Project Towards No Tobacco Use: implementation, process and post-test knowledge evaluation

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Abstract

This paper describes the curricula contents, and presents data to evaluate the implementation, process and immediate post-test knowledge of Project Towards No Tobacco Use (Project TNT). Four different school-based tobacco use prevention curricula were developed to counteract the effects of three types of tobacco use acquisition variables typically addressed within a comprehensive social influences program: (1) peer approval for using tobacco (normative social influence), (2) incorrect social informational provided about tobacco use (information social influence) and (3) lack of knowledge or misperceptions about physical consequences resulting from tobacco use. Three curricula were designed to counteract the effects of single acquisition variables, whereas a fourth curriculum was designed to counteract the effects of combined social and physical consequences-related influences. These curricula were delivered to seventh grade students by trained project health educators to maximize implementation. 'Program' schools, those schools that received one of these curricula, were compared to 'control' schools that provided asystematic health education delivered by school personnel. A total of five conditions were contrasted through use of a randomized experiment involving 48 southern California junior high schools. This paper documents high levels of implementation in all program conditions. Also, favorable process ratings were obtained across the four program conditions, using multiple measures and sources of ratings (students, health educators and classroom teachers who observed curricula delivery). Finally, knowledge item sets completed by the students demonstrated discriminant validity across all five conditions. Because the program conditions were discriminable, yet were quite similar in implementation and process ratings, planned future study of behavioral outcomes can be interpreted as relatively uncontaminated by delivery or credibility confounds.

Introduction

This paper describes the curricula contents, and presents implementation, process evaluation and post-test knowledge data from the prevention component of Project Towards No Tobacco Use (Project TNT), a 5 year school-based tobacco use prevention and cessation project (Boyd and Glover, 1988). The prevention component involves a between-groups experiment with a total of 48 southern California junior high schools. The main project objective is to attempt to determine which, from among the three most common components of current comprehensive social influences programming, is the most effective in preventing use of tobacco-containing products.

In the first section of this paper we outline the theoretical basis of different curricula developed in

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this project, the means of translating theory into curricula contents and the composition of each curriculum. In the second section of the paper we describe the evaluation design and examine the extent to which the different curricula were delivered as intended, received favorable process ratings and improved knowledge specific to the theoretical content being delivered. Ideally, delivery of the different curricula would result in implementation data and process ratings that were favorable and equivalent across conditions, and knowledge scores would indicate discriminant validity between conditions. This pattern of results then would permit the attribution of future behavioral outcome differences between conditions to differences in content of material provided rather than to differences in the quality of delivery (Pentz et al., 1989) or curriculum credibility (Sussman et al., 1989a).

Project TNT curricula development and contents

Social influences and adolescent tobacco use

Social influences are among the most important determinants of adolescent cigarette and smokeless tobacco use. For example, most teenage cigarette and smokeless tobacco use begins in a peer group context (Bewley et al., 1974; Eiser, 1985; Friedman et al., 1985; Hahn et al., 1990). There are two main types of social influence which may facilitate adolescent tobacco use, normative social influence and informational social influence. (A detailed discussion of these two types of social influence in the tobacco use prevention context is provided by Sussman, 1989.)

Normative social influence in this context 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 youth are confronted with offers to use tobacco products. If youth yield to offers and use tobacco, they may receive acceptance from the group or perceive acceptance. If they do not yield to offers of tobacco, they may be rejected in some way by the group, or they may perceive rejection. Informational social influence in this context refers to more covert pressure applied to make youth adopt social values favorable to tobacco use. Such values may be acquired from statements made or behaviors exhibited by the peer group, from tobacco advertising or from other sources (e.g. parents, movies). These sources of information may suggest that use of tobacco products is widespread or will help the tobacco user achieve a desired social image (e.g. the image of a mature person, a risk-taker or a rebel; Burton et al., 1989).

Measures of these two types of social influence have been found to be empirically separable in basic social psychology research and in applied research on the prediction of adolescent tobacco use (Deutsch and Gerard, 1955; Sussman, 1989; Graham et al., 1992; A.W.Stacy, unpublished manuscript). Normative social influence measures include exposure to direct social pressure and perceived peer approval to use tobacco products, whereas informational social influence measures include numbers of friends who use tobacco, prevalence estimates of use and social image expectancies (Sussman, 1989; A.W.Stacy, unpublished manuscript).

Comprehensive social influence prevention programs

The social influences 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 (McGuire, 1964; Evans, 1976; Flay, 1985; Silvestri and Flay, 1989). Cigarette smoking prevention programs that focus on teaching strategies to counteract social influences have been successful in reducing the onset of adolescent smoking by as much as 50% 3 years post-program (e.g. Flay, 1985; Tobler, 1986). While these findings are encouraging, it is not known which types of activities exert the greatest preventive effects (McCauly and Glasgow, 1985).

