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Outcome of a Tobacco Use Cessation Randomized Trial with High-School Students

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Abstract

This study analyzed quantitative data on tobacco use and dependency for 3,589 high-school students, qualitative data for 448 students, and outcome data for a randomized trial comparing the efficacy of two cessation interventions and a control condition for 337 students. Data were collected from 1988 through 1992 in California and Illinois as part of a larger longitudinal study. Smokeless tobacco users, but not smokers, were more likely than controls to maintain cessation for 4 months: biochemically validated cessation at 4 months was 6.5% versus 3.2% for smokers and 14.3% versus 0.0% for smokeless tobacco users. Implications and limitations are discussed.

Keywords

tobacco; adolescent; assessment; addiction; dependency; cessation; intervention

Introduction

Daily use of cigarettes by adolescents in the United States increases from 4.0% among 8th-grade students (average age 13–14 years) to 7.6% among 10th-grade students (age 15–16 years), and to 12.2% among 12th-grade students (17–18 years), according to 2006 data from the most recent Monitoring the Future national survey (Johnston, O'Malley, Bachman, and Schulenberg, 2007). The national 30-day prevalence rates for cigarettes were 8.7%, 14.5%, and 21.6%, respectively, for 8th-, 10th-, and 12th-grade students in 2006. Unchecked in adolescence, smoking prevalence continues to climb into young adulthood, to 27.0% for young adults aged 19–28 years in 2006 (Johnston et al., 2007). Hence, there is a persisting need for developing methods effective in helping adolescents stop smoking.

The need to intervene with adolescents who already smoke is highlighted by the extent of nicotine dependence among young smokers. In the most recent National Survey on Drug Use and Health conducted in the United States in 2006 (Substance Abuse and Mental Health

Services Administration [SAMHSA], 2008), 36.4% of youths aged 12 through 17 years who had used cigarettes in the previous month were found to be nicotine dependent; criteria for dependence were derived from two existing scales (Fagerstrom, 1978; Shiffman, Paty, Gnys, Kassel, and Elash, 1995) focusing on the compulsion to smoke—patterns and continuity of smoking and nicotine tolerance. Moreover, 17.0% of those youths who were nicotine dependent were reported to have experienced a major depressive episode in the past year, in comparison with 7.5% of youths who had smoked in the past month but were not nicotine dependent (SAMHSA, 2008). Findings such as these suggest the need for interventions that focus on the complexity of the lives of young people who smoke and that include an opportunity to interact with a professional counselor.

Although adolescent smoking has long been acknowledged as a major public health concern, few randomized school-based smoking-cessation trials have been conducted (Garrison, Christakis, Ebel, Wiehe, and Rivara, 2003). Low levels of initial participation by adolescents in cessation programs (Massey et al., 2003) followed by high levels of attrition (Garrison et al., 2003; Moolchan, Aung, and Henningfield, 2003) have led some investigators to shift the focus of their efforts from adolescence to young adulthood. However, the first meta-analysis of smoking-cessation interventions with teenagers (Sussman, Sun, and Dent, 2006) examined 48 studies using a variety of settings and concluded that overall, smoking-cessation programs with adolescents are efficacious.

The study reported here, part of a larger longitudinal tobacco use prevention and cessation project (Dent et al., 1995; Sussman, Dent, Burton, Stacy, and Flay, 1995), was developed to assess the nature of tobacco dependence among adolescents and to meet the critical need for identifying ways to help teenagers who are already regular smokers to quit smoking. As part of the goal of helping youths to become free of all tobacco, this study also focused on smokeless tobacco (ST; snuff, chew). The study included a randomized intervention trial and took place in two states, California and Illinois, from 1988 to 1992.

Methods

Human Subjects Approval

The research and intervention design and procedures were reviewed and approved by the University of Illinois at Chicago Institutional Review Board.

Schools

All study activities, including focus groups, surveys, pretesting, and randomized trial, took place at the same 16 schools. Eight of the schools were located in southern California and eight in central or southern Illinois. Urban areas were excluded from the study. The eight schools within each region were randomly selected from all public high schools.

Timeline for All Study Activities

Activities took place as follows:

- Year 1. Focus groups
- Year 2. Schoolwide survey 1 and additional focus groups
- Year 3. Pretest of cessation models and motivational campaigns
- Year 4. Schoolwide survey 2 and randomized trial of cessation groups

Preliminary Assessments

The main results of preliminary assessments taking place in Years 1–3 of the study are summarized below.

