approaches, the strategy developed initially by Evans and his colleagues was designed to target the social influences believed to promote the initiation of cigarette smoking by “inoculating” adolescents against these influences to smoke, teaching techniques for resisting these influences, and correcting normative expectations concerning the prevalence of smoking.

Studies testing variations on this prevention model have provided considerable evidence for the effectiveness of strategies that increase adolescents’ ability to resist social influences to smoke cigarettes (e.g., Arkin, Roehmild, Johnson, Luepker, & Murray, 1981; Biglan, Weissman, & Severson, 1985; Hurd et al., 1980; Johnson, Hansen, Collins, & Graham, 1986; Luepker, Johnson, Murray, & Pechacek, 1983; McAlister, Perry, & MacCoby, 1979; Murray, Johnson, Luepker, & Mittlemark, 1984; Perry, Killen, Slinkard, & McAlister, 1980; Telch, Killen,
McAlister, Perry, & Maccoby, 1982). Follow-up studies indicate that the positive behavioral effects of these prevention approaches are evident for up to 2 years after the conclusion of these programs for cigarette smoking (e.g., Luepker et al., 1983; McAlister, Perry, Killen, Slinkard, & Maccoby, 1980; Telch et al., 1982).

Some contemporary prevention strategies have been designed to address the factors promoting drug use in a more comprehensive fashion (e.g., Botvin & Eng, 1982; Gilchrist & Schinke, 1985; Pentz, 1985). Regarding substance use as part of a general tendency toward problem behavior as conceptualized by Jessor (1982), these prevention strategies teach a variety of personal and social skills in order to increase general competence and reduce potential motivations to smoke, drink, or use drugs and also to teach skills that are situation/problem-specific. Thus, a distinguishing feature of this approach is its emphasis on teaching generic skills with broad applicability to various situations and problems in order to facilitate generalization to a variety of problem behaviors.

In our own work, we have conducted a series of investigations testing the efficacy of this type of prevention strategy. The conceptual model guiding this research has been described elsewhere (e.g., Botvin, 1982; Botvin & Dusenbury, 1987; Botvin & Tortu, 1988). Briefly stated, it is hypothesized that substance use onset is the result of the interplay of social and intrapersonal factors. Substance use behavior, like other behaviors, is learned through a process of modeling and reinforcement and is mediated by intrapersonal factors such as cognitions, attitudes, expectations, and personality. Substance use is promoted and supported by social influences from peers, family members, and the media. Vulnerability to these influences is determined by domain-specific cognitions, attitudes, and expectations as well as the availability of skills for coping with substance use offers. In addition, skills for coping with a variety of life situations along with intrapersonal factors such as self-esteem and self-efficacy are important because they determine both general susceptibility to interpersonal influence and the extent to which adolescents may be motivated to engage in substance use.

This suggests that one effective approach to the prevention of tobacco, alcohol, and drug abuse might involve teaching (a) domain-specific skills, knowledge, attitudes, and expectations in order to enable adolescents to resist substance use social influences and (b) generic personal and social skills to increase overall competence and promote the development of interpersonal characteristics associated with decreased substance use risk.

The findings of studies assessing the efficacy of generic cognitive–behavioral drug abuse prevention approaches indicate that they significantly reduce cigarette smoking and that intervention effects can be produced by a variety of providers including project staff, social workers, graduate interns, peer leaders, and classroom teachers (Botvin, Baker, Botvin, Filazzola, & Millman, 1984; Botvin, Baker, Renick, Filazzola, & Botvin, 1984; Botvin & Eng, 1980; Botvin, Eng, & Williams, 1980; Botvin, Renick, & Baker, 1983; Pentz, 1983; Schinke, 1984; Schinke & Blythe, 1981; Schinke & Gilchrist, 1983; Schinke & Gilchrist, 1984). Moreover, these approaches have been found to impact on a number of hypothesized mediating variables and to be effective with rural, suburban, and urban students. Evidence also exists indicating that booster sessions may help maintain and even enhance intervention effects (Botvin et al., 1983; Botvin, Baker, Filazzola, & Botvin, 1990).

