Using Theory and Technology to Design, Implement, and Improve School-Based Tobacco Cessation and Prevention Curricula

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Abstract

Tobacco use among youth is a significant health issue that must be addressed with effective and comprehensive measures. There are numerous methods to combating adolescent tobacco use but it is crucial to develop and implement tobacco control programs that are relevant to the many needs of adolescents. This chapter will explore one aspect of tobacco control curricula: school-based interventions. The design, implementation, and improvements of school-based tobacco control initiatives are examined, as well as other methods that have been effective and the numerous barriers to program success. The three school-based tobacco cessation and prevention research studies discussed were conducted utilizing innovative techniques such as web-based interactive multimedia interventions that use tailored educational tracks to incorporate social, behavioral, and cognitive changes. For each research study, the curricula design and overall effectiveness of adolescent tobacco control components are explored. The discussion of each school-based curriculum is concluded by examining future directions of intervention programs to improve curricula design, implementation, and longevity.

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INTRODUCTION

Background

School-based tobacco prevention and cessation programs are essential to saving lives. It is known that while 80% smokers began smoking before they were 18 years of age, 500 million deaths worldwide associated with tobacco related disease are preventable (CDC, 1994; La Torre, Chiaradia, & Ricciardi, 2005; WHO, 2009). Preventing adolescents from smoking in the United States would save $68 billion in direct and indirect costs associated with smoking (CDC, 1994). School-based approaches have been used to prevent smoking for the last 30 years. But with tobacco companies spending more money to reach young audiences and place ads in magazines with high youth readership, the greatly needed denormalizing of tobacco use is becoming increasingly challenging (TobaccoFreeKids, 2010). Using school-based approaches permits researchers, interventionists and educators to communicate with a captive student audience (Sussman, 2001).

The Center for Disease Control and Prevention Guidelines for School Health Programs to Prevent Tobacco Use and Addiction were released in mid-1990s to assist in the planning, implementation and assessment of school-based tobacco prevention programs (CDC, 1994). The CDC guideline provides information on the benefits of preventing tobacco use which includes preventing long-term health problems and premature death, decreasing the number of school days missed due to respiratory illness and decreases the likelihood that adolescents will become an adult smoker (CDC, 1994). For all these reasons, school-based tobacco programs represent key prevention measures essential to keep adolescents tobacco-free.

Additionally, the CDC indicates that a well-designed school-based program can reach adolescents when they are at highest risk for becoming nicotine-dependent and ending up as lifetime smokers. Leading a tobacco-free lifestyle can eventually become the norm and can be reinforced through positive role modeling by other non-tobacco users. Lastly, as tobacco has been recognized as a "gateway" substance (USDHHS, 1994), timely tobacco control among adolescents can also lead to the prevention of other substance use (CDC, 1994). Certain essential elements are needed for a school-based program to be successful at achieving these goals. Smoking prevention interventions should address three core elements: (1) social influences (i.e., media, peers, and parents), (2) short-term physiological effects of tobacco use, and (3) refusal skills training. These elements constitute important domains of our own research and dissemination projects which will be discussed herein.

Optimizing Program Effectiveness

Using a school-based approach to prevention adolescents from using tobacco products has a relatively long and rich history in the United States. Various methods have been used to increase the impact of school-based smoking prevention programs and while some studies have shown to be more successful than others, program developers should be aware of the documented strategies optimizing the program's effect and sustainability. Dobbins, DeCorby, Manske, & Goldbatt (2008) conducted a systematic review of school-based tobacco prevention programs and concluded that this approach is effective. The reviewed programs were able to reduce smoking prevalence, reduce smoking initiation and intentions to become a smoker in the near future. Let us review what specific methods and techniques were used to make the programs effective.

It is well-documented that knowledge alone is not an effective method for preventing tobacco use among children and adolescents (La Torre, Chiaradia, & Ricciardi, 2005). School-based programs are most effective when methodologically rigorous and based on more than one or two sessions. On the other hand, the number of sessions/lessons ought to be reasonable to accommodate the ever more challenging school program. Sussman (2001) reported that programs with as few as five lessons were successful in delaying tobacco-use onset. The methods used within the program included daily lessons for students. Daily lessons of the tobacco prevention program were considered to be a better approach over spacing the program lessons out considerably over time. Sussman (2001) also believes that it is important to provide participants with all program lessons as opposed to only delivering only portions of the program lessons. This indicates that each component of the school-based program should be implemented as originally designed. This, in turn, will increase the fidelity of program and ensure that students are receiving the entire (not fragmented) modules.

Two smoking cessation programs tested in eight public high schools used flyers to recruit participants. The flyers were placed in the school hallways and school health centers. Word also got around to the schools and among health center staff and program announcements were also a method of advertisement. The smoking cessation programs were held during student lunches where lunch was provided. Students also received modest incentives for participating at each intervention session. Over 60% of student participants were successfully contacted for each follow-up. The high number of successful follow-ups is thought to have been facilitated by the contact information gathered from each student participants. Participants gave research staff their home and cellular phone numbers as well as a friend's contact information to ensure a successful follow-up contact (Joffe et al., 2009). The programs' abilities to recruit participants and retain

them for follow-ups are utmost important for obtaining analyzable samples, therefore the methods to ensure retention ought to be well thought out when planning a school-based program.

Barriers and Obstacles

While there are various methods that facilitate adolescent tobacco cessation and prevention programs, there are numerous barriers that hinder school-based tobacco cessation and prevention curricula from achieving long-term effects in mitigating adolescent tobacco use, including social influences (e.g., peer structure, language, culture), lack of appropriate training and/or resource materials (e.g., counseling skills, incentives), lack of educator, student, or parental interest, school policies regarding tobacco use, and context and delivery of the curricula. The most influential of these barriers is unequivocally the effect of social constructs such as peer norms, peer group structures, and social bonding.

