Project Towards No Tobacco Use: 1-Year Behavior Outcomes

ABSTRACT

Objectives. We present 1-year follow-up data from a school-based tobacco use prevention project designed to test the effectiveness of three main components of social influence programs. The components teach refusal skills, awareness of social misperceptions about tobacco use, and misconceptions about physical consequences.

Methods. Four different curricula were developed and tested in a randomized experiment involving 48 junior high schools. The outcome variables examined were changes in initial and weekly cigarette and smokeless tobacco use 1 year after the intervention.

Results. Analyses indicated that each of the component programs were effective in decreasing both the initial and the weekly use of cigarettes except for the curriculum in which refusal skills were taught. Also, each curriculum was effective in decreasing the initial use of smokeless tobacco except for the one aimed at correcting social misperceptions. Only the combined curriculum showed an effect on the weekly use of smokeless tobacco.

Conclusions. The combined intervention was the most effective overall in reducing the initial and weekly use of cigarettes and smokeless tobacco. This suggests that different reasons for use exist and need to be counteracted simultaneously. However, since single programs were also effective in reducing all but weekly smokeless tobacco use, any of these components may be worthwhile prevention tools. (*Am J Public Health.* 1993;83:1245–1250)

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Introduction

This paper presents the 1-year behavioral outcomes data from the prevention study of Project Towards No Tobacco Use (Project TNT), a 5-year school-based tobacco use prevention and cessation project.[1] The prevention study involves a between-groups experiment with 48 southern California junior high schools. The main project objective is to determine which of the three most common components of social influence programs is the most effective in preventing the use of tobacco-containing products. The two tobacco products on which this project focused are cigarettes and smokeless tobacco.

Since the passage of the Comprehensive Smokeless Tobacco Health Education Act of 1986 (Public Law 99–252), the dangers of using smokeless tobacco have become widely known to the general public. Yet use of this product has become a rapidly developing health problem among teenage males,[2,3] who are now tending to favor it over the use of cigarettes.[4] Thus, it is imperative for us to understand how to prevent the use of smokeless tobacco. Only very recently have prevention programs been developed to counter use of both smokeless tobacco and cigarettes; however, the generalizability of effects from one tobacco product to the other is uncertain.[1] More research is needed to discern whether different prevention program components exert unique effects in deterring the use of these two tobacco products.

Social Influences and Adolescent Tobacco Use

Social influences are among the most important determinants of adolescent cigarette and smokeless tobacco use, and most such use begins in a peer group context.[5–9] There are two main types of social influence that may facilitate adolescent tobacco use: normative and informational.[10] *Normative social influence* refers to pressure applied by the peer group to make youth act in ways to achieve group acceptance. Often, this type of influence is present in those situations in which young people are confronted with offers to use tobacco products. If these youth yield to such offers, they may be or perceive themselves being accepted by the group. If they do not yield to such offers, they may be rejected in some way by the group or they may perceive themselves as being rejected.

Informational social influence refers to more covert pressure applied to make young people adopt social values favorable to tobacco use. Such values may be acquired from statements made by the peer group, from tobacco advertising, or from other social sources (e.g., parents, movies, music videos). These sources of information suggest that use of tobacco products is widespread or will help the tobacco user achieve a desired social image, such as looking older or rebellious.[11] Measures of these two types of social in-

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fluence are empirically separable in basic social psychology research and in applied research on the prediction of adolescent tobacco use.[9,10,12,13] (A detailed discussion of these two types of social influence in the context of tobacco use prevention is provided elsewhere.[9])

Comprehensive Social Influence Prevention Programs

The social influence prevention approach posits that resistance to using tobacco will be greater if one has developed an awareness of, and skills that counteract, social pressures to use tobacco.[14–17] Cigarette smoking prevention programs that focus on teaching strategies to counteract social influences have successfully reduced the onset of adolescent smoking by as much as 50% 3 years postprogram.[15,18] But although these findings are encouraging, it is not known which types of activities exert the greatest preventive effects.[19]