Notwithstanding the promising findings of recent prevention studies, a number of important issues need further attention. First, although both the social influence approaches and the broader cognitive–behavioral “life skills” approaches have demonstrated rather consistent intervention effects for cigarette smoking, there is only limited evidence that these approaches generalize to other forms of substance use (e.g., Botvin, Baker, Botvin, et al., 1984; Botvin, Baker, Renick, et al., 1984; McAlister et al., 1980; Pentz, 1983). Second, a number of issues relating to the dissemination, implementation, adoption, and diffusion of new curricula need to be examined (Basch, 1983; Bauer, 1980). Although previously published research has demonstrated that successful prevention approaches exist, it is not yet clear whether these approaches can be effective in real-world settings where there may be considerable variability with respect to the frequency of prevention sessions, the subject area in which they are implemented, the motivation and training of providers, and the perceived importance of drug abuse prevention curricula.

Third, tobacco, alcohol, and drug abuse prevention research has also been criticized in several recent reviews on methodological grounds (Biglan & Ary, 1985; Botvin, 1986; Flay, 1985; Glasgow & McCaul, 1985; Schaps et al., 1981). These criticisms have focused largely on a number of methodological issues affecting both internal and external validity (e.g., the validity of self-report data, inappropriate research designs, inappropriate statistical analysis, lack of demonstrated pretest equivalence, and failure to examine potential attrition effects). Furthermore, it has been suggested that additional attention be given to process evaluation data and the impact of interventions on hypothesized mediating variables.

Our paper reports final data from a 3-year prevention study designed to test the efficacy of a cognitive–behavioral skills training approach to drug abuse prevention among adolescents. This study was designed to overcome the methodological criticisms leveled at previous prevention research. This study was also designed to extend our previous research with cigarette smoking by determining the potential generalizability of this prevention approach to other forms of substance use abuse. Finally, this study was designed to determine if this type of prevention approach could be packaged in a manner that would make large-scale dissemination feasible, while at the same time maintaining its effectiveness.

We hypothesized that by the end of the study the students receiving the prevention program would (a) have lower levels of cigarette smoking, immoderate alcohol use, and marijuana use than control subjects; (b) be more knowledgeable about the prevalence, social acceptability, and salient negative consequences of substance use; (c) view substance use as less normative and have more negative attitudes toward substance use; (d) have better domain-specific and generic skills; and (e) have higher self-esteem and self-efficacy and lower social anxiety. We also hypothesized that the prevention condition involving a formal training workshop with periodic implementation feedback would be superior to the prevention condition involving videotaped training with no feedback.
Previous examination of data collected during the 1st and 2nd years of this study provided evidence for the gradual emergence of prevention effects over time (Botvin, 1989; Botvin, Baker, & Dusenbury, in press). Moreover, roughly comparable results appeared to be produced by teachers who had received a formal teacher training workshop with implementation feedback and teachers who were provided merely with a packaged version of the prevention program including teacher training videotapes.

At the end of the 1st (Grade 7) and 2nd (Grade 8) years of this study, effects were found for domain-specific knowledge and normative expectations concerning tobacco, alcohol, and marijuana use. Prevention effects were also evident at the end of both years for interpersonal skills knowledge. The only behavioral effects found during the first 2 years of this study were for cigarette smoking. The current paper presents data on the cumulative effects of the intervention over the 3 years of this study by examining changes occurring between the beginning of the seventh grade and the end of the ninth grade.

Method

Sample

A total of 56 schools from three geographic regions of New York State were recruited for participation in this study. This included 23 schools in eastern New York State, 19 schools from central New York State, and 14 schools from Long Island. Of the original 5,954 seventh-grade students who participated in this study during the fall of the 1985-1986 school year, 4,466 (75%) provided data at both the pretest and final posttest. The sample was 52% male and approximately 91% White, 2% Black, 2% Hispanic, and 1% Native American. Participating students attended a mixture of suburban and rural schools, 83% lived with both parents, and 58% of the fathers attended at least 1 year of college.

Design

In the spring of 1985, participating schools were surveyed to determine existing smoking levels. On the basis of these data, schools were divided into tertiles (high, medium, and low), and schools were randomly assigned to the following experimental conditions within each of the geographic areas: (a) prevention program with a 1-day teacher workshop and implementation feedback by project staff (E1); (b) prevention program with teacher training provided by videotape and no implementation feedback (E2); and (c) a comparison control group. Eighteen schools were assigned to the E1 condition, 16 schools were assigned to the E2 condition, and 22 schools were assigned to the control condition.

Prevention Program

The Life Skills Training (LST) Program (Botvin, 1983) was the prevention strategy used in this research. The LST program consists of 12 curriculum units designed to be taught in 15 class periods. Each unit consists of a major goal for the unit, measurable student objectives, content, and classroom activities. LST is designed to be offered to seventh graders, and it can be integrated into any subject area, although health and drug education are the most appropriate.