Establishing peer group structure/norms and engaging in social bonding behaviors within specified peer groups are significant predictors in adolescent tobacco use. Peer smoking has consistently been found to be related to adolescent smoking initiation, maintenance, and intentions (Biglan, Duncan, Ary, & Smolkowski, 1995; Hirschman, Leventhal, & Glynn, 1984; Spear & Akers, 1988), and normative values (e.g., perceived prevalence of smoking) significantly affect adolescent tobacco use (Ellickson, Bird, Orlando, Klein, & McCaffrey, 2003; Iannotti & Bush, 1992). Furthermore, Dishion & Owen (2002) reported a bidirectional influence of tobacco use from adolescence to adulthood, showing that the strongest proximal correlate of adolescent substance use is the tendency to cluster into peer groups that engage in such behavior, in addition to smoking serving as a secondary function of enhancing peer interaction. School-based interventions that do not adequately address peer group structures and normative values undermine adolescent tobacco cessation and prevention efforts.

Social constructs such as language and culture also significantly influence the efficacy of school-based tobacco cessation and prevention curricula. Language is fundamental to adolescents understanding the value of tobacco use intervention measures; that is, language influences comprehension of intervention messages as well as social relevance to familial, peer, and community groups. A large portion of overt behavior, including tobacco use, is governed by social category affiliation, such as language identification and application (Eckert, 1983). This affiliation includes natively-spoken and colloquial language, as well as language preference and expression (Baezconde-Garbanati, 2001). Likewise, cultural aspects can create a sequestered population in terms of societal exposure to particular lifestyles, behaviors, opportunities, and other ethnic-specific homogenous variables (e.g., traditional family values, normative customs, etc.). Newly-arrived immigrant adolescents, as well as those who are U.S. citizens but reside in ethnically-rich environments, often experience a conflict between ethnic/traditional values and the process of acculturation (Baezconde-Garbanati, 2001), which can greatly impact the implementation of tobacco interventions which are primarily written in English and focus on American culture. Tobacco cessation and prevention curricula should account for these sociocultural aspects so as to provide adolescents with personalized information that is relevant to their heritage, environment, and community.

In addition to social aspects, the lack of appropriate training and/or resource materials affects the efficacy of school-based tobacco cessation and prevention interventions. Studies have consistently shown that educators who receive training in such curricula/counseling skills and feel confident about implementing it were more likely to incorporate such programs into their classrooms (Brink, Basen-Engquist, O'Hara-Tompkins, Parcel, Gottlieb, & Lovato, 1995; McCormick, Steckler, & McLeroy, 1995; Rohrbach, D'Onofrio, Backer, & Montgomery, 1996;

Rohrbach, Graham, & Hansen, 1993; Sy & Glanz, 2008; Voisin, Salazar, Crosby, Diclemente, Yarber, & Staples-Horne, 2005). Likewise, appropriate training is critical for other school personnel, as, for instance, lack of knowledge and counseling skills have been identified as barriers to nurse involvement in assisting adolescents with quitting tobacco use (Hamilton, O'Connell, & Cross, 2004; Lawendowski, 1998; Schubiner, Herrold, & Hurt, 1998). Moreover, Ennett et al. (2003) found that recent school personnel training and comfort with using proposed substance abuse programs were strong correlates of effective prevention programming. Not investing in school personnel training ultimately jeopardizes the effective implementation of such tobacco control initiatives.

Lack of support resources compound the issue of poor educator training skills with many schools having to decide upon the cost-benefits of implementing tobacco cessation and prevention programs as well as the associated expenses, such as incentives, educational handbooks, and student supplementary materials. Many schools are faced with selecting one intervention over another to include in class curricula so those interventions that require comprehensive instruction and may cost more, such as many tobacco programs, are excluded (Dino, Horn, Abdulkadri, Kalsekar, & Branstetter, 2008; Tengs, Osgood, & Chen, 2001). Equally, the lack of student resources such as incentives and support materials impede program implementation. Many tobacco control tools/incentives are not available in schools due to insufficient financial resources (McCormick, Steckler, & McLeroy, 1995) or lack of availability specific to the development needs of adolescents (Meis et al., 2002). Appropriate training for school personnel and the availability of adequate support materials is necessary to ensure successful implementation of comprehensive tobacco cessation and prevention measures for adolescents.

While social constructs, and appropriate educator training and resources availability are considerable barriers to adolescent tobacco control programs, lack of interest on behalf of the school, educator, and/or student/parent can also significantly interfere with tobacco cessation and prevention efforts. Previous research has indicated that school connectedness (i.e., feeling that schools were actively involved in student welfare) may actually serve as a protective factor against tobacco use (Hawkins, Catalano, & Miller, 1992; McBride et al., 1995; Resnick et al., 1997). Similarly, teachers who were not specifically engaged in tobacco control curricula were more likely not to implement those programs in their classroom activities (Sy & Glanz, 2008). Finally, students who perceived a lack of interest on behalf of their teacher were more likely to engage in health risk behaviors, including tobacco use (Steinberg, 1996; Voisin, Salazar, Crosby, Diclemente, Yarber, & Staples-Horn, 2005).

Lack of student interest or poor attendance/participation in tobacco control initiatives is also a barrier to implementing tobacco cessation and prevention programs. Engaging individuals in tobacco control activities is difficult when they are not ready to quit (Blumenthal, 2007) and, as expected, if students are not participating in such activities due to poor attendance or lack of interest, tobacco use is likely to remain at high prevalence rates (Johnson et al., 2009; Midanik, Polen, Hunkeler, Tekawa, & Soghikian, 1985). Equally, if parents are not concerned with school tobacco control measures and the health of their children, students are more likely to engage in tobacco use. Resnick et al. (1997) showed a significant association between family involvement with youth and substance use with family context measures, such as connectedness to parents and family members, resulting in less frequent cigarette use among adolescents. Bailey, Ennett, & Ringwalt (1993) found that parent awareness of their children's activities was correlated with adolescents' lifetime smoking while family disunion (i.e., disconnectedness) was correlated with

adolescents' current tobacco use. Paradoxically, recruitment and retention of adolescent participants in intervention programs have consistently been problematic due to inability to obtain adequate rates of active parental consent for their child to participate in school-based tobacco programs (Kealey et al., 2007).