Comprehensive prevention programs often are described as being composed of "components": sets of activities designed to counteract the effects of a hypothesized cause of an unhealthy behavior.[20,21] Current comprehensive tobacco use social influence programs generally are composed of three prevention components. One component consists of activities that counteract normative social influence to use tobacco. The most widely implemented activity within this component involves provision of refusal assertion skills. Although this is generally thought to be the most effective single prevention activity, small sample sizes of studies evaluating its effects limit the potential generalizability of those effects.[19] Recent studies suggest that the successful counteraction of normative social influence is due to manipulation of peer disapproval of tobacco use in the classroom and not to instruction in refusal assertion skills.[22,23]

A second prevention component consists of activities that counteract informational social influence to use tobacco. Such activities include provision of information about modeling and advertising tactics, and correction of inflated tobacco use prevalence estimates.[19,24] In addition, instruction in effective communication skills has been used to facilitate acquisition of accurate social information.[25] This component attempts to help students evaluate and use effectively various social sources of information.

Finally, a third prevention component consists of activities that counteract misperceptions or a lack of knowledge regarding the physical consequences of tobacco use. Although not a social influence–type component, information about risk and the severity of long- and short-term physical consequences of tobacco use is often provided by social influence programs, and researchers report that providing information about short-term consequences may prevent tobacco use.[15,26,27]

Development of Empirically Distinct Curricula

One way to compare the effectiveness of these three components of social influence prevention programs is to engage in a priori development of curricula that address them separately.[20,21]

Four curricula were developed in Project Towards No Tobacco Use. Three were designed to counteract the effects of the separate (single) components just mentioned, whereas a fourth curriculum was designed to counteract the effects of combined social and physical consequences–related influences. The process of deriving the current curricula from these three prevention components is described in detail elsewhere.[21,28,29] In brief, the curricula were formed through use of an empirically based building-block method. After several preliminary tests of single activities were completed, sets of 10 lessons were constructed and then combined into curricula so that earlier lessons would motivate involvement in the curricula and later lessons would motivate a commitment not to use tobacco products. Each curriculum was piloted to maximize its feasibility, perceived efficacy, and effects on behavioral intentions to use tobacco products. Knowledge items were developed and examined as manipulation checks of effects of the different activities.

One-Year Outcomes Evaluation

An outcomes evaluation considers the effectiveness of a program in achieving immediate and long-term goals.[30–32] The main long-term goal of an evaluation in the present context is to assess preventive effects on tobacco use. Behavioral effects among adolescents are examined at least 1 year after a program is implemented because detectable changes in behavior usually demand this time lag or longer.[15] The present study examined the effects of the four different curricula on changes in cigarette and smokeless tobacco use behavior over a 1-year postprogram interval.

Method

Experimental Design

A five-group randomized block design was used.[33,34] Schools were randomly assigned within blocks defined by region (urban, rural), school type (middle school with sixth through eighth grades, junior high school with only seventh through eighth grades), and a composite variable. The composite variable was composed of a linear composite of school size, socioeconomic status (Aid to Families with Dependent Children percentile rank, English as a second language percentile rank, median income in zip code), academic status (California Assessment Program reading, writing, and math percentile ranks), demographic variables (percentage White, percentage growth of population in zip code, county name, median age in zip code), and estimate of tobacco use prevalence (based on school staff estimates and pilot data collected at the school).

Forty-eight junior high schools from 27 southern California school districts were recruited and randomly assigned to participate in one of five conditions. There were 8 schools assigned to each of the four program conditions (i.e., curricula), and 16 schools assigned to a "standard" curriculum control condition. All seventh-grade students at the program schools received tobacco programming. Students were evaluated by two sampling methods. In cohort 1, all seventh-grade students at 20 of the schools were surveyed and followed as an individual-level collection. In cohort 2, students from the remaining 28 schools were surveyed as repeated cross-sectional partial samples (approximately three randomly selected classes per school).[32] In each of the four program conditions, 4 schools were urban, 4 were rural; also, 4 involved individual-level collection whereas the other 4 schools were involved in a repeated cross-sectional collection. Region by collection variables was also fully crossed and balanced: in the control condition, 8 schools were urban, 8 were rural, 4 involved individual-level collection (half rural/half urban), and 12 involved a repeated cross-sectional collection (half rural/half urban).

Students in the control condition received routine prevention activities provided directly by their school. Control school activities were generally limited to assemblies that presented values clarification material, long-term physical consequences information, or simple "just say no" to drug use messages. Aside from two

lessons in the health education classes, which provided information about tobacco products and long-term consequences, control schools did not provide programming specifically for tobacco use prevention. However, 5 of the 16 control schools did provide in-class lessons on general drug use prevention.