The main purpose of the LST program is to facilitate the development of personal and social skills, with particular emphasis on the development of skills for coping with social influences to smoke, drink, or use drugs. The LST program teaches students cognitive-behavioral skills for building self-esteem, resisting advertising pressure, managing anxiety, communicating effectively, developing personal relationships, and asserting one's rights. These skills are taught using a combination of teaching techniques including demonstration, behavioral rehearsal, feedback and reinforcement, and behavioral "homework" assignments for out-of-class practice.

In addition to teaching skills for the enhancement of generic personal and social competence, the LST program teaches problem-specific skills and knowledge related to smoking, drinking, and drug use. For example, students are taught the application of general assertive skills to situations in which they might experience direct interpersonal pressure to smoke. In addition, unlike traditional prevention approaches, only minimal information concerning the long-term health consequences of use is provided. Instead, information hypothesized to be more salient to adolescents and relevant to prevention is provided including information concerning the immediate negative consequences of use, the decreasing social acceptability of use, and actual prevalence rates among adults and adolescents.

Students in the two prevention conditions were also provided with booster sessions in the 2nd (Grade 8) and 3rd (Grade 9) years of the prevention study. The booster interventions were designed to review and reinforce the material covered during the 1st-year intervention. As in the 1st year, the booster sessions focused on domain-specific knowledge and skills to enable students to deal more effectively with social influences to smoke, drink, or use marijuana. The booster sessions also taught generic personal and social skills to enable students to more effectively deal with life as an adolescent. The booster intervention consisted of 10 class sessions in the 2nd year and 5 class sessions in the 3rd year.

Curriculum materials for the LST program include a teacher's manual for each year of the intervention, a student guide for the 1st year, and a 15-min relaxation audiocassette for all 3 years. Table 1 provides a brief overview of the content and structure of the LST intervention by grade level. A description of the prevention strategy and the curriculum materials can be found elsewhere (Botvin & Dusenbury, 1987; Botvin & Tortu, 1988).

### Table 1

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<th>9th</th>
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<tr>
<td>Assertiveness</td>
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<td>3</td>
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</table>

Note. LST = Life Skills Training (Botvin & Dusenbury, 1987).

Procedure

Before program implementation, all teachers in the E1 condition attended a 1-day training workshop conducted by project staff and were provided with the teacher's manual and other curriculum materials. The purposes of the workshop were to provide teachers with the rationale for this prevention approach, to describe the curriculum ma-
terials, and to provide a session-by-session review of the curriculum (Tortu & Botvin, 1989). In addition, following the collection of classroom observational data, E1 teachers met with project staff for approximately 15 min, during which time they were provided with implementation feedback and reinforcement in order to increase the quality and completeness of program implementation.

Before program implementation, teachers in the E2 condition were provided with a 2-hour training videotape accompanied by written instructions and curriculum materials. The videotape was intended to serve the same purpose as the workshop, and the content and structure of both the videotape and workshop were as much alike as possible. No feedback or reinforcement was given to the E2 teachers.

All students in the study were pretested by questionnaires administered by project staff immediately before the implementation of the prevention program. In an effort to enhance the validity of substance use self-reports, breath samples were collected in a variation of the "bogus pipeline" procedure (Evans, Hansen, & Mittlemark, 1977). Students in the two treatment conditions participated in the 15-session prevention program, which was taught during the fall of 1985 at an average rate of two sessions per week. Booster sessions were provided during the 1986–1987 school year and the 1987–1988 school year. Regular classroom teachers served as primary program providers; teacher selection was made by participating schools.

Program implementation was monitored by project staff, and quantitative assessments were made of the extent to which the two prevention conditions were implemented with fidelity to the intervention protocol. Interobserver reliability was 80% both within and across intervention sites. All students were reassessed again after the 1st, 2nd, and 3rd years of intervention by questionnaires administered by project staff using procedures identical with those used for the pretest. One class period (40–45 min) was allocated for data collection each year.

**Assessment of Program Implementation**

In order to assess the completeness of program implementation, trained observers monitored randomly selected classes taught by the teachers in each of the two prevention conditions. Using observation forms developed for each prevention session, the observer checked off the curriculum material covered during the particular session observed. Program implementation was observed during all 3 years of the study. Fifty-one teachers were observed during an average of 2.80 classes per teacher during the 1st year; 89 teachers were observed during 2.85 classes in the 2nd year; and 87 teachers were observed during 2.16 classes in the 3rd year.