Focus Groups and Survey 1, Years 1–2—In Years 1 and 2, 64 focus groups were conducted with students in two of the eight California high schools and two of the Illinois high schools, all with the objectives of determining what might best assist teenagers in quitting tobacco use and what might motivate them to participate in a tobacco use cessation group (Sussman, Burton, Dent, Stacy, and Flay, 1991). Four rounds of focus groups were conducted, each with 16 groups (1 group for boys and 1 for girls from each of four grade levels, 9 through 12, within each state). Focus-group participants expressed the opinions that cessation groups should not be specific to tobacco but should cover alcohol, illicit drugs, and tobacco; girls and boys should be together in groups; groups should be small to facilitate openness; the cessation-group facilitator should be knowledgeable and in touch, not necessarily young; any health messages should be personalized; films or videos should be serious in tone; participation should be confidential; and class release should be obtained for group participation. These results are comparable to those reported in Molyneux and colleagues' (2006) qualitative study of preferences of school-age smokers in Nottinghamshire, United Kingdom: Students preferred nonjudgmental services provided during school time by a professional counselor, allowing the option to participate with friends.

The top three ideas volunteered, in the 64 focus groups, for what might motivate high-school students to quit using tobacco were as follows: if someone gravely afflicted by a tobacco-caused disease talked to them, if their own physician told them that it was important for them personally to quit, or if their boyfriend or girlfriend wanted them to quit. These focus-group findings were subsequently corroborated by responses to structured questionnaires in an anonymous schoolwide survey (Survey 1) administered within all 16 schools of 3,674 students in Year 2: of 23 items in a survey checklist, the 3 most frequently chosen in response to the question "What might make you want to stop smoking/using smokeless tobacco" were as follows: the death of someone close to me from tobacco use, if a doctor told me to quit, and if my girlfriend/or boyfriend wanted me to quit.

Pretest Cessation Groups, Year 3—The frame of reference for this tobacco use cessation study was a four-stage model for the acquisition of dependency on tobacco, with the stages hypothesized to be social influences (when peer tobacco use and advertising trigger the desire to use tobacco), addiction (when the user begins to crave or otherwise miss tobacco when not using), psychosocial dependency (when the user begins to depend on tobacco to function or to be competent), and negative affect (when tobacco becomes linked with mood regulation, in particular with managing depression or anger) (Burton, 1994). Four models of cessation groups focusing on strategies pertinent to each of the hypothesized stages of dependency were developed in Year 2 and implemented in Year 3 as preliminary assessments for the main trial.

Two cessation groups for each of the four models were conducted in 6 schools (randomly selected from the total 16 schools as pretest schools): 4 schools had one group, and 2 schools had two groups. All of the cessation groups were informed by results of the focus groups: groups were small, with male and female participants together; class release was provided; trigger videos were serious in tone; attention was given to other drugs (although the clear focus was tobacco), and extensive efforts were made to encourage confidentiality regarding participation.

The most successful of the four types of groups in terms of participants' reports of satisfaction and group facilitators' reports was that based on the addiction model; this model was thus selected to be one of two tested in the randomized trial. The group based on social influences

was the least well received and was discarded. The negative affect group and selected components of the psychosocial dependency group (e.g., those addressing feelings of personal competence) were well received and were merged to form the second cessation group model (referred to as the psychosocial dependency model) to be tested in the randomized trial.

Motivational Campaigns—Two types of campaigns intended to motivate students to participate in the tobacco use cessation groups were considered in the preliminary assessments in Year 3. The first type was based on results of the focus groups in which students had expressed preferences for serious, emotionally evocative, or fear-arousing material. The second type of campaign was based on principles of imagery advertising and sought to link the concept of being tobacco-free with images of power. Each campaign was conducted in two pretest schools randomly selected from the total 16 schools. The campaigns consisted of posters placed under glass in the school hallways, and an auditorium speaker. Each professional speaker made a 30-minute antitobacco presentation; in the “power” condition, the speaker emphasized themes related to the strength that a person gains from becoming tobacco-free; in the “fear” condition, the speaker told a true story of the loss of a loved one from a tobacco-related disease. Brief, written, anonymous audience assessments were conducted at the end of each auditorium presentation. Each presentation was rated on a 5-point scale, where 1 = extremely interesting and 5 = not at all interesting. The presentation for the fear condition was rated extremely or very interesting by 83% of 340 students, compared with 60% of 261 students in the audience for the power condition (chi-square value of 52.7 significant at $<.0001$). Since this result was consistent with the results of the focus groups, a fear-arousal motivational campaign was developed for the randomized cessation trial.