Concurrent with lack of educator/student/parental interest is a lack of classroom time to implement adolescent tobacco control programs. Several recent studies have found that the most frequent barrier to including tobacco cessation and prevention curricula in class instruction was a lack of time (Ennett et al., 2003; McCarthy, Dietsch, Hanson, & Zheng, 2008; Sy & Glanz, 2008). Tobacco control initiatives are generally not a mandated part of the school curricula, so educators often have to rearrange class schedules to accommodate such initiatives' implementation. Class formats (e.g., shorter class period duration or school term) also interfere toward full curriculum implementation, as does the coordination of resource availability (e.g., computer labs, personnel, etc.) (Sy & Glanz, 2008). The primary factor to successfully implementing tobacco control measures is to garner interest and commitment from the school authorities, teachers, students, and parents. For this to be achieved, adolescent tobacco control programs must be innovative and require reasonable classroom commitment.

While social norms, resources training and availability, and personal interest can be difficult to mediate in terms of successfully implementing school-based tobacco control programs for adolescents, probably the easiest barrier to overcome is the establishing and enforcing of sound tobacco use policies on campus for both school personnel and students. Numerous studies have shown that schools with smoking policies have significantly lower rates of student smoking (Charlton & While, 1994; Pentz et al., 1989; Wakefield, Chaloupka, Kaufman, Orleans, Barker, & Ruel, 2000). Unfortunately, although smoking bans on campus are

common, they are poorly enforced (Huang et al., 2010; Leatherdale & Manske, 2005; Moore, Roberts, & Tudor-Smith, 2001; Pentz, Sussman, & Newman, 1997). Such inadequate enforcement of smoking bans could be due to various reasons. For example, suspending students for smoking on campus could lead to their missing a greater proportion of classroom instruction, becoming disconnected with the school environment, and even dropping out of school altogether (Ellickson, Bui, Bell, & McGuigan, 1998). Likewise, many schools allow staff members and visitors to use tobacco in designated areas (Darling, Reeder, Williams, & McGee, 2006; Huang et al., 2010) while mandating the students not to use tobacco. Harsh punitive measures (Booth-Butterfield, Anderson, & Williams, 2000; Clarke, White, Hill, & Borland, 1994; Pentz, Brannon, Charlin, Barrett, MacKinnon, & Flay, 1989) and differential tobacco-use treatment (i.e., double-standards and hypocrisy) of students versus teachers/parents/visitors regarding on-campus smoking (Crawford, 2001; Leatherdale & Manske, 2005) are not conducive to promoting successful adolescent tobacco control. Since policy measures relate to school personnel, visitor, and student smoking restrictions, school-based tobacco cessation and prevention programs are ultimately affected due to vacillating enforcement.

Finally, a significant barrier to school-based adolescent tobacco control, in addition to the aforementioned categories, is the complexity of program content and delivery. Many teachers are willing to at least attempt implementation of tobacco control measures in their classroom but are met with complex curricula and outdated delivery methods (Sy & Glanz, 2008), such as workshops, student handbooks, or standardized health measures (i.e., generic health information about tobacco use). Using a didactic approach results in very little interaction between students and program components (Tobler, Roona, Ochshorn, Marshall, Streke, & Stackpole, 2000) and educators ultimately do not follow through with subsequent tobacco control sessions (Ennett et

al., 2003). Furthermore, schools cannot sustain overtly complex programs for various reasons (Reid, 1999) and educators are apathetic to implementing curricula that requires constant teacher involvement and training (Sy & Glanz, 2008). Likewise, contemporary students are unlikely to participate in such initiatives if the programs are not progressive and interactive (Meis, 2002).

Furthermore, poor communication between research staff and school personnel greatly inhibits program development and implementation. Schools will need further instruction, training, or coaching to be able to implement tobacco control initiatives successfully (DeBourdeaudhuij et al., 2010), as greater inconsistencies in the implementation of the curricula could arise without proper supervision and communication of study procedures. This requires program staff to frequently and consistently correspond with administration to adequately address any issues or concerns, as research has shown that active adoption of a program does not necessarily translate to a higher usage of the curricula (Flay, 2009). Likewise, schools may initially enthusiastically endorse tobacco control programs only to forego curricula implementation due to lack of student participation over time (Thomas & Perera, 2008). As a result, the initial enrollment of schools into adolescent tobacco control programs outweighs the total number of schools that are able to successfully follow through with program completion (Flay, 2009).

While many adolescent tobacco control programs have been developed, the aforementioned barriers significantly impede successful adoption and sustained implementation. To render adolescent tobacco control measures successful, the programs must streamline curricula components, thereby making them consistent with the students' health literacy level, make learning experience both educational and entertaining, and make the delivery "vehicles" consistent with the high demands of the 21st century. Our investigative team has created and

implemented three unique youth-oriented tobacco cessation and prevention curricula that address many of the barriers and use promising strategies mentioned above.

THEORETICAL FRAMEWORK

The theoretical frameworks for our adolescent tobacco control programs, A Smoking Prevention Interactive Experience (ASPIRE), Teens and Young Adults Acquiring Lung Cancer Knowledge (TALK), and Curbing Tobacco Use in Suburban and Rural Schools (CURBING), are the Transtheoretical Model of Change (TTM) and Social Cognitive Theory (SCT). The TTM is extensively described in the literature and incorporates: (a) a continuum of stages of change of problem behaviors; (b) a framework for understanding the hypothesized processes that mediate health behavior change; (c) constructs (e.g. self-efficacy, decisional balance) that are sensitive to the earliest signs of change; and (d) a means of tailoring education and intervention approaches to an individual's level of readiness for change (Prochaska, DiClemente, & Norcross, 1992a, 1992b). The SCT is also widely referenced in literature and incorporates: (a) observation; (b) imitation; (c) and modeling, whereby individuals learn through others' behaviors attitudes, and outcomes of those behaviors (Bandura, 1977).