Comprehensive prevention programs often are described as being composed of 'components'. A component is defined as a set of activities designed to counteract the effects of an acquisition variable (Chassin et al., 1985; Sussman, 1991). Current comprehensive tobacco use social influence programs are generally composed of three prevention
components. One prevention component consists of activities which counteract normative social influence to use tobacco. The most widely implemented activity within this component involves provision of refusal assertion skills. While generally thought to be the most effective single prevention activity, small sample sizes of studies evaluating the effects of this activity limit the potential generalizability of obtained effects (McCaul and Glasgow, 1985). Recent studies suggest that effects on normative social influence are due to manipulation of peer disapproval of tobacco use in the classroom, not instruction in refusal assertion skills per se (Hansen and Graham, 1991; MacKinnon et al., 1991).

A second prevention component consists of activities which counteract informational social influence to use tobacco. Activities include provision of information about modeling and advertising influences and correction of inflated tobacco use prevalence estimates (McCaul and Glasgow, 1985; Sussman et al., 1988). In addition, instruction in effective communication skills often is used to facilitate acquisition of accurate social information (e.g. Botvin and Eng, 1979).

Finally, a third prevention component consists of activities which counteract lack of knowledge or misperceptions regarding tobacco use physical consequences. While not a social influence-type component, social influence programs often provide data about risk and severity of long-term and short-term physical consequences of tobacco use, and researchers report that provision of short-term consequences information may prevent tobacco use behavior (e.g. Flay, 1985; Flynn et al., 1985; Johnson, 1982).

Developing empirically distinct curricula
One means of testing between these three components of social influences prevention programs is to engage in a priori development of curricula which separately address them (Chassin et al., 1985; Sussman, 1991). To counteract normative social influence, assertion refusal skills training or peer approval restructuring approaches are appropriate activities. To counteract informational social influence, general social skills training or tobacco use social image restructuring approaches are appropriate activities. To counteract lack of knowledge or misperceptions about physical consequences, provisions of personally relevant material (e.g. short-term physical consequences information) or 'awareness-raising' material (e.g. role-playing diseases) are appropriate activities (see Sussman, 1989).

The process of deriving the current curricula from these three prevention components is described in detail by Sussman (1991) and Sussman et al. (1989c). In brief, curricula were formed in an empirically-based, building-block manner. First, Project TNT researchers utilized 'theme' studies, in which one-paragraph descriptions of numerous activities were rated on their perceived efficacy to counteract theoretically distinct acquisition variables. Activities with the highest perceived efficacy ratings were selected for the subsequent step. Next, tests of competing activities were accomplished through use of a simple pre-test–activity–post-test design. Each activity was administered to at least two classrooms and data was analyzed at the individual level. Activities with the greatest effects on knowledge items and on behavioral intentions to use tobacco products were retained for each curriculum that was to be created. Next, activities were combined into curricula. Each lesson was composed of two substantive activities and a review activity. Lessons were combined into curricula so that earlier lessons would motivate involvement in the curriculum and later lessons would motivate a commitment to not use tobacco products. Finally, tests of complete 10 lesson curricula were accomplished. Each curriculum was piloted twice 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.

Curricula contents
The four curricula (see Table I) contain similar motivational and commitment elements in Lessons 1, 9 and 10. Also, each curriculum includes unique material which confronts either (1) normative social influence, (2) informational social influence,
Table I. Project TNT prevention curricula contents

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Combined condition</th>
<th>Informational social influence condition</th>
<th>Normative social influence condition</th>
<th>Physical consequences condition</th>
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<td>1</td>
<td>active listening</td>
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<td>active listening</td>
<td>physical consequences</td>
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<td>2</td>
<td>consequences course</td>
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<td>addiction</td>
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<td>5</td>
<td>effective communication</td>
<td>self-esteem</td>
<td>avoidance</td>
<td>horrific images</td>
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<tr>
<td>6</td>
<td>refusal learning</td>
<td>effective communication</td>
<td>refusal practice</td>
<td>Sean Marsee memorial</td>
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<td>7</td>
<td>refusal practice</td>
<td>starting/maintaining conversations</td>
<td>refusal practice</td>
<td>risk of consequences</td>
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<td>8</td>
<td>advertising images</td>
<td>social problem solving</td>
<td>escape and stress management</td>
<td>consequences advocacy</td>
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<td>9</td>
<td>social activism</td>
<td>social image activism</td>
<td>social activism</td>
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(3) physical consequences or (4) combined normative and informational social influences plus physical consequences. The contents of these curricula are described next.

Commonalities:

In all four curricula, Lesson 1 provides a participatory listening exercise (the ‘telephone game’) to engage the students in the curriculum and motivate them to pay attention to the subsequent material. Also, in the first lesson, students are provided with tobacco product information, are introduced to the ‘TNT Game’ (a competitive team game used to help maintain student involvement and maximize homework return rate) and are introduced to a major reason youth engage in tobacco use. Within each curriculum, students are provided with a major reason youth engage in tobacco use that is linked to the specific content of that curriculum. For example, in the normative social influence condition students are instructed that one major reason youth use tobacco is to achieve acceptance by their peers.