A quantitative assessment of the completeness of program implementation was calculated on the basis of the proportion of curriculum objectives achieved during each class observed (number of objectives covered divided by the total number of actual curriculum objectives for the particular session observed). Quantitative implementation scores were calculated for each observation session, and an average was computed for each condition. Weighted averages were then calculated for each year of intervention and combined for the 3 years of the study. These weightings were based on the length of the intervention during each year with a weighting of 3 for Year 1 (15 sessions), 2 for Year 2 (10 sessions), and 1 for Year 3 (5 sessions). This resulted in a 3-year cumulative implementation score for each student in the two prevention conditions.

**Measures**

Before the pretest, students were randomly selected within each class to receive one of three questionnaire forms (A, B, or C). All forms of the questionnaire contained the same core of items concerning basic demographic information and self-reported tobacco, alcohol, and marijuana use. The balance of Forms A, B, and C contained measures of several cognitive, attitudinal, skills, and psychological variables believed to foster the initiation of drug use, with each of these measures being included on two of the three forms. Also included were items concerning the perceived prevalence of smoking, drinking, and marijuana use by adults and peers; the perceived use of tobacco, alcohol, and marijuana by significant others; and the perceived attitudes of significant others toward the respondent's use of these substances. Because this is part of a larger investigation focusing on etiology as well as on the effectiveness of two intervention models, this assessment strategy was adopted to maximize the coverage of variables hypothesized to play a role in the drug use etiology as well as those hypothesized to mediate intervention effects while maintaining a questionnaire length consistent with the time available for data collection. A brief description of the measures used to evaluate the effectiveness of the two intervention conditions is provided below. Where appropriate, reliability data (Cronbach alphas) are provided in parentheses.

**Cigarette Smoking.** A 10-point scale was used to measure current smoking status. Response categories consisted of (1) (never), (2) (not in the last 12 months), (3) (a few times in the last 12 months), (4) (usually once a month), (5) (a few times a month), (6) (usually once a week), (7) (a few times each week), (8) (a few times most days), and (9) (about half a pack each day) and (10) (more than a pack a day).

**Alcohol use.** Three items were used to assess the use of alcoholic beverages. The frequency of drinking alcoholic beverages was measured using a 9-point scale with response categories consisting of (1) (never), (2) (tried them but don't drink now), (3) (less than once a month), (4) (about once a month), (5) (about two or three times a month), (6) (about once a week), (7) (a few times a week), (8) (about once a day), and (9) (more than once a day). The amount of alcohol consumed per drinking occasion was measured using a 6-point scale with response categories including (1) (don't drink), (2) (one drink), (3) (two drinks), (4) (three or four drinks), (5) (five or six drinks), and (6) (more than six drinks). The frequency of getting drunk was also measured on a 9-point scale with response categories consisting of (1) (don't drink), (2) (drink but never get drunk), (3) (less than once a month), (4) (about once a month), (5) (about two or three times a month), (6) (about once a week), (7) (a few times a week), (8) (about once a day), and (9) (more than once a day).

**Marijuana use.** Frequency of marijuana use was measured using a 9-point scale with response categories consisting of (1) (never tried it), (2) (tried it but don't use it now), (3) (less than once a month), (4) (about once a month), (5) (about two or three times a month), (6) (about once a week), (7) (a few times a week), (8) (about once a day), and (9) (more than once a day).

**Knowledge measures.** Three 10-item true/false measures were used to assess knowledge about the immediate/short-term consequences, prevalence, and social acceptability of tobacco, alcohol, and marijuana use (Botvin, Baker, Renick, et al., 1984).

**Attitudes and normative beliefs.** Students' attitudes about tobacco, alcohol, and marijuana use, the characteristics of users, and the perceived social benefits of using these substances were assessed by three parallel measures. The smoking items were derived from an item analysis of the Teenagers Self Test: Cigarette Smoking (U.S. Public Health Service, 1974). Parallel items were developed for alcohol and marijuana. Ten items were used to assess attitudes toward tobacco use (α = .76), 10 items for alcohol use (α = .73), and 11 items for marijuana (α = .78). Responses were indicated by means of a 5-point Likert scale ranging from strongly disagree to strongly agree. Two items each were used to measure respondents' normative beliefs concerning the prevalence of tobacco, alcohol, and marijuana use among adults and peers. Responses were rated on a 6-point scale from none to almost all.