ASPIRE

Background and Hypotheses

ASPIRE, a theoretically- and empirically-based interactive, multimedia smoking prevention and cessation curriculum for culturally diverse high school students was a 4-year, nested-cohort, group-randomized, controlled trial implemented in 16 ethnically diverse, economically disadvantaged high schools located in the greater Houston area. The program was designed to compare the effect of a CD-ROM-based smoking prevention and cessation intervention program (ASPIRE) against the effect of a standard-care condition (National Cancer

Institute's *Clearing the Air* self-help booklet) with 8 schools assigned per condition. Participants were 10th grade students who could speak, read, and write English.

It was hypothesized that students in schools receiving the ASPIRE curriculum would have lower rates of smoking initiation (for nonsmokers) and higher rates of smoking cessation (for smokers) at 18-month follow-up compared to students in comparison schools. It was also hypothesized that well-established determinants of smoking, including decisional balance (Hudmon, Prokhorov, Koehly, DiClemente, & Gritz, 1997; Velicer, DiClemente, Prochaska, & Brandenburg, 1985), temptation to smoke (Velicer, DiClemente, Rossi, & Prochaska, 1990), self-efficacy (Bandura, 1977), resistance skills (Lloyd-Richardson, Papandpontos, Kazura, Stanton, & Niaura, 2002), peer smoking (Killen et al., 1997), and parental smoking (Flay, Phil, Hu, & Richardson, 1998), would mediate the effect of the intervention on both initiation and cessation of smoking.

Methodology

ASPIRE was programmed with embedded animations, video, and interactive activities, and comprised of 5 weekly sessions in one semester and 2 "booster" sessions in the following semester (each 30 minutes in duration). The program was accessed on desktop computers in the classroom during lesson periods and featured 8 educational "tracks" (over 5 hours worth of videos, animations, interactive quizzes, etc.). ASPIRE was designed to address the needs of both smokers and nonsmokers by users "scaling" Mount ASPIRE, an interactive "mountain" with two main educational paths: smoking cessation and smoking prevention. ASPIRE assesses a user's readiness to quit smoking, assists with the cyclical nature of tobacco use (i.e., quitting, withdrawal symptoms, relapse), and reinforces smoking prevention measures. At the commencement of each session, students completed a series of questions designed to determine

their smoking status and stage of smoking acquisition or cessation. They were then provided with a series of activities that were tailored to stage of change and designed to promote movement through the stages toward smoking cessation (for smokers) or to reduce the likelihood of smoking initiation (for nonsmokers).

Results

Results showed that ASPIRE was effective in preventing smoking initiation at 18-month follow-up: among baseline nonsmokers, only a small percentage (1.9%) in the intervention group initiated smoking, and this percentage was significantly less than the percentage of students in the comparison condition who initiated smoking (5.8%). In addition, smoking intensity at follow-up (measured by the MSI index) provided partial evidence that the intervention increased smoking cessation among the small sample of baseline current smokers, although this trend was not significant.

The ASPIRE intervention also had a positive effect on changing decisional balance (pros and cons of smoking) and temptations to smoke among participants at 18-month follow-up and was particularly effective in reducing smoking initiation among students who were at highest risk, i.e. those whose peers and/or parents smoked. In contrast, for students who were not exposed to ASPIRE, smoking initiation was higher among students with baseline peer pressure to smoke and among students whose mother or father smoked at baseline. An interesting discovery was that among the students who received ASPIRE, only Hispanic students initiated smoking. At baseline, Hispanic students exhibited higher baseline temptations, experienced greater peer pressure, and agreed more with reasons to smoke (lower decisional balance scores), and these patterns had not significantly changed at 18-month follow-up.

The underlying principles of ASPIRE and its long-term results can be found elsewhere (Prokhorov et al., 2008; 2010). The ASPIRE curriculum showed considerable promise in terms of providing adolescents with edgy and compelling tobacco cessation and prevention information. Further improvements were implemented to boost the intervention's capabilities (e.g., placing ASPIRE on the Internet thereby making the program accessible online 24-hours a day, improving the interface, and updating the content with newly discovered issues (e.g., smoking in movies and new tobacco products). The two subsequent curricula developed by our investigative team, Project TALK and Project CURBING, have been largely built on the success of ASPIRE. They incorporate additional features such as using in-depth health information to boost tobacco control impact (TALK) and targeting underserved populations such as suburban and rural communities (CURBING).

TALK

Background and Hypotheses

We agree with Torres et al. (2005) who posits that tobacco control programs should be disseminated communitywide. We also submit that school-based programs ought to be complemented by interventions offered outside public schools to render smoking prevention and cessation knowledge and skills to school dropouts (Pirie et al., 1989) and students of alternative schools. i.e., those youths who are at very high risk to lifelong nicotine dependence.

Project TALK (Teens and Young Adults Acquiring Lung Cancer Knowledge) was a Department of Defense funded pilot study that provided alternative school students, who were at least 16 years of age, an interactive educational video game with tailored tobacco cessation and prevention messages. We hypothesized the following: (1) video game will result in higher non-initiation of tobacco use among nonsmokers, (2) video game will result in higher cessation rates

among smokers, (3) video game will increase perceived tobacco-related health vulnerability, and (4) video game will promote intention to adopt tobacco-free lifestyles.

Methodology

Within the framework of the Project TALK, our investigative team has created a full-scale, arcade-type educational video game named "Escape With Your Life" (EWYL). The game also was released on CDs for downloading to PC or Macintosh computers. This fully interactive educational tool uses a "HealthScare Hospital" metaphor in which users travel to different rooms within the hospital to learn about various dangers of tobacco. The mission is to find three keys to eventually escape from this scary-looking hospital, full of ghosts, zombies, mad scientists, and other characters. The game allows users to personalize the main character (avatar) using gender, race/ethnicity, smoking status, and readiness to quit/start smoking. Depending on the smoking status, the user enters a tailored educational track guided by the TTM. Each track has a unique set of hospital rooms to explore, from which users pick up necessary items required to escape from the hospital successfully. The various rooms educate users on the lung cancer and other tobacco-attributable diseases, financial issues of tobacco use, environmental impact of smoking, being manipulated by the tobacco industry, and many other important issues. Numerous animations, interactive activities, written facts, and videos were incorporated in this video game to illustrate various issues.