Also, in all four curricula, Lessons 9 and 10 overlap in content. The ninth lesson teaches students to become involved in protesting tobacco use by writing a letter advocating no tobacco use. The content of the letter reflects the rest of the curriculum contents; that either one will not be liked if he or she uses tobacco. Tobacco use will not provide the social images one might think it does, tobacco use causes negative physical consequences or all three messages (in the combined condition). The tenth lesson involves filming a video in the classroom, using a TV news program format, in which students summarize what they have learned in the project and share a commitment they have made about tobacco use. The commitment they have made is either to teach someone what they had learned about tobacco use or to not start use themselves. The students view the video they developed at the end of the same class period.

Finally, in all four curricula, approximately 25% of the language which addresses tobacco products refers to smokeless tobacco, 10% refers to the generic use of the word ‘tobacco’ and 65% refers to cigarette smoking. Thus, both major forms of tobacco used by youth are addressed, and are addressed in the same proportions across curricula. Thus, any differential effects of these curricula on future cigarette versus smokeless tobacco use behavior would not be due to the tobacco product focus of the curriculum.

Normative social influence curriculum

In the normative social influence curriculum, in Lesson 2, students are introduced to aspects of peer pressure and peer group acceptance. Also, they discuss that they can resist peer pressure to use tobacco and still be liked by their friends because they serve multiple functions in their group (‘ingratiation’). In Lesson 3, students are introduced to a thought changing process (‘cognitive restructuring’) which, through use of ‘thought bubbles’, teaches them that situations are often less threatening than
they initially appear. In particular, they learn that they may be respected by their friend for refusing tobacco offers. In Lesson 4, students learn the importance of being assertive in peer pressure situations and are introduced to the various ways of saying no to tobacco offers. In Lesson 5, students are introduced to the ‘KAT’ decision-making process (know the problem, know the alternatives, think the problem through) as a means of avoiding tobacco use pressure situations. In Lesson 6, students view a videotape depicting ways to say no, and then they practice the methods they have learned through role-plays practiced in groups and performed in front of the class. In Lesson 7, students continue to practice methods of saying no. Finally, in Lesson 8, students practice escape techniques (from tobacco use situations) and then they are introduced to stress reduction techniques which could be used to keep themselves calm in peer pressure situations.

**Informational social influence curriculum**

In the informational social influence curriculum, in Lesson 2, students compare the assumed prevalence of tobacco use in their class with actual use to reduce overestimation errors. In Lesson 3, students discuss ways to achieve social images they desire without using tobacco. Also, students participate in a ‘restructuring’ activity, in which students indicate whether or not they ‘agree’ or ‘disagree’ with various statements by standing under signs. In this procedure, participants learn that most students do not believe that social images sometimes associated with tobacco use are true (e.g. that tobacco use makes someone look older). In Lesson 4, students discuss the ways that the entertainment and advertisement media portray tobacco use social images which might influence individuals to use tobacco. A videotape is shown which corrects inaccurate social image depictions of tobacco use. In Lesson 5, students practice techniques to improve their self-esteem, e.g. by being prompted to acknowledge their own positive characteristics. In Lesson 5, students learn to identify key aspects of effective communication and they practice communication skills in role-play situations. They are instructed that, by learning effective communications skills, they can acquire more accurate information about social events. In Lesson 7, students practice how to develop open-ended questions as a means of enhancing their conversational skills. Finally, in Lesson 8, students learn a method of decision making to help them make the best choices in difficult interpersonal situations (e.g. how to speak with a friend who has not returned a belonging that was borrowed).

**Physical consequences curriculum**

In the physical consequences curriculum, in Lessons 2 and 3, students learn about the course of tobacco use addiction and disease through use of role-play demonstrations of different stages of tobacco experimentation (first trial, tolerance and enjoyment, addiction, health problems, disease). In Lesson 4, students discuss in more detail tobacco-related diseases and they role play disease symptoms. In Lesson 5, students calculate the financial costs of addiction to tobacco products and identify facts about tobacco use consequences through playing a team game (‘prevention baseball’). In Lesson 6, students practice horrific imagery to provide a memory association of tobacco use to negative physical consequences in situations where they are likely to use it. In Lesson 7, students discuss the death of Sean Marsee, a high school track star who had been a heavy user of smokeless tobacco. They also begin preparation of a class presentation about tobacco use consequences, which they perform in Lesson 10. Finally, in Lesson 8, students identify the relative risks of tobacco use-related diseases comparing those who use tobacco to nonusers.