Study Design for Randomized Trial

The 16 high schools were randomly assigned, within state (Illinois/California) and region (rural/suburban), to two conditions: addiction groups and psychosocial dependency groups.

Students volunteering to participate in a cessation group were randomly assigned to be in one of the two groups offered at each school (treatment subjects) or to not be in a group (control subjects). All students had been informed ahead of time that they might or might not be randomly assigned into the groups, but that they all would be invited to a follow-up session in 4 months. Control subjects were given a tobacco use cessation tip sheet and encouraged to work on quitting.

Two cessation groups were held at each school, for a total of 32 groups. Each group consisted of five sessions spaced over a 1-month period. Four months after the start of the groups, both treatment and control subjects were invited to participate in the follow-up session, in which tobacco use data (self-report and saliva for cotinine analysis) were collected.

Measures

Tobacco Use—Tobacco use was defined as follows:

Regular smoker: Reported “currently” using cigarettes, and reported using cigarettes at least “a few times each week”;

Daily smoker: Reported currently smoking at least “a few times most days”;

Regular ST user: Reported “currently” using ST, and reported using ST at least “a few times each week”; and

Daily ST user: Reported currently using ST at least “a few times most days.”

Biochemical Validation of Tobacco Use—Analyses of cotinine in saliva samples were used to verify self-reports of tobacco use (at the 4-month follow-up only).

Tobacco Dependency—Students used a checklist to indicate which of several statements were true of them. Each type of dependency below was assessed by the number of statements checked. Scores for each of the four hypothesized dimensions of tobacco dependency were computed by adding the number of items checked, from 0 to 3 for each. (The examples below are given for smoking; each questionnaire included the same items worded for ST use.)

Social influences: “I smoke more when I’m with friends”; “I smoke more when I’m at parties”; “I like to take a cigarette when I see a picture of someone smoking.”

Addiction: “It bothers me to go a whole day without smoking”; “I like to have a cigarette first thing in the morning”; “I don’t feel right if I go too long without a cigarette.”

Psychosocial dependency: “I smoke more when I’m concentrating”; “I smoke more when I’m alone”; “I smoke more when I’m working hard.”

Negative affect: “I smoke more when I’m stressed out”; “I smoke more when I’m angry”; “I smoke more when I’m down.”

A confirmatory factor analysis of the 12 items was conducted and revealed an overall goodness of fit of .867, with an adjusted goodness-of-fit index of .779 (chi-square = 633.01; $p < .001$). The greatest internal consistency was demonstrated for addiction, with correlations ranging from .848 to .957, and for negative affect, with correlations ranging from .787 to .838. One item, “I like to take a cigarette when I see a picture of someone smoking,” fit better with psychosocial dependency than with the social influences dimension; the internal consistency for psychosocial dependency, with the addition of this item, ranged from .547 to .824, and for the two remaining items in social influences, .459 and .802.

Cessation Stage—Cessation stage was assessed by students’ responses to a question in which they were asked to choose, from the following six options, the one item that best describes them: (1) I’ve never thought about quitting tobacco use; (2) I’ve thought about quitting, but haven’t made up my mind; (3) I plan to quit, but not until later; (4) I plan to quit right away; (5) I’ve quit and I’m trying to stay off; (6) I’ve thought about quitting and decided I don’t want to. These six responses are defined, respectively, as: (1) precontemplator, (2) contemplator, (3) postponer; (4) preparer; (5) maintainer, and (6) rejecter. The first five cessation stages parallel Prochaska and DiClemente’s stages of self-change of smoking (Prochaska and DiClemente, 1983).

Procedures

Survey—A second anonymous questionnaire was administered to 3,589 students representing two classrooms from each grade level, 9–12, at each of the 16 schools. The survey took place at the start of the school year of Year 4 of the study, prior to recruitment for the cessation groups in the randomized trial.

Cessation Groups

Recruitment: Campaigns to motivate tobacco users to volunteer for the tobacco use cessation groups were conducted in the 16 schools. These campaigns were based on findings from the preliminary assessments summarized earlier. Posters consisting of pictures of tobacco users disfigured from cancer, one picture of an ST user, and one of a smoker, were placed in the hallways of each school, on official school bulletin boards, under glass. The same pictures were

published in advertisements purchased in student newspapers, in full-page ads on the back-page. The motivational campaign ran for 3 weeks at each school.