**Skills.** Seven items were used to assess decision making (α = .82), with responses ranging from never to almost always. The decision-making measure assessed the use of sound decision-making skills (e.g., "When I have a problem I get information that is needed to deal with..."..."
the problem). Five items were used to assess the use of different relaxation skills for coping with anxiety (α = .63). Each item described a relaxation technique such as sitting quietly and relaxing all the muscles in one's body or imagining oneself in a peaceful place. Frequency of use was assessed on a 5-point scale ranging from never to almost always. Both of these scales were derived from the Coping Inventory developed by Wills (1986).

Assertiveness was assessed using an abbreviated 18-item version of the Gambrill and Richey (1975) Assertion Inventory with responses ranging from never to almost always. Assertiveness was assessed in terms of both resisting substance use offers (α = .82) and general assertiveness (α = .70). Examples of assertive behaviors include returning defective merchandise, complaining when someone steps ahead in line, and saying “no” in various situations. Respondents' confidence about their ability to use specific personal and social skills (skills efficacy) was measured using 14-items (α = .78) rated on 5-point Likert scales ranging from not at all confident to very confident. Sixteen true/false items were used to measure knowledge about communication skills and general social skills.

Psychological characteristics. Measures were also included to assess general psychological characteristics or tendencies. These included self-efficacy, self-esteem, and social anxiety. Self-efficacy (α = .67) was measured by 5 items indicating the belief that goals could be achieved through personal effort and hard work (Paulhus, 1983). Responses ranged from strongly disagree to strongly agree. Self-esteem (α = .80) was measured by the 10-item scale developed by Rosenberg (1965). Statements were typical evocations of self-esteem (e.g., "I take a positive attitude toward myself;" "I feel that I have a number of good qualities"). Responses ranged from strongly disagree to strongly agree. Social anxiety (α = .82) was measured by 9 items derived from the Social Anxiety Inventory (Richardson & Tasto, 1976). Statements described various social situations (e.g., giving a speech before a group of strangers, speaking to someone in authority, and expressing a controversial opinion in a group). Responses measured the amount of nervousness felt in each situation from very nervous to not at all nervous.

Results

Data were analyzed using the statistical procedures contained in SAS 6.03 (SAS Institute, Inc., 1988) for general linear models (GLM) multivariate analysis of variance (MANOVA) and analysis of variance (ANOVA). First, a MANOVA was conducted to determine the pretest comparability of the three experimental conditions for the major dependent variables. Second, the sample used in this study was examined to determine the impact of attrition using a series of GLM ANOVAS. Third, the effectiveness of the prevention program was analyzed using a 3 × 3 (Assignment Blocks × Treatment Conditions) MANCOVA with the pretest scores being used as covariates. Significant MANCOVAs were followed by univariate GLMs and preplanned comparisons of covariate adjusted means.

Pretest Equivalence

Table 2 provides a comparison of the prevention and control conditions at the pretest and final posttest. An overall MANOVA was computed to determine the comparability of the E1, E2, and control conditions with respect to the primary behavioral outcome variables used in this study. No significant differences were found across conditions for these variables, indicating a high degree of comparability between conditions at the pretest.

Attrition Analysis

Because previous studies have indicated that higher attrition may occur among substance users (e.g., Botvin et al., 1990; Hansen, Collins, Malotte, Johnson, & Fielding, 1985), the following analyses were conducted to determine the extent to which any potential bias might have been introduced into this study resulting from differential attrition. A series of two-way ANOVAS (Pretest Use Status × Condition) were conducted for each of the primary behavioral variables. As expected, significant differences were found with respect to substance use status at the time of the pretest with smokers, $F(1, 5881) = 258.04, p < .0001$; drinkers, $F(1, 5870) = 84.60, p < .0001$; and marijuana users, $F(1, 5898) = 129.31, p < .0001$, having higher attrition rates than nonusers. In addition, significant main effects were found for condition for the analysis conducted with the marijuana use index, $F(2, 5898) = 6.37, p < .0017$, with greater attrition among the students in the control condition. Finally, a significant Condition × Pretest Use Status interaction was found for marijuana use, $F(2, 5898) = 5.52, p < .0004$, with greater attrition among the pretest marijuana users in the control condition. The net effect of the attrition accruing in this study, therefore, was to provide for a more conservative test of the interventions being evaluated.

Implementation Fidelity

Examination of classroom observational data concerning program implementation indicated that the prevention program was not uniformly implemented by participating teachers. The quantitative measure of the amount of intervention material covered ranged from a low of 27% to a high of 97% with a mean of 68%. The level of program implementation was roughly comparable for the E1 ($M = 67\%$) and the E2 ($M = 68\%$) conditions. Inspection of the distribution of implementation scores indicated that 75% of the students in the prevention conditions were exposed to 60% or more of the prevention program.