**Combined curriculum**

In the combined curriculum, in Lesson 1, students learn to correct inflated prevalence estimates of tobacco use as well as learn material common across curricula. In Lesson 2, students learn about the course of tobacco addiction and disease through use of role-plays, and they identify the physical and social consequences associated with tobacco use. In Lesson 3, students practice techniques to improve their self-esteem, including being prompted to acknowledge their own positive characteristics. In Lesson 4, students are introduced to peer pressure, and they
discuss how they can resist peer pressure to use tobacco and still be accepted for their other attributes by those who offer them tobacco. In addition, students are taught about ‘thought changing’ processes in order to learn that they may be respected by friends for refusing tobacco offers. In Lesson 5, students are introduced to the importance of effective communication. They practice effective listening skills, initiating conversations and developing open-ended questions. In Lesson 6, students learn the importance of being assertive and are introduced to various ways of saying no. In Lesson 7, students view the videotape depicting the different ways to say no and then they practice these methods. Finally, in Lesson 8, students discuss the ways in which the media portrays tobacco-related ‘social images’ that influence individuals to use tobacco. Students view the videotape which corrects false social images about tobacco use depicted by the public media. Thus, in Lessons 2–8, the combined condition is composed of three lessons of normative social influence curriculum material, three lessons of informational social influence curriculum material and one lesson of physical consequences curriculum material.

Implementation, process and post-test knowledge evaluation

Overview
In the development of curricula for the present project, considerable effort was expended to derive theoretically-driven but practically-feasible program components linked to the experimental conditions outlined earlier. Since random assignment of schools to conditions was performed, the major potential confounds involved in the experimental trial would be imbalances in program implementation, process and discriminant validity. Thus, the next step in this research program is the evaluation of the major confounding variables that may hamper the adequate evaluation of program effects. Therefore, the second section of this paper provides implementation, process and immediate outcome (curricula knowledge) evaluations which compare the program conditions at immediate post-test. Curricula knowledge is contrasted not only between the program conditions but also with a ‘standard care’ control condition in order to provide an assessment of the discriminant validity of program contents.

Definitions of implementation, process and outcome evaluations
An implementation evaluation considers whether or not program activities are completed as intended. Key measures in the school-based prevention context include student attendance, homework return rate and delivery fidelity. Attendance and homework return rates are direct measures of student completion of program activities. ‘Delivery fidelity’ measures how closely actual delivery of a curriculum is to its maximum intended delivery. Delivery fidelity is defined here as consisting of four levels of departure from ideal delivery: adherence (whether or not the curriculum was delivered at all), exposure (pertaining to how much of the curriculum was delivered), reinvention (given that the whole curriculum was delivered, whether or not the curriculum was delivered as written) and how ‘smooth’ the delivery was (i.e. whether or not there were interruptions in delivery of material, see Pentz et al., 1990). Adherence refers to the most severe level of departure in the delivery of the curriculum and smoothness of delivery refers to the most mild level of departure. One of the most likely threats to the internal validity of an experimental comparison of curricula occurs when observed differences in implementation within and across conditions are not due to the defining characteristics of the treatments but are due to extraneous or unintended differences between curricula. Therefore, it is desirable to document that treatments are implemented as intended and do not vary considerably.

A process evaluation in the present context considers multiple perspectives regarding measurement of the quality of a curriculum that was delivered. Process is differentiated from implementation in that it consists of subjective ratings of curriculum quality as opposed to measurement of completion of program activities. Process measures in the present school-based prevention context
include student, health educator and regular classroom teacher-observer perceptions of class control, class enthusiasm, understandability of curriculum lessons, health educator effectiveness and enthusiasm, and perceived overall curriculum effectiveness. It is ideal that process ratings be favorable and equivalent across conditions. If so, it is likely that future behavioral effects on the students would be due to curricula content differences and not due to curriculum credibility effects (Sussman et al., 1989).

Finally, an outcomes evaluation considers the effectiveness of a program on achieving immediate and long-term goals. One main immediate goal in the present context is to assess whether or not a program has adequately imparted its content matter to participants. An evaluation of knowledge items completed at immediate post-test permits an assessment of whether or not students have learned central concepts within a condition and whether or not discriminant validity of program material is achieved when comparing different conditions. Comparison with a 'standard care' control condition, which is assessed during the same measurement period, provides a more complete assessment of discriminant validity. The main long-term goal of a project in the present context is to assess preventive effects on tobacco use behavior. Behavioral effects among adolescents are examined at least 1 year after implementation of a program since the statistical power to detect changes in behavior usually demands this time lag or longer (Flay, 1985). The present study provides an assessment of one immediate outcomes variable, post-test knowledge.

Sources of data for the present analysis

Measures of implementation rely primarily on health educators' reports of attendance, homework received and delivery fidelity, because they are best able to provide these reports. However, three sources of ratings are available for process measures: the students, the health educators and the teacher-observers. The health educators are those persons who were hired and trained by others in Project TNT. They had no connection to the schools they visited other than to deliver the curriculum. When a health educator taught a curriculum, the regular classroom teacher observed the delivery but did not contribute to it in any way. Thus, three perspectives were represented in the process evaluation. The students provided ratings from the perspective of a program recipient, the health educator provided ratings from the perspective of a delivery person, and the classroom teacher provided ratings from the perspective of an observer. Finally, the post-test knowledge evaluation relies on students' ratings since they are the targets of the project for future behavioral effects.