Subjects

Student posttest data were collected the next school day after completion of a 10-day curriculum. Data were collected from 6716 seventh-grade students, 50% of whom were male. Regarding ethnic composition, 60% were White, 27% were Hispanic, 7% were Black, and 6% were Asian or "Other." School districts selected for participation in this research were restricted to be majority White by design. One-year follow-up data were collected from 7052 students. Ninety-three percent of the students reported attending the same school 1 year earlier. Data were aggregated to the school level at each time point using the total school sample.

Questionnaires and Data Collection

On the days immediately prior to and following the 2 weeks of curriculum delivery, students in the program conditions were administered an in-class, 20-page self-report questionnaire. This same questionnaire was used in the control schools, collected 2 weeks apart. The questionnaire included a core section at the front, which contained items that assessed demographic and behavioral information. The same questionnaire was administered again 1 year later.

Students from the individual-level cohort had breath or saliva samples collected, and they were read a script informing them that their data were confidential. Students from the grade-level cohort did not provide biological samples, and they were read a script informing them that the data collected were anonymous. Both of these procedures have been shown to increase the accuracy of self-reported tobacco use.[35,36] The biological samples were not biochemically analyzed because of cost and incomplete collection.

Four behavioral outcome measures were examined: "Have you ever tried cigarettes?" (yes/no); "Have you ever tried smokeless tobacco?" (yes/no); "How often do you smoke cigarettes?" (weekly use = a few times each month or more); and "How often do you use smokeless tobacco?" (weekly use = a few times each month or more). Forms of smokeless tobacco were described on the cover page of the questionnaire, which the data collector reviewed for the class. Students were instructed to code chewing tobacco and snuff as forms of smokeless tobacco.

Implementation, Process Evaluation, and Posttest Knowledge

To maximize implementation, trained project health educators delivered the four curricula over 10 consecutive school days. Previous analysis has shown that implementation data and process ratings were favorable and similar across the four program conditions, and knowledge scores indicated discriminant validity among conditions.[29] This pattern of results permitted future behavioral outcome differences among conditions to be attributed to differences primarily in the content of material provided rather than to differences in the quality of delivery[30] or in curriculum credibility.[31] A detailed description of the curricula contents can be found elsewhere.[29] The types of material provided reflect the components of comprehensive social influence programs.

Analysis

Of principle interest in this study is the change in prevalence of tobacco use over the 1-year study interval. We constructed four behavioral change outcome measures: two measured the change in prevalence of initial trial of cigarettes and smokeless tobacco, and two indicated the change in prevalence of weekly use of these substances. Measures were constructed at the school level by first calculating the prevalence estimates of tobacco use at each school at immediate postprogram and 1-year follow-up time points. An average of the survey results before and immediately following the survey was used as the initial time-point estimate. (There was little change in behavior over that 2-week interval.) A change score was then calculated by subtracting initial prevalence from follow-up. The number of subjects measured at each school was used as a weighing factor in all subsequent calculations (i.e., small schools contributed less weight).

The first thing to be examined was the prevalence of tobacco use by gender and region. For each time point and for the difference, two-group t tests between regions (urban vs rural) and paired t tests between genders (male vs female) were calculated, with school as the unit of analysis. In the analysis of gender comparisons, each school contributed a separate mean for its males and females. For urban versus rural comparisons, each school contributed a single mean.

Examined next were the effects of the four curricula on each of the tobacco outcome measures. This was done by computing a five-group, one-way analysis of covariance (ANCOVA) model with school as the unit of analysis. Covariates included gender, the blocking assignment variables (composite, school type, region), and a measure of school "turnover." Turnover was defined as the proportion of new students at the school at 1-year follow-up (average value = 7%), and it was added to the model to adjust for possible differences in student composition at follow-up.

Use of the ANCOVA model at the school level entailed our assuming that the effects of the intervention are additive in the scale of changes in school proportions (i.e., that each school in a group responds the same way, on average, to treatment) and that rate of change without any systematic intervention can be characterized as a constant that is estimated by the control schools. To test this assumption, interaction terms between covariates and treatment were calculated. None of these terms was significant, and they were subsequently dropped from the model. This set of results suggests that our assumptions are tenable and that any discernible pattern of treatment effects may be considered to be the same across levels defined by the covariates, regardless of the presence of main effects of gender and region. Therefore, our planned mean difference comparisons between the four treatment group means and the control group mean collapsing across gender and region were calculated using the ANCOVA model error term. Additionally, using Tukeys least significant difference criteria for multiple comparisons, all possible pairs of treatment group means were compared post hoc to determine if treatments dominated each other.