Inclusion Criterion and Data Analysis Sample

In order to establish a minimum standard of acceptable program implementation while at the same time retaining as much of the sample as possible, a 3-year cumulative implementation score of 60% was used as the inclusion criterion for the subsequent analyses of program effectiveness.1 The resulting sample

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1 The relation between program implementation and outcome was determined by computing a series of multiple regressions for each of substance use measures with the cumulative 3-year implementation scores and pretest substance use scores being entered simultaneously as independent variables and the scores on the five substance use measures at the final data collection as dependent variables. After controlling for pretest substance use levels, implementation scores were found to be significantly related to outcome for cigarette smoking ($β = -.04, SE = .003, p < .0098$); drinking frequency ($β = -.08, SE = .0004, p < .0001$); frequency of getting drunk ($β = -.08, SE = .0003, p < .0001$); drinking amount ($β = -.07, SE = .0003, p < .0001$); and marijuana use ($β = -.08, SE = .0003, p < .0001$).

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consisted of 3,684 students from 50 schools (14 schools in each of the two prevention conditions and 22 schools in the control condition). The demographic characteristics of this sample were virtually identical with those of the original sample. This sample was 51% male and 91% White, with 84% of the students living with both parents and 58% of the fathers having attended at least 1 year of college.

**Substance Use**

Data were analyzed using a 3 × 3 (Assignment Blocks × Treatment Conditions) GLM MANCOVA with the pretest scores being used as covariates. The MANCOVA revealed significant treatment effects for the set of substance use variables, $F(10, 7340) = 2.26$, $p < .0125$. Univariate GLM ANCOVAs were conducted for each of the substance use dependent variables followed by planned comparisons of the covariate adjusted means. The results of these analyses are summarized in Table 3 for the substance use variables.

Significant treatment effects were found for three of the five primary dependent substance use variables. There was significantly less cigarette smoking and marijuana use in both the El and E2 conditions than in the control condition. Although no significant effects were found for drinking frequency or amount, the frequency of getting drunk was significantly less in the E2 condition.

**Impact on Hypothesized Mediating Variables**

A series of ANCOVAs was computed to determine the impact of the two treatment conditions on hypothesized mediating variables. Table 2 presents the results of the ANCOVAs for the knowledge, attitudes, expectations, skills, and personality variables assessed in this study. In order to control for the experimentwise error rate, a Bonferroni's correction was used ($0.05/23 = .0022$), and only those comparisons that had $p$ levels that were lower than .002 were considered significant.

Knowledge concerning substance use. Significant treatment effects were found for both prevention conditions with respect to domain-specific knowledge concerning substance use. Students in the El and E2 groups had significantly more knowledge about actual smoking prevalence rates, the negative consequences of smoking, and the declining social acceptability of smoking, as well as similar knowledge about drinking. Comparison of the El and E2 groups indicated that the El group had significantly higher scores than the E2 group with respect to smoking consequences.

Substance use attitudes. Significant differences were found between the prevention and control conditions for normative expectations regarding substance use (i.e., perceived substance use by adults and peers). Both the El and E2 prevention conditions had significantly lower normative expectations than the control condition concerning adult smoking, and the El condition had significantly lower normative expectations concerning adult and peer marijuana use.

Skills knowledge and personality. Interpersonal skills knowledge scores were significantly higher for both the El and E2 conditions than in the control condition. In addition, there was a marginally significant impact on communications skills knowledge. No effects were found for any of the personality variables.

**Discussion**

The findings of this study provide additional support for the effectiveness of a cognitive-behavioral approach to substance abuse prevention among junior high school students. Prevention effects were found for cigarette smoking, immoderate alcohol use, and marijuana use. Because this prevention approach was originally developed to reduce adolescent cigarette smoking, it is not surprising that the strongest effects were for smoke
Table 3
Univariate F Values and Adjusted Follow-Up Substance Use Means and Standard Errors for Prevention and Control Conditions