Flyers inviting students to voluntarily participate in the tobacco use cessation groups were distributed to all students, in the homeroom sessions, during the third week of the motivational campaign. Smokers and ST users were eligible to participate in the groups, as long as they wanted to quit using all tobacco. Students in all grades (9 through 12) were eligible to participate. Students were told that if they were interested in participating they should sign the invitational flyer and place it in a box located in the principal's or nurse's office. At the end of a 2-week sign-up period, a maximum of 33 students were randomly selected from among those who volunteered at each school (in some schools, less than 33 students volunteered in which case all students were randomly assigned to the three conditions); signed invitations were first separated by gender and the names then randomly drawn within gender to ensure a comparable number of male and female subjects. The maximum of 33 students at each school then were randomly assigned to three conditions: cessation group 1, cessation group 2, or no group (control).

Subjects: Of the 244 regular tobacco users randomly selected to participate in the clinics, 19.6% were in the 9th grade; 25.2%, 10th grade; 25.2%, 11th grade; and 29.9%, 12th grade. There were 53.3% female and 46.7% male subjects. At the start of the cessation groups, 84.1% of the participants in California, and 74.0% of those in Illinois reported that they were currently smokers only; 7.5% from California and 17.3% in Illinois reported being ST users only, and 8.4% of the participants in California and 8.7% of those in Illinois reported that they were currently both smoking and using ST. Subjects from rural regions were more likely to be ST users or to use both ST and smoke (15.0% and 13.1%) than were subjects from suburban regions (9.6% and 3.8%) (Pearson chi-square value of 7.91, significant at $<.05$).

Group Format: Two tobacco use cessation groups were held at each of the 16 schools. Group size ranged from 5 to 11 participants. Five 45-minute sessions per group were held during school hours over a 1-month period. Participants were released from class to participate in the groups. The groups were led by health educators, trained in tobacco use cessation methodology. Four facilitators staffed the program in Illinois (each leading four groups) and two facilitators in California (each leading eight groups). Each facilitator was trained in and delivered an equal number of groups for each of the two intervention models, described below.

Group Content: The addiction-model groups and the psychosocial dependency-model groups shared some standard components: The first half of each group session consisted of information presentation; the second half consisted of group discussion of individual experiences of the participants. In both models, participants were asked to write a private statement of commitment to quitting tobacco and to carry that statement with them at all times. Both types of groups included information on the health risks of tobacco use, and both presented graphic, emotionally evocative clips from three videos that had been well received in the preliminary assessments. Both models suggested that participants try to quit for the third group session. Both types of groups included a carbon monoxide monitor demonstration; both presented the "Floating" relaxation exercise (Burton and Wohl, 1979) and both provided samples of stick cinnamon, and MintSnuff^T, an inert ST substitute (Chakravorty, 1996). Information for weight management also was standard. Both models provided reinforcements for group participation: date books distributed at the first session, with the remaining group dates marked for the participants; US\$5 McDonald's coupons, given at the fourth session, and key chains at the fifth group session.

Addiction-Model Groups: The addiction-model groups focused on the physiological aspects of addiction. The first session gave an overview of the addictive nature of nicotine, properties

of chemical addiction, relationship of tobacco addiction to other addictions, and what it takes to break an addiction. The second session introduced strategies for withdrawal symptoms. The third session focused on early withdrawal symptoms and the use of physical exercise and other behavioral strategies to deal with withdrawal. The fourth session continued the discussion of strategies for drug withdrawal. Each participant was given an audiocassette about teenagers helping each other quit using tobacco; the audiocassette script presented tobacco use as an addiction. The fifth session included discussion of applying the strategies learned for tobacco use cessation to breaking addiction to other drugs, and constructive ways of helping other addicts.

Psychosocial Dependency-Model Groups: The psychosocial dependency model groups focused on the social and psychological factors involved in tobacco use and on stress management. The first session gave an overview of the pleasures involved in tobacco use, the stressful situations in which tobacco is used, and what it takes to break a psychosocial dependency. The second session introduced strategies to deal with the loss of the pleasure and comfort of using tobacco. The third session focused on thought substitution, visualization, and other strategies for stress management. The fourth session continued the discussion of strategies for stress management and introduced the topics of assertiveness as a constructive way to express anger and ways to take action against depression. Each participant was given an audiocassette about teenagers helping each other quit using tobacco; the audiocassette script presented tobacco use as a psychosocial dependency. The fifth session included discussion of continuing use of strategies learned and introduced the concepts of asking for support, changing versus letting go, and striving for personal best.