Results

Within-Time Prevalence by Gender and Region

As shown in Table 1, immediate posttest and 1-year follow-up cigarette use did not differ by gender; however, trial and weekly use of smokeless tobacco use did differ. Use of smokeless tobacco was higher among males. Regarding region, trial of cigarette smoking and smokeless tobacco use was higher in the rural schools than in the urban schools at both time

TABLE 1—Prevalence of Tobacco Use over Time, by Sex and Region

	Trial Use			Weekly Use		
	Immediate Posttest	1-Year Follow-up	Difference	Immediate Posttest	1-Year Follow-up	Difference
Cigarettes						
Male	.41[a]	.48[a]	.071[a]	.06[a]	.09[a]	.030[a]
Female	.38[a]	.47[a]	.093[a]	.06[a]	.10[a]	.036[a]
Urban	.35[a]	.44[a]	.090[a]	.05[a]	.08[a]	.032[a]
Rural	.43[b]	.50[b]	.071[a]	.07[a]	.11[a]	.034[a]
Total	.40	.47	.080	.06	.09	.033
Smokeless tobacco						
Male	.12[a]	.17[a]	.054[a]	.02[a]	.03[a]	.008[a]
Female	.04[b]	.04[b]	.002[b]	.00[b]	.00[b]	.000[b]
Urban	.05[a]	.08[a]	.029[a]	.01[a]	.01[a]	.004[a]
Rural	.10[b]	.11[b]	.010[b]	.01[a]	.02[a]	.005[a]
Total	.08	.10	.020	.01	.01	.004

Note. Within the sex or region comparisons in each column, significant differences ($P < .05$, two-tailed) between proportions are indicated by differing superscripts; same-letter superscripts denote no significant difference.

TABLE 2—Treatment Effects from Project TNT: Change in Prevalence of Tobacco Use

	Condition				
Tobacco Measure	Combined	Informational Social Influence	Normative Social Influence	Physical Consequences	Standard Care Control
Trial cigarette use	.073[b]	.071[b]	.102[a]	.061[b]	.093[a]
Weekly cigarette use	.020[b]	.032[b]	.053[a]	.026[b]	.056[a]
Trial smokeless tobacco use	.017[b]	.035[a]	.026[b]	.024[b]	.041[a]
Weekly smokeless tobacco use	–.004[b]	.005[a]	.003[a]	.006[a]	.005[a]

Note. Within each row comparison (i.e., between conditions of a tobacco measure) significant differences ($P < .05$, two-tailed) between proportions are indicated by differing superscripts; same-letter superscripts denote no significant difference.

points. Weekly use of the tobacco product did not differ by region.

Change in Prevalence by Gender and Region

From immediate posttest to the 1-year follow-up, trial and weekly use prevalence of cigarettes rose about 8% and 3%, respectively—an equal percentage among males and females. On the other hand, trial and weekly use prevalence of smokeless tobacco rose only for males (5% change for trial use and 1% change for weekly use).

Cigarette use prevalence rose equally across urban and rural regions (about 8% and 3% change regarding trial and regular use, respectively). Trial of smokeless tobacco use rose about 3% at urban schools and about 1% at rural schools, whereas weekly use increased only about 0.5% at both regions, which did not differ from each other.

Change in Prevalence by Condition

Changes in prevalence data comparing the program and control conditions are shown in Table 2. For both trial and weekly use of cigarettes, the informational social influence, physical consequences, and combined conditions (which did not differ from each other) were superior to the normative social influence and control conditions (which did not differ from each other). For trial of smokeless tobacco, all program conditions except for the informational social influence condition were superior to the control condition. Finally, for weekly use of smokeless tobacco, the combined condition was superior to all other program conditions and the control condition (which did not differ from each other).