Method

Subjects

Student data were collected from 4852 seventh grade youth, of whom 50% were male and 50% were female. Regarding ethnic composition, 60% were White, 27% were Hispanic, 7% were Black and 6% were Asian or 'Other'. Students consisted of two cohorts. In Cohort I, students from all seventh grade classes at 20 schools were followed as a panel at an individual level. In Cohort II, students from 28 other schools were followed as a repeated cross-sectional random sampling of seventh grade classes. Data from Cohorts I and II combined are presented herein.

Health educator data were collected from nine core project health educators, each of whom had taught each curriculum at least once and who were equally represented across conditions. Of these health educators, 78% were White, 11% were Black (one educator) and 11% were Latina (one educator). All were female. All health educators received 3 weeks of training (120 hours) before delivering a curriculum. Mean age was 28 years (SD = 2.7 years).

Teacher data were collected from 76 teacher-observers, the regular classroom teachers who observed the curriculum delivery process. All teachers from those seventh grade classes in which a curriculum was delivered completed the teacher data. Of these teachers, approximately 85% were White and 51% were female. Mean age was approximately 35 years old (SD = 10 years).
Experimental design

There were eight schools in each condition of the design, except for the control condition, in which there were 16 schools. Four Project TNT-developed prevention curricula were delivered to all seventh grade students at 32 of these schools (eight schools received each curriculum). Regular school health education curricula were delivered at the remaining 16 schools to serve as a control condition. In each of the five conditions, half of the schools were urban, half were rural; also four involved individual-level collection (including the control condition), whereas the other schools involved a repeated cross-sectional collection. Region and means of collection were fully crossed. The design of the study is shown in Table II.

In the control condition, students received prevention activities provided directly by their school. Aside from two lessons of tobacco product and long-term consequences material provided in the health education classes, the 16 control schools held assemblies which taught values clarification material. Long-term physical consequences information or simply just say no to drug use messages (e.g. red ribbon week). None of the control schools provided special programming for tobacco use prevention, although five of the 16 control schools did provide at least five lessons of drug use prevention material.

Questionnaires and data collection

Students

All students were administered a 20-page self-report questionnaire. This questionnaire was provided directly after receiving a 10 lesson curriculum in the program conditions. The questionnaire was composed of a core section at the front, which contained items that assessed demographic and behavioral information, followed by three sections that rotated in order on three different forms of the questionnaire (which were randomly distributed to students). In addition, the questionnaire contained two pages of program evaluation items appended to the back of the questionnaire. Students were instructed that they were not expected to complete the full questionnaire. Rather, they were told to complete however many items they were able to in the one class period.

Students were requested to stop completing any other item 5 minutes before the end of the period and were instructed to complete the program evaluation items. The program evaluation portion of the post-test questionnaire included 21 process evaluation adjective items (on three-point scales written as 'yes', 'somewhat' and 'no, not really'; on the first page) and nine implementation or process evaluation items (on three-to-six-point scales; on the second page). On the first page, students were instructed to "take a minute to think about the last two weeks of this class. Think about the topics and activities you did each day. Think about all 10 lessons and then try to form a general opinion about the class. Overall, did you find the topics and activities... acceptable, believable", etc? The adjective items were all process-type. The items were analyzed as an index consisting of the mean of all items. Also, four of the items from this index were analyzed individually (class control/acceptability, program effectiveness/helpfulness, program understandability and teaching effectiveness/organization) to permit a comparison of students' process ratings with those of the health educators and teacher-observers. On the
second page, students were instructed that "some classes have just finished a 10 day program with Project TNT. We would like to know how students feel about the program". Then they were requested to complete the nine items if they were in a Project TNT program condition. Among these items included an assessment of the number of homeworks completed, program usefulness and whether or not the students would recommend that other students the same age be administered this program. The only implementation item assessed of students was the number of homeworks returned to the health educator.

Knowledge items were contained in a rotating section of the questionnaire. A total of 45 knowledge items tapped learning of the three separate prevention components. Each knowledge item was multiple choice and provided two-to-three wrong answers along with one correct answer. Approximately two items tapped material from each lesson (i.e. Lessons 2–8) in each component. For example, normative social influence knowledge items with their correct answers include "You will be liked more by a friend if": "you agree with most of their opinions but not all of them" (Lesson 2) and "Which of the following is reversing the pressure? saying": "I don't smoke and you shouldn't either" (Lesson 6). Informational social influence knowledge items with their correct answers include "Most 7th grade students agree that smoking cigarettes makes young people": "none of the above" (i.e. not look older, not look glamorous; Lesson 4) and "Which of the following is the best example of an open-ended question": "what did you think about yesterday's class?" (the other choices are questions which do not facilitate extended responses; Lesson 7). Physical consequences knowledge items with their correct answers include "Nicotine withdrawal means": "a person will feel bad if they can not get any tobacco" (Lesson 3) and "Who is Sean Marsee?": "a teenager who died from tobacco use" (Lesson 7).