Recruitment for Project TALK took place at an alternative school is Southwest Houston. Recruiting from an alternative education program allowed the educational video game to be tested by a multiethnic high-risk sample of young participants. The recruitment process included assistance from our on-site collaborator, a drug and gang counselor, who spoke with potential participants and their parents during orientation.

Students' schedules were coordinated such that no more than two participants at a time played the kiosk version of the video game. The students were given a brief introduction to the study along with consent forms. Once the participants returned a signed consent form, they completed a contact information sheet and baseline survey. After completing the survey the participants used the kiosk version of the video game for up to 30 minutes.

During data collection for the 7 day follow-up survey, the same routine was followed. After the completion of the survey, the participants received their incentive gift cards and were reminded that their 6 month follow-up survey would be conducted over the telephone. The on-site pilot testing of the program was completed in May 2008.

Results

The 6 month follow-up results indicated that the vast majority (94%) of the sample (n=239) reported that they have learned new facts about smoking effects, 82% reported that they were inspired never to start or to quit, and 71% planned to share the game with family or friends. At 6 months, 53% out of 34 baseline smokers reported that they were abstinent and 6% out of 112 baseline nonsmokers reported that they had initiated smoking.

After completion of the pilot study, the EWYL kiosk was placed at a Houston-metro area Adolescent Substance Abuse Prevention and Recovery Center (ASAPRC) operated by the Memorial Hermann system. This partnership began with a meeting among staff, which included a former psychiatrist from the same alternative school in Southwest Houston in which the program was originally tested, and the research team. The study results were presented and indicated the usefulness and acceptability of the video game among patients of the ASAPRC. Future directions include placing EWYL kiosks at other alternative schools, juvenile justice programs and youth community outreach organizations.

CURBING

Background and Hypotheses

The CURBING Project is a web-based tobacco cessation and prevention program that is interactive and tailored to individual users, and is currently being evaluated in 16 suburban and rural high schools throughout the greater Houston area and rural Texas. The 16 high schools, across 16 different school districts, comprise a group-randomized, controlled trial with an overall ethnic composition of 41% Caucasian, 35% Hispanic, 19% African American, and 5% Asian/Pacific. A total of 2,000 culturally diverse students, ages 14-16, were recruited for the study with an estimated 125 students per school.

There were several hypotheses that CURBING was designed to address. The primary hypothesis deals with smoking prevention/cessation in that at 18-month follow-up, schools assigned to the intervention condition will demonstrate lower smoking incidence and higher smoking cessation than schools assigned to the standard care condition. A secondary hypothesis concerns the reduction of spit tobacco use, and it is theorized that at 18-month follow-up schools assigned to the intervention group will demonstrate a lower rate of spit tobacco use than schools in the standard care group. Two tertiary hypotheses are also being investigated regarding stages of change and mediating variables. Concerning stages of change, it is anticipated that among non-tobacco users, more students in the intervention condition will remain in the early stages of acquisition than students in the standard care condition. Likewise, among tobacco users, students in the intervention group will experience greater progression through the stages of cessation compared to students in the standard care group. Regarding mediating variables, it is anticipated that established and new predictors of tobacco use will mediate the effect of the intervention on the onset and cessation of tobacco use.

Methodology

Schools were solicited for study participation and were pair-matched on size, rural/suburban location, and ethnic composition. Schools were then randomly assigned from within pairs to the intervention or standard care conditions. A pretest-posttest cohort design was used among the participants, and baseline surveys were administered at the target sites in the fall of 2009, with follow-up surveys conducted at 6, 12 and 18 months following the initial baseline survey for both study groups. Participants in the intervention group were exposed to "Superstation KURB," a curriculum that uses a television station metaphor to discuss both smoking and smokeless tobacco cessation and prevention. Users are "hired-on" as station assistants to help spread the word on how tobacco is affecting their community, and perform duties such as participate on game shows, review new media pieces, prepare news reports, and other "TV station" activities. Through these experiences, students will learn about the health, economic, and social consequences of tobacco use.

The educational tracks are guided by the TTM according to each participant's tobacco use status, willingness to quit, addiction to nicotine, and depression index score. Students in the intervention group also had unlimited access to the "KURBLounge," an interactive blog where additional tobacco cessation and prevention resources are provided. Students in the standard care condition received two informational booklets, the National Cancer Institute's *Clearing the Air* self-help pamphlet and the American Cancer Society's *Cold Hard Facts about Dip*.

Results

CURBING is still being implemented in target schools, so data analyses has not commenced. However, we will use process and outcome evaluation to gather results once data collection is complete.

Process evaluation will allow us to understand how the program functions within the school organization. We will document to what degree the intervention was implemented as designed, which components of the intervention were useful, the barriers to implementation, and the improvements that are needed.

Outcome evaluation will allow us to determine the impact of the intervention when comparing the intervention group participants who played the online educational video game, and the control group participants who received pamphlets. The main outcome measures will be analyzed using longitudinal techniques. The primary method of analysis will be a group intervention group comparison using mixed-model regression.

CONCLUSION

Adolescent tobacco control has only recently been given substantial attention by the research community with consistent growth observed in relation to school-based interventions and the development of tobacco cessation and prevention programs specific to the needs of youth (Nykiforuk, Osler, & Viehbeck, 2010). This finding indicates the significance of adequate tobacco control for adolescents as well as the need for future research to evaluate various aspects that moderate or enhance tobacco use initiatives.