Results

Comparison of Subjects by Study Condition at Start of Trial

Subjects in the two conditions did not differ significantly in any of the types of dependency assessed (social influences, addiction, psychosocial dependency, negative affect) at the start of the group. There also were no significant differences in daily versus nondaily tobacco use between the two conditions.

Comparison of Cessation-Group Participants With Survey 2 Respondents

The smokers who volunteered and were randomized to participate in the cessation groups were significantly more dependent on tobacco, as assessed by the addiction (mean scores of 2.18 vs. 1.46, $t = 7.49$, $p < .001$), psychosocial dependency (means of 1.43 vs. 1.13, $t = 3.10$, $p < .01$), and negative affect (means of 2.36 vs. 2.06, $t = 3.57$, $p < .001$) measures, than were smoking respondents to the schoolwide survey conducted at the beginning of the school year immediately before recruitment for the cessation group trial. Smokers from the schoolwide survey differed significantly from smokers in the cessation groups on cessation stage as well: Survey respondents were more likely than cessation group subjects to be precontemplators (14.9% vs. 3.0%), rejecters (14.4% vs. 6.1%), or maintainers (14.7% vs. 9.7%), while cessation group subjects were more likely to be contemplators (52.7% vs. 30.0%), or preparers (10.9% vs. 5.5%) (Pearson chi-square value of 50.6 significant at $<.0001$).

The ST users in the cessation groups were more dependent on tobacco than those in the schoolwide survey only on the addiction measure ($t = 2.44$, $p < .02$). However, the cessation group subjects differed from ST users in the general survey on cessation stage in some of the same ways observed for smokers: Survey respondents were more likely than cessation group subjects to be precontemplators (25.3% vs. 2.6%) and rejecters (13.9% vs. 5.2%), while cessation group subjects were more likely to be contemplators (50.3% vs. 22.4%) (Pearson chi-square value of 70.6, significant at $<.0001$).

Reasons for Participating in the Cessation Groups

In a brief questionnaire administered in the first group session, subjects gave the following responses as their main reason for participating in the cessation groups: to quit using tobacco, 69%; to help another person quit, 9%; to get out of class, 15%; and miscellaneous other reasons, 7%.

Attrition

Across all 16 schools there was a 14.6% attrition from randomization into the trial and the first group session (i.e., subjects who never came for treatment), and there was an additional 54.4% attrition from session 1 to session 5. There were no significant differences in attrition between subjects in the addiction condition and those in the psychosocial dependency condition. There also were no significant differences in attrition between daily and nondaily tobacco users or among the stages of cessation.

Perceived Helpfulness

In a brief questionnaire administered in the fifth group session, subjects reported that the following were the most helpful parts of their group experience: quit strategies and information, 40%; communicating with others, 24%; oral substitutes (MintSnuff^T, gum, stick cinnamon), 20%; the Floating exercise, 8%, and the frequency of sessions, 8%.

Expectations of Future Tobacco Use

At the first group session 39.4% of the subjects reported that it was very likely that they would be using tobacco a year later, 47.2% that it was somewhat likely, and 13.4% that it was not at all likely. At the fifth group session, 7.0% reported that it was very likely that they would be using tobacco a year later, 58.1% that it was somewhat likely, and 34.9% that it was not at all likely.

Cessation of Tobacco Use

Cessation During Group—When only subjects present at the final (fifth) group session are used as the denominator, the proportion of smokers reporting cessation at any time during the course of the groups is 41.6; the figure for those reporting having quit smoking and still being off at the fifth group session drops to 24.7%. For ST users, 45.5% of those present at the fifth group session reported quitting during the groups, and all of these reported that they had stayed off.

Cessation by Model—There were significant differences in smoking cessation by group model, with 66.7% of those in the Psychosocial Dependency groups compared with 30.2% of those in the Addiction groups reporting cessation at any time during the group (Pearson chi-square = 9.05, $p < .01$), and 50.0% of those in the Psychosocial Dependency groups versus 13.2% of those in the Addiction groups reporting that they were still not smoking by the end of the group (Pearson chi-square = 12.0, $p < .001$). There were no statistically significant differences for the 42 ST users, with 35.3% of those in the Addiction groups and 24.0% of those in the Psychosocial Dependency groups reporting end-of-group cessation. Similarly, for the 18 students who both smoked and used ST, 50.0% in the Addiction groups and 33.3% in the Psychosocial Dependency groups reported end-of-group cessation of both substances.