Completion rate for core and evaluation items was 80% for those in the individual-level cohort and was 85% for those in the grade-level cohort. Reasons for incomplete data were absenteeism at school on the day of testing (10%), parental or student declines (5%) and individual-level tracking attrition (5%). Students from the individual-level cohort were administered carbon monoxide and saliva biochemical collection measures, and were provided with scripts which informed them that their data were confidential. Students from the grade-level cohort were not administered biochemical collection measures; data collected were anonymous. Both of these procedures increase the accuracy of self-reported tobacco use (e.g. Bauman and Dent, 1982; Murray and Perry, 1987).

Health educators

Health educators completed three types of ratings of curriculum implementation and process. One type of rating was an 11-item session evaluation which was completed after each class taught (mostly on seven-point rating scales; e.g. "How enthusiastic was the class during this session?", from 'enthusiastic' (7) to 'unenthusiastic' (1)). They also completed a 13-item end of program evaluation, one for each class group taught (completed after Lesson 10, mostly on four-point rating scales; e.g. "How effective do you think this curriculum is in preventing tobacco use?", from 'very effective' (1) to 'very ineffective' (4)). Finally, they completed a 13-item overall curriculum evaluation at the end of the school year which assessed four items for each curriculum (mostly on four-point rating scales). The overall curriculum evaluation also included a ranking item of relative curricula perceived effectiveness. In addition, health educators kept records of each of their student's attendance and homework returns.

Regarding implementation measurement, delivery fidelity items were asked solely of health educators. Adherence was not measured through any questionnaire item, since all other items depend on whether or not a curriculum was delivered at all. Exposure was measured through use of open-ended responses to the items 'activity omitted' and 'activity not completed', contained on the session evaluation form. Reinvention was a binary item from the session evaluation and read "Was the session taught as written?", 'yes' or 'no'. Finally, the smoothness of delivery item also was from the session evaluation form and read "Did the session proceed smoothly?".
'yes' or 'no'. Session evaluation responses were averaged across sessions and classes within each school to provide a means of comparison across conditions.

Teachers

Teacher-observers completed a nine-page school staff survey, consisting of 19 evaluation items (on four-to-five point rating scales), that was administered at post-test. For example, Item 7 read "How effective do you think the TNT curriculum will be in teaching this age group of students to resist drugs (including tobacco)?" and responses ranged from 'very ineffective' (1) to 'very effective' (4). Anonymity of their responses was assured.

Analysis

Data analysis was completed by using one-way analyses of variance (ANOVAs), predicting response means from the conditions. If an ANOVA model was significant, least significant difference post hoc comparisons were calculated (LSD tests) between pairs of means. The LSD post hoc test controls for the comparisonwise error rate at 0.05 for comparisons of any two means within a set of means. For example, in a comparison in which the four program conditions may differ in mean level of perceived effectiveness, an LSD comparison will reveal which of the conditions show a significant difference between mean perceived effectiveness from any of the other conditions. All statistics were calculated at the school level. Several process and implementation items were analyzed individually, rather than by forming composite variables, in order to maximize the chances of finding differences between conditions. Strong support would be found for implementation and process equivalence if few or no differences were found across conditions.

Results

Implementation

Adherence did not vary by condition; the curricula were implemented at all program schools. Exposure to the curricula did not vary by condition; all activities were completed in each curriculum. Results for the remainder of the implementation items are shown in Table III. Reported by the health educators, the least reinvention was in the informational social influence condition, whereas the other three program conditions did not differ. The most smooth delivery was in the physical consequences condition, the least smooth delivery was in the combined condition, and the other two conditions did not differ.

Student attendance, as indicated on attendance records, averaged approximately 90% across conditions, equivalent to the average attendance in the regular classroom situation, and attendance was slightly but significantly higher in the physical consequences condition compared with the informational and normative social influences conditions, which did not differ.

Health educators reported that the highest homework return rates were in the combined and physical consequences conditions, and the lowest return rates were in the informational and normative social influences conditions. Similar to the health educator reports, students reported relatively higher homework return rates in the combined and physical

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<th>Table III. Results for variables measuring program delivery (implementation)</th>
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<td>Informational social influence</td>
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<td>Reinvention (%)</td>
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<td>Smooth delivery (%)</td>
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<td>Attendance (%)</td>
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<tr>
<td>Homework - health educators (%)</td>
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<tr>
<td>Homework - students (%)</td>
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Significant differences ($P < 0.05$, two-tailed) between percentages are indicated by different-letter superscripts; same-letter superscripts denote no significant difference; the first two items are considered averaged over lessons.
consequences conditions. Students’ report of homework return averaged about 85% across conditions, and was 10% higher than actual homework returns averaged across conditions, as recorded by the health educator.

Process

Process rating comparisons are provided in Table IV. They are divided by reports of the students, health educators, and teacher-observers. Significance tests of differences among the conditions also are provided in Table IV.

