Modifying Smoking Behavior of Teenagers: A School-Based Intervention

CHERYL PERRY, PHD, JOEL KILLEN, BA, MICHAEL TELCH, MA, LEE ANN SLINKARD, MA, AND BRIAN G. DANAHER, PHD

Abstract: Tenth grade health classes in three high schools received a special program focusing on the immediate physiological effects of cigarette smoking and the social cues influencing adoption of the smoking habit, and classes in two control schools received standard information on the long-term effects of smoking. Only subjects in the special program reported a decrease in smoking from pre to post-test; they also scored higher than controls on a knowledge test. Carbon monoxide levels were significantly lower for subjects in the special group at post-test. (*Am J Public Health* 1980; 70:722-725.)

Cigarette smoking is the single most important preventable environmental factor contributing to illness, disability, and death in the United States.[1] Despite widespread knowledge of the harmful effects of tobacco use,[2] adolescents continue to adopt the smoking habit. A recent study by the National Institute of Education reported a five-fold increase in smoking between junior and senior high school.[3]

Numerous anti-smoking programs have been implemented in junior and senior high schools in attempts to reduce the rate of smoking. Traditionally, programs have employed a wide range of techniques including lectures, discussions, posters, and films aimed at increasing student awareness of the harmful long-term effects of cigarette smoking. While some studies have reported positive changes in knowledge and attitudes, most show little or no effect on students' reported smoking behavior.[4-14]

While programs emphasizing the long-term health effects of cigarette smoking have shown little success, recent research in youth smoking prevention has shown promising results with programs emphasizing both the immediate physiological effects of smoking and skill training in coping with the social pressures to smoke.[15-17] Although such programs have shown promising results in terms of prevention,[18] their effectiveness as cessation strategies i.e., with youth who have already adopted the cigarette habit, has not been evaluated.

The present study compared the effectiveness of a multicomponent smoking program with the traditional anti-smoking curriculum in reducing the incidence of smoking among high school students.

Materials and Methods

Participants were tenth grade students from five local area high schools in the vicinity of Stanford, California. Subjects in three schools (N = 498; males = 227, females = 271) received a special experimental smoking prevention/cessation program conducted in regular tenth grade health education classes. Subjects in two schools (N = 399, males = 188, females = 211) received traditional tenth grade health class material emphasizing the harmful long-term physiological effects of smoking. The five schools selected represented all of the high schools in two local school districts. Schools were matched according to socioeconomic status and then randomly assigned to experimental and control conditions.

Experimental subjects received four consecutive 45-minute sessions in their regular health classes during the fall semester, 1978. Health teachers in the experimental schools were trained by the authors and assumed major responsibility for program implementation. Experimental classes focused on social pressures influencing adoption of the smoking habit and the immediate physiological effects of smoking. Slide shows and films presented promotional techniques used to encourage smoking. Teachers helped students to identify "selling strategies" and modeled a variety of self-verbalizations which students could produce to counter the effects of cigarette advertising. Student-led discussion sessions evaluated peer group influences on individual behavior. Students modeled ways of resisting pressures from peers to begin smoking. In addition, students received instruction in identifying social and emotional cues which signal smoking behavior and learned methods to counteract cues to smoke from cigarette advertising and adult models. Students were also introduced to several smoking cessation procedures. These included self-recording of urges to smoke and actual smoking behavior, relaxation strategies to reduce tensions which might cue smoking, and goal setting to direct behavior change.

Physiological measures and performance tests were used to demonstrate the immediate effects of smoking on health. Graduate and undergraduate students from Stanford

Address reprint requests to Joel Killen or Michael Telch, CERAS, Stanford Heart Disease Prevention Program, Stanford University, Stanford, CA 94305. Dr. Perry is with the Stanford Heart Disease Prevention Program; Ms. Slinkard is with the Program in Health Psychology, University of California, San Francisco; Dr. Danaher is with the UCLA School of Public Health. This paper, submitted to the Journal September 10, 1979, was revised and accepted for publication February 26, 1980.

Editor's Note: See also related editorial, p. 678, and article, p. 719, this issue.