Our three unique tobacco cessation and prevention programs, ASPIRE, TALK, and CURBING, are tailored to the needs of adolescents and address many of the barriers associated with current adolescent tobacco control initiatives, such as focusing on peer norms, requiring minimal involvement from school personnel, and utilizing interactive multimedia. However, the development of future adolescent tobacco control measures should incorporate literature recommendations to further enhance program efforts. For instance, in dealing with social aspects, programs should integrate modular variables that predict, with relative accuracy, the

likelihood of subsequent tobacco use, as well as assess longitudinal outcomes to determine how social context contributes to the long-term developmental trajectories of adolescent tobacco use (Biglan, Duncan, Ary, & Smolkowski, 1995). Longitudinal analyses are necessary to evaluate any links between normative beliefs, intentions to use tobacco, and subsequent initiation. In the end, comparisons between predictive use and perceived use can be achieved and adolescents can be apprised of actual versus perceived prevalence of tobacco use (Iannotti & Bush, 1992). Furthermore, interventions should target problem behaviors, such as delinquency, risk taking, and rebelliousness, as these factors have predicted higher rates of persistent smoking across ethnic groups (Griesler, Kandel, & Davies, 2002).

Socio-cultural factors such as language and collective traditions and values must also be considered when developing adolescent tobacco control measures. Language capabilities and preferences must be considered at all levels of tobacco control, from the conduct of research to the development and delivery of anti-tobacco messages (Baezconde-Garbanati, 2001). This includes natively-spoken and colloquial language, idiomatic expressions with varying meanings, syntax, grammar, contextual frameworks, phonetic articulations, and other etymological principles. Language should be appealing and simple to adolescents yet direct and non-judgmental (Meis et al., 2002). Likewise, interventions should address cultural norms such as native beliefs (e.g., giving cigarettes at weddings or as gifts in the Asian/Pacific Islander groups (Lew, 1998)), acculturation, and cultural marketing. For example, female Latino immigrants with initially lower smoking rates tend to increase their smoking as they become more acculturated to U.S. social norms (Marin, Marin, Otero-Sabogal, Sabogal, & Perez-Stable, 1989). Similarly, tobacco advertising and marketing initiatives target socio-cultural values, for instance, by portraying highly acculturated celebrities as glamorous and successful thereby enticing

adolescents to mimic unhealthy behaviors (Baezconde-Garbanati, 2001). Culturally-appropriate interventions should also consider differing tobacco use patterns among ethnicities as well as focus on changing smoking behavior at the population level through strategies that alter adolescents' social environment (Vickers, Thomas, Patten, & Mrazek, 2002), such as addressing deviant familial behavior (e.g., selling drugs) (Iannotti & Bush, 1992), or utilizing cultural media messages that reinforce effective prevention strategies.

Future adolescent tobacco cessation and prevention initiatives should also consider the necessity of adequate program training and the provision of appropriate intervention materials. Effective curricula require a specific "dose" involving number and duration of lessons (Tobler, Roona, Oschsborn, Marshall, Streke, & Stackpole, 2000), so teachers who are not formally trained in tobacco use curricula may not be effective in implementing such measures (Sy & Glanz, 2008). Extensive training strategies are needed to "teach the teacher" on how to adequately address adolescent tobacco control, and such training should allot time for classroom instruction, modeling, and practicing interactive strategies on which the curricula depend (Ennett et al., 2003). If educators do not have the appropriate background, schools should support in-service trainings from qualified adolescent health specialists or allow paid time off to attend off-campus workshops specific to adolescent tobacco control. Likewise, schools should hire and support competent teachers who are experienced in subject content, teaching techniques, and classroom management expertise to meet diverse student needs (Voisin, Salazar, Crosby, Diclemente, Yarber, & Staples-Horne, 2005) as well as provide additional valuable school personnel (e.g., nurses) with relevant skills and resources to increase their involvement in adolescent tobacco cessation and prevention (Hamilton, O'Connell, & Cross, 2004). Equally, tobacco use curricula must be widely promoted so that such measures can be implemented as

intended and achieve successful results (Ennett et al.). Establishing universal health measures, such as a national tobacco control budget, would provide comprehensive, organizational resources that could develop and monitor, or supplement, initiative implementation and product availability.

Increasing population interest in adolescent tobacco control measures could quite possibly be the most difficult issue to address as it requires multiple components on multi-level dimensions. Varying groups of people must be willing to engage in tobacco cessation and prevention initiatives in order for adolescent tobacco control to be effective. At the outset, environmental media campaigns (e.g., public service announcements, advertising, public affairs events) that continually promote anti-tobacco messages and/or programs for cessation and prevention have been found to be beneficial in exposing individuals to available tobacco control options (Hong, Johnson, Myers, Boris, Brewer, & Webber, 2008; Johnson, Myers, Webber, Boris, He, & Brewer, 2009). Similarly, incentives can be provided through "partnership" affiliations, whereby the school/teacher/parent/student is not only rewarded for continued participation, but the affiliate (e.g., movie theater, food/beverage retailer, theme park, etc.) receives positive exposure and the potential for future business and publicity. Initially, media campaigns may not be noticed, but over time exposure is likely to increase. Schools can also design reform strategies that promote the clustering of students with the same teacher for consecutive years which is likely to increase student connectedness with not only their teacher but with their school environment (Voisin, Salazar, Crosby, Diclemente, Yarber, & Staples-Horne, 2005).

Schools should also properly time program implementation. For instance, many senior high school students experience countless changes during this life stage, from graduation to

entering into college/workforce/armed services to possibly even marriage or parenthood. It may be at this stage of their life adolescents are most receptive to change so tobacco cessation and prevention programs may be more successful than if implemented earlier in high school. To further strengthen such programs, yearly follow-ups are encouraged to serve as a reinforcement/reminder that additional treatment is available (Midanik, Polen, Hunkeler, Tekawa, & Soghikian, 1985), to assess tobacco control progress, and to address any issues that may affect successful intervention implementation. Further exploration should be conducted to examine the effects of parents' former smoking on adolescent initiation, including adolescent age and amount (i.e., parent is heavy, moderate, or light smoker) of exposure. Research should also examine other characteristics that may moderate adolescent tobacco control efforts such as parental communication style and quality of marital/partner relationship (Bailey, Ennett, & Ringwalt, 1993). Parents can exude positive behaviors in mitigating adolescent tobacco use such as restricting access to tobacco both within and outside the home (Kann et al., 1996), as well as spending more time with their children to increase family connectedness and parental influence (Resnick et al., 1997).