Students

On an averaged index of 21 adjectives describing the program, the physical consequences condition was rated most favorably, although all treatment conditions were rated moderately favorably; the physical consequences condition was not rated significantly higher than the informational social influence condition. Class enthusiasm was rated lowest by students in the normative social influence condition, although only significantly lower than the physical consequences and combined conditions. Perceived program effectiveness, recommendation of program to others and perceived program usefulness were rated significantly higher by students in the physical consequences condition than the other three conditions, which did not differ.

Health educators

Contrary to the students, health educators rated all conditions more equally. Class control, understandability and perceived effectiveness did not differ by experimental condition. Health educator enthusiasm and effort, and class enthusiasm, did differ by

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<th>Table IV. Process evaluation results</th>
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<tr>
<td>Students</td>
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<tr>
<td>evaluation adjectives index (1–3)</td>
</tr>
<tr>
<td>2.64&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
<tr>
<td>class control (1–3)</td>
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<tr>
<td>2.66</td>
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<tr>
<td>class enthusiasm (1–3)</td>
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<tr>
<td>2.21&lt;sup&gt;a,b&lt;/sup&gt;</td>
</tr>
<tr>
<td>understood program (1–3)</td>
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<tr>
<td>2.83&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>teaching effective (1–3)</td>
</tr>
<tr>
<td>2.56</td>
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<tr>
<td>program effective (1–3)</td>
</tr>
<tr>
<td>2.49&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>recommend program (1–3)</td>
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<tr>
<td>2.56&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>program usefulness (1–3)</td>
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<tr>
<td>2.50&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>Health educators</td>
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<tr>
<td>class control (1–7)</td>
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<tr>
<td>4.92</td>
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<tr>
<td>teacher enthusiasm (1–7)</td>
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<tr>
<td>5.33&lt;sup&gt;a,b&lt;/sup&gt;</td>
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<tr>
<td>class enthusiasm (1–7)</td>
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<td>5.01&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>understood program (1–4)</td>
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<tr>
<td>3.09</td>
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<tr>
<td>teaching effort (1–7)</td>
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<tr>
<td>2.86&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>program effective (1–4)</td>
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<tr>
<td>2.76</td>
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<tr>
<td>mean rank curricula effectiveness (n = 7)</td>
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<tr>
<th>Informational social influence</th>
<th>Normative social influence</th>
<th>Physical consequences</th>
<th>Combined</th>
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<tbody>
<tr>
<td>2.64&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>2.62&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.64&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.62&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
condition. Health educators reported the least enthusiasm for teaching the normative social influence condition as compared with the combined and physical consequences conditions. Health educators' judgment of student enthusiasm was highest in the physical consequences condition. Health educator judgment of teaching effort was highest in the combined condition compared with the other three conditions, which did not differ.

Seven of the health educators provided a ranking of overall quality of the curricula at the end of the year on the overall curriculum evaluation form. On this ranking the combined condition was rated most favorably, although agreement of the rankings among health educators was fairly low (Kendall's $W = 0.27$).

Teacher-observers
Likewise, the classroom teachers did not differ across conditions in their ratings of class control or understandability. However, they also did not differ in their ratings across conditions of class and teacher enthusiasm. Teacher-observers in the physical consequences condition did report a significantly higher rating of perceived effectiveness than those in the normative social influence condition, although the remaining two program conditions did not differ from either the physical consequences or normative social influence conditions.

Knowledge outcomes
As shown in Table V, while the post-test percentage correct on the knowledge items averaged around 50%, the relative difference between groups was significantly different—in line with the content of the items. For example, the highest score on the informational social influence knowledge items was attained by those students in the informational social influence condition. Program conditions that were not provided informational social influence information obtained knowledge scores that did not differ from the control condition. Also, scores in the combined condition were in between each single-component condition. This latter result is expected since students in that condition received less material but from all curricula. Thus, as intended, the different conditions manipulated different domains of knowledge, indicating content discriminant validity of the conditions.

**Discussion**

The first section of this paper described that four curricula were developed to test for the effective components of comprehensive social influences programs. Each curriculum that was developed was based on a different theoretical perspective and was constructed through use of an empirical curriculum development process to maintain its distinctiveness. The second section of the paper provided a comparison between curricula of their implementation, process evaluation and post-test knowledge. The discussion will focus on the potential implications of these data and of the curricula contents for the interpretation of future behavioral effects.

While differences between conditions were small on any given item, some patterns emerged. Generally, the physical consequences condition received the most favorable implementation and process ratings. The physical consequences condition showed the highest attendance (although rates ranged only from 92 to 90%). The physical consequences condition showed the highest homework return rates
by health educator report, though this rate was not significantly higher than the combined condition. The physical consequences curriculum was rated most favorably by the students on the process adjectives index. Also, the physical consequences condition was rated most favorably on five process items: students’ rating of usefulness, effectiveness and willingness to recommend the program to other students; health educators’ rating of class enthusiasm; and the teacher-observers’ rating of effectiveness, though this last rating was only significantly higher than the normative social influence condition.