TABLE 1—Experimental Program in Smoking Prevention/Cessation

Day 1:	• Introduction of the topic of smoking prevention by the teacher-facilitator: the pressures for young people to smoke tobacco, the immediate negative effects of smoking, and how to help others quit. • Student small group discussions on social pressures to smoke and methods to handle social pressures. • Student group presentations on ways to handle social pressures. • Brief slide show on the pressures to smoke tobacco.
Day 2:	• Teacher-facilitator presents topic: How advertising affects adoption of smoking with adolescents. • Movie: "Too Tough to Care." • Slide show on various cigarette ads; students identify who the ad is addressed to, what it is really selling, and how to counteract advertising. • Class discussion on each slide.
Day 3:	• Topic: The immediate effects of smoking. • Students form three teams and measure their own Carbon Monoxide in their breath, blood pressure, pulse rate, lung capacity, and skin temperature. • Teacher shows results of self-measures by comparing smokers to nonsmokers in the class. • Teacher-led discussion on the effects of smoking, emphasizing the implications of the physiological measures. • Teacher completes discussion on the immediate effects of smoking and distributes articles from *Licit and Illicit Drugs* and *Reader's Digest.*
Day 4:	• Teacher-led discussion on how to help other people quit smoking. • Student brainstorming sessions on how to help others remain nonsmokers, quit smoking, or build a nonsmoking community. • Student group presentations to the class.

University measured high school students levels of carbon monoxide, skin temperature, blood pressure, pulse rate, and lung capacity. The nature of each measure as a health indicator was discussed. Mean scores for smokers and nonsmokers were reported in health classes to underscore the negative relationship between smoking and general physical fitness. Details are summarized in Table 1.

Students in the control schools received information on the long-term harmful effects of smoking, during three days of their regular health classes. Instruction in the control classes was didactic, non-participatory, and did not include instruction on the social pressures to smoke.

Dependent measures included: carbon monoxide (CO) breath samples, knowledge-attitude questionnaire, and self-reported incidence of smoking; post-test CO samples and knowledge-attitude data were obtained for all subjects at the end of Fall Semester.* Subjects' knowledge and attitudes about cigarette smoking were assessed on a 10-item questionnaire that included questions about the immediate physiological effects of smoking and perceived difficulties in smoking cessation. Questionnaires were scored by undergraduate volunteers who were blind to the experimental condition of each subject. Surveys, taken in class, asked students to report frequency of cigarette smoking. Subjects were guaranteed anonymity in order to reduce demand effects. Self-reports were completed prior to introduction of the experimental program, in September 1978 and at post-test, February 1979. CO samples were attached to self-report surveys (via rubber bands) at post-test in order that the relationship between the two measures could be assessed.

*CO samples were taken with a series 2000 model carbon monoxide analyzer (manufactured by Energetics Science Inc.) Students received no advance notice of day on which breath test was to be done, and teachers were specifically asked not to warn students of the advent of the investigation.

TABLE 2—Percentage of Subjects Reporting Smoking Cigarettes

	Experimental Program N = 477		Control N = 394	
	Pre	Post	Pre	Post
Smoked in Past Day	13.9	9.7*	14.5	13.1
Smoked in Past Week	19.5	16.3	21.6	21.9**
Smoked in Past Month	29.2	23.6*	26.3	30.4**

*Within-treatment differences, $p < .05$
**Between-treatment differences, post-test only, $p < .05$

Results

Significant differences between experimental and control groups were obtained for each dependent measure. Mean carbon monoxide (CO) levels at post-test were 4.83 parts per million for subjects in the experimental program ($S_d = 4.6$) and 9.10 ppm for controls ($S_d = 7.6$). A one-way ANOVA revealed these differences to be statistically significant ($F(1,3) = 36, 18, p < .01$).

Subjects' self-reported smoking during the previous day, week, and month are presented in Table 2. With respect to changes over time, the experimental group showed significant ($p < .05$) reductions in the percentage of subjects who reported smoking during the previous day and previous month. No significant improvement from pre to post-test was found for the control group. The between-group analysis at pre-test indicated no significant differences in subjects' reported smoking. At post-test, however, the experimental group had a significantly greater percentage of subjects reporting abstinence in the previous week and month compared to the control group.

Results of the knowledge and attitude survey are presented in Table 3. Subjects receiving the experimental program scored significantly higher than controls on all items pertaining to the immediate physiological effects of smoking (items 1-5). Furthermore, experimental subjects were significantly more knowledgeable regarding the best way to quit (item 8) and ways to prevent others from smoking (item 9). No significant differences were found for subjects' knowledge regarding the difficulty to quit smoking (item 7) or the reasons why people start smoking (item 6). Likewise, sub-

TABLE 3—Percentage of Subjects Responding Correctly on Smoking Knowledge and Attitude Survey

Survey Items	*Treatment* N = 524	*Control* N = 399	X^2
1. What happens to your blood pressure if you smoke?	89	62	91.1*
2. What happens to the carbon monoxide in your blood?	87	60	91.0*
3. What happens to your pulse rate?	81	52	88.3*
4. What happens to your skin temperature?	65	12	268.0*
5. What happens to your lung capacity?	88	69	49.8*
6. What are the reasons people your age smoke?	80	65	NS
7. Is it difficult for people your age to quit?	50	52	NS
8. What is the best way to quit?	41	26	26.6*
9. What can a high school student do to prevent others from becoming hooked on cigarettes?	88	52	66*
10. What is your general opinion about smoking?	68	65	NS

*$p < .001$

jects in the two groups did not differ on their general attitude toward smoking.