Intent-to-Treat Analysis of Cessation—When all subjects at the first group session are included in the denominator, the percentage of subjects reporting that they were still quit at the fifth group session was 11.4% for smokers and 19.2% for ST users. When all subjects randomized into the trial are used as the denominator within each category (an intent-to-treat

analysis), 10.3% of the smokers and 11.9% of the ST users were still quit at the fifth group session (see Table 1).

Cessation at 4-Month Follow-Up—When only those subjects who attended the follow-up 4 months after the first group session are included in the denominator, 19.7% of the 71 smokers who had participated in groups compared with 10.5% of the 38 control subjects verbally reported quitting smoking; 43.8% of the 16 ST users who participated in groups reported quitting compared with 0% of the 7 ST control subjects. When we apply the most conservative interpretation to the results and consider all students randomized to be treatment or control subjects, respectively, as the denominators, we find that 7.6% of the smokers who had participated in groups and 4.2% of the control subjects reported quitting, and that 16.7% of the ST users who had participated in groups compared with 0% of the control subjects reported quitting.

Biochemical Corroboration of Cessation—When these verbal self-report results were then adjusted by biochemical results (using saliva cotinine for validation), the 4-month result for confirmed smoking cessation was 6.5% for treatment subjects and 3.2% for control subjects, and 14.3% versus 0% for treatment versus control subjects who had been ST users.

Characteristics of Adolescents Who Quit Using Tobacco

Youths who reported quitting smoking at the fifth group session had scored significantly lower at the first group session on overall dependency (the total of scores for all 12 items of the dependency measure), with mean dependency scores of 6.7 versus 8.2, $t = 2.44$, $p < .05$. When the four types of dependency are considered separately, only the addiction score at the group's start predicted reported cessation by the group's end, with reported quitters having scored lower than those reporting not quitting (1.56 vs. 2.46, $t = 3.72$, $p < .01$).

An analysis of variance of cessation at the 4-month follow-up with dependency scores at time of entry into the cessation groups similarly revealed that smokers who were not smoking at the follow-up had scored lower on addiction at the start of the groups ($F = 4.39$, $p < .05$). Finally, while 89.6% of the group participants were daily smokers, only 20.3% of these reported that they quit and were still off by the end of the group, compared with 62.5% of those who were regular but not daily smokers (chi-square = 6.87, $p < .01$).

Neither the overall dependency score nor any one of the four types of dependency measured at the cessation group's first session predicted ST use cessation at the group's fifth session. However, an analysis of variance revealed that ST users who had scored lower on social influences at the start of the group were more likely to have quit and still be off ST by the 4-month follow-up ($F = 13.20$, $p < .001$).

Discussion

Dependency

The strong dependency of the adolescent smokers in this study on their addiction was demonstrated in several ways. The smokers who volunteered and participated in the cessation groups scored higher on addiction, psychosocial dependency, and negative affect dimensions of tobacco dependency than did smoking students in schoolwide surveys; this finding demonstrates that high-school students most in need of cessation assistance self-select appropriately.

Among smokers who participated in the cessation groups, those who scored higher in overall dependency on tobacco at the groups' start were less likely to quit, as were those who had

scored higher on the addiction dimension of dependency. Daily use of cigarettes dramatically reduced the likelihood of a participant's quitting: from over 60% cessation to 20% cessation during the group. The fact that smokers in the groups based on the psychosocial dependency model were more likely to succeed in quitting indicates that the relevant strategies for the smokers were those involving stress and affect management, characteristics of heavily dependent smokers.

The ST users, on the other hand, were less dependent on tobacco than were the smokers: They appeared less likely to use ST for managing stress or negative affect. The ST users who volunteered to participate in the cessation groups were more dependent than the general population of regular ST users surveyed in the schools only on the addiction dimension of tobacco dependency. No aspect of dependency predicted success in ST cessation for the group participants by the end of the cessation groups, and only the social influences dimension differentiated successful from unsuccessful quitters at the 4-month follow-up meeting.