The relatively positive implementation and process ratings obtained in the physical consequences condition indicates that seventh grade students, as well as teacher-observers, perceive this type of program as being relatively efficacious. If these data were consistent with future behavioral outcomes, the result would contradict previous research which found that social influence programming is more successful than physical consequences programming (e.g. Thompson, 1978; Tobler, 1986). Of course, it is possible that process ratings, if generally positive across conditions, will not predict long-term outcomes. One may argue that a favorably rated physical consequences curriculum simply would provide a very good comparison condition for a social influence curriculum. Future effects on tobacco use behavior would be based primarily on differences in the content material provided, not on perceived credibility of the curricula, if greater behavioral effects were found for a social influence curriculum.

However, the physical consequences curriculum included several novel features such as correcting myths about tobacco experimentation and addiction (Glynn et al., 1985), role-playing diseases (Brannon et al., 1989; Sussman et al., 1989a) and presenting probabilities of consequences information in ways more personally relevant to youth (Sussman et al., 1989b). Previous physical consequences curricula focused more on didactic instruction of long-term consequences information. While generally not measured, social influences prevention programming may have been more successful in previous studies due to being better received by students than a traditional physical consequences approach (Sussman et al., 1989a).

While the present physical consequences condition was rated more favorably, when considered across items, the normative social influence condition received the least favorable process ratings. The health educators showed little preference except that they reported least enthusiasm about teaching the normative social influence condition, though their ratings were not significantly different from the informational social influence condition. Likewise, students reported least class enthusiasm about the normative social influence condition, though, again, their ratings were not significantly different from the informational social influence condition. Finally, the teacher-observers perceived the normative social influence condition as being least effective, though their ratings only were significantly lower than the physical consequences condition.

The data regarding the normative social influence condition indicates some disinterest from all raters. 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 lack of excitement over additional normative social influence-type information. Nevertheless, the knowledge indices indicate that students in the normative social influence condition learned more about this type of information than students in the other conditions. Thus, there is no ceiling effect on their learning of this type of information. It is possible that previous exposure to this information outside of Project TNT may have led to a negative effect on preference ratings without concomitant negative effects on long-term outcomes. Our future long-term evaluation will assess this possibility as well as other possible effects.

While some differences were found across the program conditions, as presented above, these differences were small. Also, most differences found were based on analyses of multiple individual items to maximize the chances of finding a difference in implementation or process across conditions. A high
level of implementation and favorable process ratings were achieved in all experimental conditions. In general, 1 year outcome results can be interpreted relatively unconfounded by implementation or process rating differences. Furthermore, the percent correct among the knowledge items revealed discriminant learning among the conditions, as expected. This knowledge item information indicates that, while level of program implementation was high and credibility ratings were favorable across conditions, students were learning different topic areas. Thus, Project TNT will permit a reasonably unconfounded evaluation of the common components of comprehensive social influences programs.

The next step of the project will be to assess behavioral effects at 1 and 2 years post-treatment. There are at least three possibilities regarding the preventive superiority of the different curricula. First, a single-component curriculum could be found to be the most efficacious. This possibility is not unlikely. There is a trade-off when providing a combined curriculum as compared with providing a single-component curriculum. Greater heterogeneity of information is provided in a combined curriculum, which might permit greatest generalizability across contexts. However, as found with the present data reported above, greater teaching effort is required to impart thematically diverse material. Also, reinvention of curriculum material is relatively likely, possibly the result of attempts to provide a theoretical integration of the different perspectives. Knowledge learned from a combined curriculum is also relatively likely to be ‘washed-down’. In other words, students are likely to learn less about more material.

If a single-component curriculum obtains superior effects, future programming should focus on the perspective that was provided by that component and less or no emphasis should be placed on other components. Superiority of the normative social influence curriculum would support the main thrust of current prevention programming as well as the organization of just say no-type rallies. Superiority of the informational social influence curriculum would support the relative importance of teaching general social skills and counteracting information which promotes favorable social images. Policy implications might include restricting tobacco advertising on billboards and in magazines. Superiority of the physical consequences curriculum would support the efficacy of counteracting lack of awareness of, or myths about, physical consequences of use. Less emphasis might be placed on counteracting social factors.

Second, a comprehensive curriculum could be found to be the most efficacious. This result would imply that different influences need to be counteracted for the same or different youth. One might conclude that current comprehensive social influences programming should be continued and that isolation of effective components is not a fruitful public health goal.

Finally, possibly all program conditions would be found to be superior to the control condition but not differ from each other. If so, one might argue that simply providing any tobacco use prevention curriculum well is what would be necessary to exert preventive effects. In that case, an emphasis on effective delivery of any of these curricula would be warranted. Implementation, rather than content, would be the focus of future research (Pentz et al., 1989). One caveat of any of these comparisons is that, no matter which curriculum is supported, future research may need to identify the most effective activities within a curriculum. Previous curriculum development work, as well as future small-scale studies that include follow-up assessments, could help in that endeavor (Sussman, 1991).

References


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