The accuracy of subjects' self-reported smoking was estimated by computing a correlation between subjects' CO levels and their reported smoking for the preceding day. Results revealed a significant correlation ($r = .53$, $p < .001$) between carbon monoxide levels and reported smoking during the preceding day (obtained from the question: How many cigarettes have you smoked in the past 24 hours?).

Discussion

Results of the present study strongly suggest the superiority of the experimental program in positively affecting subjects' knowledge and attitudes, reported smoking behavior, and carbon monoxide levels.

The finding for knowledge and attitudes is not surprising since the control subjects received information focusing on long-term physical debilitation rather than immediate physiological changes.

Although self-report measures indicated that subjects in the experimental group significantly reduced their smoking relative to controls, behavioral research has shown self-reports to be sensitive to demand characteristics and subjects' forgetfulness and misperceptions.[19] It is possible that the intensive nature of the experimental program placed greater pressure on subjects to report reductions in smoking in line with experimenter expectations. However, the inclusion of carbon monoxide level determinations provided a check on the accuracy of subject's self-reports. The significant differences between experimental and control subjects on the CO post-test measure and the significant correlation between CO and reported smoking on the previous day lend credibility to subjects' self-reports. Although the correlation between CO level and reported smoking appears modest, it should be noted that marijuana smoking, alcohol consumption, and air pollution influence subjects' CO readings. Additionally, the short half-life of carbon monoxide levels for smoking, i.e., 6-8 hours, precludes detection of some self-reported smokers, i.e., those who have not smoked within the previous 8 hours. It is advised that, whenever possible, multiple biochemical measures such as CO and saliva thiocyanate be included in smoking research because they provide a more reliable assessment of subjects' smoking behavior and may enhance the accuracy of subjects' self-reported smoking.[20-22]

While conclusions regarding the long-term effectiveness of the experimental program are premature, the post-test results are encouraging. Future research is presently underway to assess the long-term effectiveness of the program. Component analysis studies are needed to identify those components which alone or in combination maximize desired behavioral change.

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ACKNOWLEDGMENTS

Special thanks are extended to Dr. John Krumboltz for his helpful comments on the manuscript.

Long-Term Outcome of Smoking Cessation Workshops

DAVID EVANS, PHD, AND DOROTHY S. LANE, MD, MPH

Abstract: Three hundred seventy-two (63 per cent) of 590 enrollees in nine smoking cessation workshops held over a five-year period responded to a follow-up survey. Outcome data were collected retrospectively for six-month intervals from workshop to follow-up. Forty nine per cent of all enrollees graduated, and 56 per cent of the respondents quit smoking during the program. Nonsmoking rates declined to an average of 25 per cent by the first year post-workshop and remained relatively stable thereafter for periods up to five years. (*Am J Public Health* 1980; 70:725-727.)

Introduction

Many reports in the literature on smoking withdrawal have sought to associate success in quitting with factors that the individual brings to the workshop. The principal findings have been that older smokers and males are more successful in quitting.[1-8] Other characteristics associated with cessation have been reported, but not supported as consistently, including higher levels of education and being married,[1, 5, 9] a firm commitment to quit,[2, 10] expectation of success,[11] symptoms related to smoking,[9] believing one's health is threatened by smoking,[1, 9] smoking fewer cigarettes,[9, 12] having a nonsmoking spouse and the support of one's spouse.[9] In addition, a review of 89 cessation clinics by Hunt and Bespalec showed a characteristic curve of relapse, with a rate of withdrawal declining to approximately 25 per cent after 12 months.[13] Several recent studies have provided long-term cessation rates over periods up to six years, with varying results.[9, 14-16] This study presents long-term follow-up data from nine smoking cessation workshops held in a community hospital over a five-year period.

Setting and Methods

Cessation workshops following the standard format of the American Lung Association and American Cancer Society were held every six months for a five-year period. Each workshop met six times over a three-week period, and com-

Address reprint requests to Dr. Dorothy S. Lane, Chairman, Department of Community Medicine, Brookhaven Memorial Hospital, 101 Hospital Road, Patchogue, NY 11772. Dr. Lane is also Associate Professor of Community Medicine, School of Medicine, SUNY at Stony Brook; Dr. Evans is Research Associate at Brookhaven Hospital and Instructor of Clinical Community Medicine at SUNY. This paper, submitted to the Journal January 10, 1980, was revised and accepted for publication March 20, 1980. An earlier version was presented at the 106th Annual Meeting of the American Public Health Association in Los Angeles, October 1978.