Attrition

While attrition did not differ among study conditions nor level of smoking, the overall high rate of attrition in this and other studies with adolescents (Garrison et al., 2003; Moolchan et al., 2003) calls into question the acceptability to youths of tobacco-cessation interventions and hence the public health value of such programs. It is understandable that young people, in the midst of trying to develop their own individual identities, forge affiliations with peer groups, and move from childhood to adulthood, will find it exceedingly difficult to persevere in a process asking that they relinquish a behavior about which they're already conflicted. Add to this the particular difficulties, for people of all ages, of breaking an addiction and one might conclude that it is unreasonable to expect a low attrition rate in a tobacco-cessation program for high-school students. Instead, if 30 to 50% of students who express interest in quitting stick it out through the end of a program, one could consider that program a substantial success to the degree that the participants do quit using tobacco. The key issue here then centers on identifying attributes of programs that predictably promote tobacco cessation among adolescents.

How to Improve Tobacco Use Cessation Programs for Adolescents

The results of this study provide several practical guidelines for improving tobacco use-cessation interventions for adolescents.

1. A unique contribution of this study is the direct comparison in a randomized trial of an intervention focusing on stress management and psychosocial aspects of smoking cessation with one focusing on management of "cravings" and withdrawal symptoms. Among adolescents who smoked, those in the groups focusing on stress and psychosocial dependency were more than twice as likely to stop smoking at some point during the group and were almost four times as likely to still be not smoking by the end of the group. Accordingly, smoking-cessation programs for teenagers should focus more on managing stress and emotions than on managing "cravings" and withdrawal symptoms.
2. The combined findings that ST users were in earlier stages of dependency and that they were significantly better able than a control group to stop using tobacco indicates that school-based programs focusing on behavioral strategies to counter physiological aspects of addiction could constitute a worthwhile investment in schools with substantial ST use.
3. The preliminary assessments highlighted the preference of the adolescents for serious and emotionally involving messages. This finding suggests that more can be done to

promote tobacco cessation on a school or community level through direct and serious motivational campaigns.

4. The potential influence of pediatricians, family physicians, and providers working in school-based clinics was emphasized by the fact that students in both focus groups and written surveys identified a personal message from their own physician as a potential motivator for tobacco use cessation. This finding is of critical importance, given that, in a large, nationally representative sample of U.S. students in the 6th through 12th grades surveyed in 2000, among those who had smoked and who had visited a physician in the past year, only 16.4% had been advised by the physician to quit smoking (Shelley et al., 2005).
5. The most salient finding of the present randomized trial, however, is that teenage smokers appear unable, without ongoing intervention, to maintain smoking cessation even for a 4-month period. The extension of a group intervention over a longer time period seems unlikely to succeed, judging from the high attrition rate from the first to the last group session. A group program focusing on stress and psychosocial dependency, found in this study to be significantly helpful to participants, followed by a proactive approach providing support over an extended period of time is needed. Proactive telephone counseling conducted by professionals with psychological and stress-management training might be able to provide the needed support to maintain smoking cessation for more teenagers. In addition, campaigns encouraging teenagers to support their friends who are trying to quit smoking holds promise as one part of a maintenance program. In a recent review of qualitative research on adolescent tobacco use, Walsh and Tzelepis (2007) reported that, while teenagers thought that the emotional support of friends and family would be helpful to them in quitting smoking, few peers offer that support.

Research Considerations

The study also demonstrates the significance of using conservative approaches to interpreting cessation results, including the use of biochemical validation. Using the number of subjects attending the first session as the denominator provides the most valid assessment of the efficacy of the intervention. Using the number of subjects randomized into the trial as the denominator (intent-to-treat analysis) bears on the public health utility of the intervention.

Conclusion

This randomized trial indicates that school-based programs focusing on stress management and psychosocial dependency will be of more help to teenage smokers than those focusing on “cravings” and withdrawal symptoms. The five-session psychosocial dependency group program described herein could be replicated with minimal resources in schools, using, for example, school nurses or counselors from volunteer organizations as group leaders. However, in order for young people to be able to maintain smoking cessation, school-based programs need an additional, longer-term support component. Smokeless tobacco users, on the other hand, are less tobacco dependent than smokers and thus better able to maintain cessation following a school-based group program; accordingly, schools with substantial smokeless tobacco use can benefit by offering ST-cessation groups to students.

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Biographies

Dee Burton, Ph.D., is a psychologist and Director of Human Rights, Public Policy & Health, for the Center on Community and Urban Health at Hunter College. Her main areas of interest for research, advocacy, and teaching are human rights and public health policy, and health communication. She has conducted research on tobacco control issues for more than 20 years and has a special interest in developing smoking-cessation programs for hard-to-reach populations.