Intervention programs also need to examine the developmental stages of youth to isolate variables that may influence tobacco use according to adolescents' formative years. For instance, children's modeling of parental behavior may vary according to life span development (Bailey, Ennett, & Ringwalt, 1993), with more impressionable stages such as late childhood (i.e., 10-12 years) resulting in higher modeling behaviors versus late adolescence (i.e., 16-19 years). Other variables to address include biological/genetic components. Hormonal influences, genetic predispositions, and even evolutionary aspects (e.g., imprinting) can influence parental and adolescent behaviors resulting in disinterest, or possibly inability, in quitting tobacco use.

Adolescent tobacco control efforts should also examine the composition of different populations (e.g., alternative schools, homeless youth drop-in centers) to identify any high-risk groups that would be overlooked with programs implemented in traditional settings. Likewise, additional variables that affect adolescent interest in tobacco control programs (e.g., number of quit attempts, motivation to change) should be investigated as these components can not only significantly impede tobacco cessation and prevention messages but also affect recruitment and retention (Kealey et al., 2007).

Adequate policy measures are critical in promoting effective tobacco control programs and the primary factor in determining successful implementation in schools is the enforcement of campus tobacco use policies. First, tobacco use rules and consequences should be uniformly enforced for all students, employees, and visitors (Crawford, 2001). Simply having a formal statement of policy is not likely to impact on-campus tobacco use. Individuals have a limited awareness of school policy unless it is reinforced by signs around the school, information in school communications, and teaching within related curriculum areas (Clarke, White, Hill, & Borland, 1994). In the end, totally smoke-free environments provide a consistent health message and are likely to be more effective in preventing tobacco use (Darling, Reeder, Williams, & McGee, 2006). In addition to uniformly enforcing policy measures, schools should expand jurisdiction covered by tobacco use restrictions to include the property surrounding the school. Likewise, research should examine if prohibiting students/employees/visitors from smoking in visible areas impacts youth smoking onset and progression (Leatherdale & Manske, 2005).

Policy measures should also highlight prevention and cessation efforts instead of emphasizing punitive measures as adolescents may be more likely to comply with school tobacco policies that are supportive and have a positive focus (Hamilton, Cross, Lower,

Resnicow, & Williams, 2003; Pentz et al., 1989). Nonetheless, sanctions should be in place for violating policy measures. To assist with curbing tobacco use, new governmental laws against underage access and use, in addition to more resources to provide enforcement, should be developed.

Besides policy measures, schools need to address curricula programming to ensure adequate information is included. Interventions should be targeted dependent upon school-level data of tobacco use (Leatherdale & Manske, 2005). For instance, implementing a surveillance system that facilitates the identification of high-risk settings across multiple risk behaviors could be beneficial to developing customized tobacco control programs. Established school substance abuse programs could incorporate no-use tobacco initiatives (Pentz, Sussman, & Newman, 1997) and ensuing anti-smoking campaigns should focus on the short-term health effects of smoking (e.g., risk addiction, consuming harmful ingredients) (Crawford, 2001) to make such information relevant and real to adolescents who seldom think about the long-term consequences of their actions. Progress in programming efforts is also most likely to occur if tobacco control efforts are but one piece of an integrated, comprehensive approach to smoking prevention (Moore, Roberts, & Tudor-Smith, 2001), such as tobacco cessation and prevention measures being combined with specific health education initiatives. Regular implementation of such integrated programs may also reinforce prevention efforts by encouraging an anti-tobacco use social climate (Pentz, Sussman, & Newman, 1997). Likewise, schools should allot funds and/or develop mechanisms (e.g., schedule accommodation) for regular implementation of tobacco control programs. In conjunction with programming efforts, schools should provide assistance in helping students and employees quit using tobacco. On-campus tobacco cessation classes could be implemented (Pentz, Sussman, & Newman), licensed counselors could be made available to assist with

quitting efforts (Crawford, 2001), and resources such as nicotine replacement therapies (NRTs), quitlines, or physician/pharmacist referrals can be made available.

Since adolescent tobacco control is a communal effort, schools should establish partnerships with citizens that predominately affect adolescent behavior. Since parents are first-line sources for communicating anti-smoking messages (Crawford, 2001), schools should connect with families and offer "open house" type events that focus on collaborative efforts in adolescent tobacco control. Lessons about parental influences on adolescent behaviors, school-supported programs students can attend, and even the promotion of joint quit efforts between parent and child can be presented. Schools should also explore community-wide initiatives (Crawford, 2001; Griesbach, Inchley, & Currie, 2002; Perry, Kelder, Murray, & Klepp, 1992) that demonstrate population encouragement towards adolescent tobacco control and promote connectedness to healthy behaviors. Joint policies should be developed and established between schools and community venues (community education centers, parks, amusement sites) to standardize adolescent tobacco control efforts. Finally, the research community can be pivotal in addressing adolescent tobacco control initiatives by publishing non-significant findings of implemented cessation and prevention measures (Clarke, White, Hill, & Borland, 1994). In doing so, colleagues can identify trends in variables that affect tobacco use, predict future influence of such variables on adolescent tobacco use, and develop appropriate programs to address those critical aspects.

Lastly, program content and delivery improvements must be made that focus on restructured curricula design and implementation. To ensure effective curricula are devised, program developers should consult with teachers to better understand the classroom, personal, and environmental needs of adolescents. Adolescents should also be a part of designing their

tobacco control initiatives as this encourages an autonomy-supportive style of interaction (Williams, Cox, Kouides, & Deci, 1999). Focus groups should be conducted with adolescents before program development to assess particular needs that may affect program efficacy (Meis et al., 2002). Throughout program implementation, schools should conduct auxiliary focus groups to establish if program content/delivery is adequate or if changes need to be made. In designing adolescent tobacco control measures, evidenced-based curricula is the benchmark to use (Ennett et al., 2003), as they provide maximum benefits (e.g., long-term efficacy) within a comprehensive framework. Interventions should also involve the use of peer support (Albrecht et al., 1998) as peer initiatives can improve knowledge, change attitudes regarding health-related behavior, and improve both self-esteem and self-efficacy (Bernard, 1991).