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<td>5.72</td>
<td>.0033</td>
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<tr>
<td>Drinking frequency</td>
<td>3.17</td>
<td>0.05</td>
<td>3.10</td>
<td>0.05</td>
<td>3.15</td>
<td>0.05</td>
<td>0.45</td>
<td>ns</td>
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<tr>
<td>Drinking amount</td>
<td>2.65</td>
<td>0.05</td>
<td>2.55</td>
<td>0.05</td>
<td>2.65</td>
<td>0.04</td>
<td>1.59</td>
<td>ns</td>
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<tr>
<td>Drunkenness</td>
<td>2.31</td>
<td>0.04</td>
<td>2.19</td>
<td>0.04</td>
<td>2.32</td>
<td>0.04</td>
<td>3.25</td>
<td>.0391</td>
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<tr>
<td>Marijuana use</td>
<td>1.51</td>
<td>0.04</td>
<td>1.54</td>
<td>0.04</td>
<td>1.66</td>
<td>0.04</td>
<td>4.04</td>
<td>.0176</td>
</tr>
</tbody>
</table>

Note. E1 = 1-day teacher workshop with feedback; E2 = videotape teacher training, no feedback; C = control condition. Means for the E1 and E2 groups with subscripts differ from the control group at the following probability levels: subscript a, p < .05; subscript b, p < .01; subscript c, p < .001.

In addition to demonstrating these effects by means of the conventional individual-level analyses, significant effects for cigarette smoking were also demonstrated by using the more conservative school-level analysis.

Previous studies have demonstrated that this type of prevention strategy can significantly reduce cigarette smoking, alcohol use, immoderate alcohol use, and marijuana use (Botvin et al., 1980; Botvin & Eng, 1982; Botvin et al., 1983; Botvin, Baker, Botvin, et al., 1984; Botvin, Baker, Renick, et al., 1984; Botvin et al., 1990). This study provides the largest and most rigorous test of the LST approach and demonstrates the effectiveness of this prevention strategy when ongoing intervention activities are

Table 4
Univariate F Values and Adjusted Follow-Up Knowledge, Attitude, Expectations, Skills, and Personality Means for Prevention and Control Conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>E1</th>
<th>E2</th>
<th>C</th>
<th>F</th>
<th>df</th>
<th>p</th>
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<td>Knowledge</td>
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<td>Smoking prevalence</td>
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<td>20.37</td>
<td>2,2357</td>
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<td>Smoking consequences</td>
<td>4.80a</td>
<td>4.60a</td>
<td>4.13</td>
<td>76.25</td>
<td>2,2346</td>
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<td>Smoking acceptability</td>
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<td>1.52a</td>
<td>1.37</td>
<td>10.86</td>
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<td>.0001</td>
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<td>Drinking knowledge</td>
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<td>7.43a</td>
<td>7.08</td>
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<td>Substance use attitudes</td>
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<td>45.21a</td>
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<tr>
<td>Adult smoking</td>
<td>3.92a</td>
<td>3.95a</td>
<td>4.22</td>
<td>27.25</td>
<td>2,2390</td>
<td>.0001</td>
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<td>Peer smoking</td>
<td>3.80a</td>
<td>3.77a</td>
<td>3.92</td>
<td>5.37</td>
<td>2,2392</td>
<td>.0047</td>
</tr>
<tr>
<td>Adult drinking</td>
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<td>4.57a</td>
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<td>4.76</td>
<td>2,1171</td>
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<tr>
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<td>Assertiveness</td>
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<td>Decision-making</td>
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<td>51.28</td>
<td>1.81</td>
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<td>3.12a</td>
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<td>.0019</td>
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<tr>
<td>Interpersonal</td>
<td>9.28a</td>
<td>9.11a</td>
<td>8.81</td>
<td>16.76</td>
<td>2,2350</td>
<td>.0001</td>
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<td>Personality measures</td>
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<tr>
<td>Self-esteem</td>
<td>34.25</td>
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<td>33.65</td>
<td>2.40</td>
<td>2,2014</td>
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<tr>
<td>Self-efficacy</td>
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<td>19.26</td>
<td>.11</td>
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<td>.9002</td>
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<tr>
<td>Social anxiety</td>
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<td>29.36</td>
<td>29.92</td>
<td>3.78</td>
<td>2,1442</td>
<td>.0231</td>
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</tbody>
</table>

Note. E1 = 1-day teacher workshop with feedback; E2 = videotape teacher training, no feedback; C = control condition. Means for the E1 and E2 groups with subscripts differ from the control at the following probability levels: subscript a, p < .05; subscript b, p < .01; subscript c, p < .001; subscript d, p < .0001.
provided throughout the critical junior high school period (Grades 7 through 9).