Bonnie Chakravorty, Ph.D., MSW, CHES, is on the faculty in the Department of Health Administration and Health Sciences at Tennessee State University. Her research interests include prevention and containment of chronic diseases, especially chronic obstructive pulmonary disease. She is on the board of directors of AlphaNet, Inc., a nonprofit health management company that focuses on improving the lives of persons affected by alpha-1 antitrypsin deficiency.

Kyle Weeks, Ph.D., is currently the Director of Product Strategy at SPSS Inc. Prior to coming to SPSS, he spent 8 years at the University of Illinois–Chicago as a Research Specialist/

Evaluation Coordinator, evaluating the impact of school-based risk behavior prevention programs.

Brian R. Flay, D.Phil., is a professor of public health at Oregon State University, where he also directs the Youth Core of the Hallie Ford Center for Health Children and Families. He has been conducting randomized trials in schools (in Canada, California, Chicago, and Hawaii) for more than 25 years. Most of his past work has concerned the development and evaluation of programs for the prevention of substance abuse, violence, and AIDS. Recent studies focus on positive youth development, including social and character education. He has also written extensively on methodological and theoretical issues. He is currently conducting several

studies of the Positive Action program, the only program that he has been able to identify that truly addresses most of the distal and proximal influences on youth development and so is likely to influence a broad array of aggressive/violent behaviors.

Clyde W. Dent, Ph.D., has been involved for more than 25 years in research that examines the onset, prevention, and cessation of health compromising behaviors in large-scale, school-based, medical clinic, and community contexts. He is particularly interested in health issues among adolescent and elderly populations. He has expertise in survey methodology, general evaluation methodology, study design, and statistical analysis.

Alan Stacy, Ph.D., is professor of preventive medicine at the Institute for Prevention Research, Department of Preventive Medicine, Keck School of Medicine, University of Southern California (USC). He is also director of the NIH-NIDA-funded USC Transdisciplinary Drug Abuse Prevention Research Center, which applies basic research on memory, implicit cognition, and social networks to drug abuse etiology and prevention. He was one of the first investigators to apply implicit cognition approaches to the addiction area, acknowledged in the 10th Special Report to Congress on Alcohol and Health. He has been principal investigator on NIH-funded projects applying this approach to the alcohol and other drug use of college students, high-risk adolescents, and adult drug offenders. He also has applied the approach in projects on the effects of alcohol advertising, HIV risk behavior, and drunk-driving. He has been co-principal investigator on several prevention projects that have received national recognition (from the Centers for Disease Control and Prevention and the National Institute on Drug Abuse) for their success demonstrated in rigorous evaluations.

Steve Sussman, Ph.D., FAAHB, FAPA, received his doctorate in psychology from University of Illinois at Chicago (1984). He is a professor of preventive medicine and psychology at University of Southern California. He studies etiology, prevention, and cessation of the addictions broadly defined, and has more than 320 publications. His projects include TNT, TND, and EX, considered model programs at numerous agencies.

Table 1

Tobacco cessation

Criterion	Reported cessation of all tobacco			
	Group participants ^a		Controls [*]	
	Smokers	ST users	Smokers	ST users
End of group				
Quit during group ^b	41.6% (32/77)	45.5% (5/11)	--	--
Still quit ^b	24.7% (19/77)	45.5% (5/11)	--	--
Still quit ^c	11.4% (19/167)	19.2% (5/26)	--	--
Still quit ^d	10.3% (19/184)	11.9% (5/42)	--	--
4-month follow-up				
Verbal report ^e	19.7% (14/71)	43.8% [*] (7/16)	10.5% (4/38)	0.0% [*] (0/7)
Verbal report ^d	7.6% (14/184)	16.7% [*] (7/42)	4.2% (4/96)	0.0% [*] (0/15)
Verbal + biochem. validation ^d	6.5% (12/184)	14.3% [*] (6/42)	3.2% (3/96)	0.0% [*] (0/15)

^aThe 18 smokers who both smoked and used ST are excluded from these analyses.

^bDenominator is all smokers or ST users at the fifth group session.

^cDenominator is all smokers or ST users at the first group session.

^dDenominator is all smokers or ST users randomized into the trial.

^eDenominator is all smokers or ST users at 4-month follow-up session.

^{*} $p < .05$. All comparisons are between group participants and control subjects.