Discussion

These data suggest that (1) physical consequences information can be used to compose a curriculum that is as successful as a social influence program; (2) a normative social influence program is not as efficacious for tobacco use prevention as are other types of programs, except for prevention of smokeless tobacco onset; and (3) the same tobacco use prevention programming can be successful when targeted to use of both cigarettes and smokeless tobacco in the school-based context.

The physical consequences condition was as efficacious as the social influence programs in most comparisons. This pattern of results may contradict previous research, which found that social influence programming is more successful than physical consequences programming.[18,37] On the other hand, the present physical consequences curriculum included several novel features such as correcting myths about tobacco experimentation and addiction,[26] role-playing diseases,[31,38] and presenting probabilities of consequences information in ways more personally relevant to youth.[39] Previous physical consequences curricula focused more on the didactic presentation of long-term consequences. Although generally not measured in previous studies, social influence prevention programming may have been more successful in earlier studies because it was better received by students than traditional approaches.[31]

The data regarding the normative social influence condition suggest that teaching refusal assertion skills and facts about classmate peer disapproval of tobacco use were ineffective in this sample (aside from prevention of trial of smokeless tobacco). A previous analysis has revealed that process ratings were slightly lower in this condition.[29] Anecdotally, health educators and students reported that the "flooding" of their school systems and homes with normative social influence–type programs (e.g., red ribbon week, "just say no" campaign public service announcements) may have led to a lack of excitement over additional normative social influence–type information, which may have affected the results obtained. Nonetheless, knowledge items in the survey indicated that students in the normative social influence condition learned more about this type of information than did students in the other condi-

tions. Thus, there is no ceiling effect on their learning of this type of information.

Another possibility is that the apparent effectiveness of refusal assertion skills training, the main normative social influence component, in previous smoking prevention programs may have been due to the confounding of training in refusal assertion skills with other social influence program components. Most social influence programs that have taught refusal assertion skills also have taught some aspects of informational social influence. In the present project, the informational social influence condition had stronger effects than the normative social influence condition on smoking, consistent with this interpretation. This finding may imply that teaching students how to interpret social sources of information more effectively is more important than teaching specific refusal assertion skills (or facts about classroom levels of peer disapproval for using tobacco products).

Another way of interpreting differences in effects obtained between the normative and informational social influence conditions is based on the observation that the informational social influence condition exerted an effect on cigarette smoking but not on smokeless tobacco use, and that the normative social influence condition exerted an effect on smokeless tobacco use (trial behavior) but not on cigarette smoking. This finding converges with some pilot study data, which had indicated effects of refusal assertion training on intention to use smokeless tobacco but not on intention to smoke cigarettes.[40] One may conjecture that teaching refusal assertion skills is effective for preventing adolescents from trying smokeless tobacco because normative social influence pressures are more prevalent for use of this substance (e.g., related to dares to use a new substance), whereas informational social influence pressures (e.g., magazine advertising) are more prevalent for cigarettes. Alternatively, perhaps simply learning that one should say no to offers of smokeless tobacco is perceived as novel to adolescents, whereas the same instruction is perceived as being "nothing new" regarding cigarettes. Future research should be conducted to examine these alternative possibilities.

Generally, the combined condition was the most efficacious. This condition was the only one that showed a preventive effect on weekly use of smokeless tobacco as well as on the other three behavioral outcomes. We did not expect to achieve a relative superiority of the combined condition. As we reported previously,[29] greater teaching effort was required to impart this thematically diverse material. Also, it was fairly likely that curriculum material would be modified during implementation, possibly owing to attempts to provide a theoretical integration of the different perspectives. Finally, knowledge learned from the combined curriculum was relatively likely to be diluted; in other words, students were likely to learn less about more material.[29] Although each of these effects of a heterogeneous curriculum conceivably could have detrimental effects on program success, the heterogeneity of the combined curriculum instead led to the strongest overall effects.

The overall predictive superiority of the combined condition might imply that different causes of tobacco use need to be counteracted simultaneously because the behavior is determined by multiple causes. Also, a heterogeneous program may reach a wider variety of youth, who may differ in risk factors that influence use. One might conclude that current comprehensive social influence programming should be continued and emphasized over the development of isolated program components. On the other hand, aside from effects on weekly smokeless tobacco use, single-component program conditions were found to be superior to the control condition and not to differ in effect from the combined condition. An emphasis on effective delivery of any of these curricula is warranted. Implementation, as well as content, is an appropriate focus of future research.[30] □

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