Adolescent tobacco control measures should also include a multifaceted approach to addressing those issues most critical to adolescents' susceptibility to tobacco initiation as well as continued use. For example, cognitive-behavioral components, such as instruction in coping skills and restructuring normative values, have been found to be effective in reducing smoking among adolescents (Sussman, Lichtman, Ritt, & Pallonen, 1999). Likewise, social cognitive theory concentrates on stage-specific interventions and the behavioral changes necessary to progress through treatment. Aspects such as perceived self-efficacy, self-esteem, and self-regulation are discussed since these factors greatly affect motivation to move from one theoretical stage to the next (Bandura, 1999). Utilizing progressive methods in adolescent tobacco cessation and prevention, such as the TTM or SCT is essential in developing successful tobacco control curricula and has been shown to be effective in adolescent tobacco cessation and prevention. Programs should also address biological components, such as addiction and withdrawal, in adolescents. Like adult tobacco users, adolescent users, particularly smokers,

develop nicotine dependence and exhibit withdrawal symptoms when trying to quit (McNeil, West, Jarvis, Jackson, & Bryant, 1986; Smith et al., 1996; Stanton, Lowe, & Silva, 1995) and research suggests that addiction to nicotine may occur even before an adolescent becomes a daily smoker (DiFranza et al., 2000).

Schools should also invest in tobacco control curricula that encourage the use of interactive teaching techniques. Interactive components are a key feature of effective tobacco cessation and prevention programs (Sy & Glanz, 2008), strongly correlating with adequate initiative programming and implementation (Ennett et al., 2003). The most substantial method in delivering adolescent tobacco control measures is the internet since internet-based interventions have the potential to provide a variety of appropriate cessation-related activities, as well as interactive feedback tailored to adolescents' developmental, psychosocial, behavioral, and biological needs. The result of such interaction is immediate, individualized feedback (Meis et al., 2002). In addition, the internet can deliver information to masses of individuals quickly, efficiently, and on demand, which gives it the capacity to provide in-depth information and the combination of audiovisual and textual content, such as animation, videos, educational vignettes, interactive games, information on tobacco use, and resources for quitting assistance. The internet also shares with print media the ability for users to refer back to information previously accessed, 24-hour service, and nonlinear control over navigation through the material. These characteristics facilitate greater user involvement and, therefore, affect a more active audience than do traditional mass media (Street & Rimal, 1997).

Since no tobacco control program is successful without adequate communication, this aspect is significantly important in the development and implementation of adolescent curricula. School personnel should be actively involved in program measures and open lines of

communication between research staff and target schools should be established early on to develop rapport and maintain trust. This increases school compliance with curricula implementation and promotes communal interest in adolescent health, since there are many factors that contribute to efficacious interventions that are not limited to the program itself (e.g., design flaws) (Flay, 2009). Availability of program staff and frequent contact with school personnel ensure any issues/concerns with curricula implementation are addressed quickly and efficiently, and the likelihood of program endorsement increases. Likewise, issues exist in the school setting that sometimes conflict with the critical elements of tobacco control programs (e.g., dose-response relationship of implemented lessons), so connecting with school personnel on a regular basis can identify those issues that impede successful implementation of the curricula (Sy & Glanz, 2008).

Finally, to improve efficacy and retention, adolescent tobacco control programs should be implemented at younger ages and for a longer duration. Launching tobacco cessation and prevention curricula prior to adolescence has been shown to help in the effectiveness of intervention programs (Muller-Riemenschneider et al., 2008), as the programs can target and correct risky behaviors and environmental influences before tobacco exposure is prominent. In 2006, some 6.3% of middle school students (i.e., grades 6-8) were current smokers (CDC, 2010), so given this information, future tobacco control curricula should target children at a younger age and continue to follow their smoking status through primary education and beyond. Glynn (1989) suggests implementing tobacco control initiatives specific to 6th grade youth to address pre-smoking onset issues (i.e., before smoking onset process has begun), and to continue the intervention through 9th grade so adolescents would be less at risk during their formative years. Likewise, two recent studies indicated that tobacco cessation and prevention school-based

interventions can be effective in the long term from 2-15 years (Skara & Sussman, 2003), and have the most meaningful effects on behavioral components of tobacco initiation and maintenance (Hwang, Yeagley, & Petosa, 2004).

The preceding chapter has described a plethora of information regarding adolescent tobacco control curricula design, implementation, and feedback. Given the statistics, it is evident tobacco cessation and prevention initiatives are essential in combating the ever-present issue of adolescent tobacco use. School-based interventions are the primary method in achieving such measures and while many programs are effective, there are considerable barriers to overcome in the development, implementation, and maintenance of such interventions. An interesting commentary by Sussman (2001) describes the idea of a program's "shelf life" in relation to efficacious intervention results. If schools are being asked to adopt a tobacco control program then the program's effectiveness should be evaluated to ensure the messages are still relevant to the target population. This involves developing programs that are sustainable for years and can be easily updated through multimedia approaches to evolve with present-day adolescent tobacco use trends. While our three unique adolescent tobacco control curricula have significantly addressed many issues surrounding program development, implementation, and efficacy, there are still many opportunities for improvement in future initiatives, such as translating programs into different languages, partnering with unconventional community groups like juvenile detention centers, youth outreach organizations (e.g., YMCA), and school groups, such as Future Farmers of America or athletic clubs where tobacco use is generally associated with group participation. As there is so much promise in using school-based interventions, our research team plans on utilizing previously implemented techniques as well as expand our research abilities in developing innovative adolescent tobacco control initiatives for successful dissemination.

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