A general criticism of the school-based prevention literature is that these and other prevention studies have not been conducted under conditions typical of most classrooms and, therefore, the extent to which they would be effective in real-world settings has been only a matter of speculation. In addition to addressing that criticism, our study was also designed to assess the exportability of this type of prevention strategy when schools were provided simply with a prevention package consisting of curriculum materials and a set of teacher training videotapes for each of the 3 intervention years. The results of the study indicate that this type of prevention approach is both feasible and effective when implemented under real-world conditions in which teachers are the program providers, schools use their own criteria for teacher selection and scheduling the prevention curriculum, and competing demands on teachers' and students' time may mean that the implementation of the prevention program is somewhat less than optimal. Moreover, both prevention conditions produced results that were essentially comparable. Together these findings suggest that this and similar prevention approaches will have high exportability and can be packaged in a manner that will facilitate large-scale dissemination and utilization.

A common deficiency of most prevention studies is the failure of investigators to adequately consider issues related to the fidelity and completeness of program implementation. In the absence of any objective data concerning program implementation, it is virtually impossible to accurately access the efficacy of a given intervention strategy. Information concerning fidelity of implementation becomes even more critical in large prevention studies involving program providers not under the direct control of investigators (e.g., teachers, peer leaders). Evaluation studies conducted without assessment of program implementation are likely to underestimate the strength of existing program effects if the evaluation is conducted with a mixture of individuals who received the intervention in a relatively complete form and individuals who may have received only a portion of the intervention.

Previous studies testing the efficacy of the intervention utilized in the present study have found that (a) it was implemented with varying degrees of completeness and (b) program effects where stronger among those individuals receiving a more complete implementation of the prevention program (Botvin et al., 1990; Botvin, Dusenbury, James-Ortiz, Kerner, 1989). Similar results were found in this study. Considerable variability in the completeness of program implementation was evident with some students receiving a high level of program implementation (90%-100%) and others receiving a low level of implementation (<50%). Moreover, program effectiveness was found to be related to the level of program implementation. Importantly, individuals receiving at least a minimally complete version of the prevention program (60% or more) had significantly lower levels of substance use at the end of the ninth grade than did control subjects.

The decision to use 60% as the cutoff for inclusion in the analysis of prevention effects was based on a conservative estimate of the level of implementation that might be expected in the average classroom along with a consideration of the actual distribution of implementation scores in this study. Although a much higher level of implementation would certainly be desirable, the results of this study indicate that even with a modest level of implementation completeness, this prevention approach is capable of producing an impact on drug use. Although these data generally support the feasibility of conducting this type of preventive intervention, they clearly underscore the importance of a careful and complete implementation of preventive interventions.

The results of this study also indicate that this prevention program, when implemented under the two different intervention conditions, significantly impacted on a number of hypothesized mediating variables in a direction consistent with non-substance use. These results provide at least partial evidence supporting the construct validity of this type of prevention model. However, a weakness of this study is the absence of a more direct assessment of the skills taught in this prevention program. Future research is needed to assess the extent to which the skills taught in this prevention program are learned and utilized by participating students in order to further understand the mechanism through which this approach is effective.

Interpretation of the findings of this study should be tempered by a recognition of the limitations of this and similar studies. First, although an effort was made to increase the generalizability of this study by including students from a large number of schools and from three different geographic regions, the population for this study consisted of predominantly White, middle-class, suburban and rural students. The results of two recent studies with urban minority populations have provided tentative support for the generalizability of this prevention approach to other populations (Botvin, Batson, et al., 1989; Botvin, Dusenbury, et al., 1989). Still, caution is warranted in generalizing beyond the population involved in the present study.

Second, this and other school-based prevention studies have consistently found higher attrition among substance users. Although the fact that the attrition of substance users was not differential with respect to conditions (preserving the internal validity of this study), the general tendency of substance users to drop out of school-based prevention studies does limit external validity. Additional research is needed to determine the effectiveness of this type of prevention approach with individuals who may be at the highest risk of becoming drug abusers by utilizing more aggressive follow-up techniques designed to include even those individuals who may have dropped out of school.

Future research should be directed toward developing methods for increasing the completeness of program implementation to the point where all individuals participating in a preventive intervention receive at least 85% of the intervention. This might be accomplished by determining the characteristics of effective program providers and providing schools with this information in the form of guidelines included with the intervention materials. This might also be accomplished by developing a more effective training component or reducing the burden on providers through the use of audiovisual material. Finally,
barriers to adoption, utilization, effective implementation, and institutionalization will need to be more fully researched.

References


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