

Reducing cigarette smoking among working adolescents: results from the SMART study

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Abstract

Objective: The SMART Teens Against the Risks of Tobacco Study was designed to test the feasibility and efficacy of tobacco control intervention methods for employed teens.

Methods: A randomized controlled pilot study tested the efficacy of a behavioral intervention delivered between September, 1999, and August, 2000. Baseline and final survey data were collected on 560 teens in four intervention and five control stores.

Results: Although smoking prevalence decreased and intention to quit increased more among teens in the intervention stores compared to those in the control stores, the differences were not statistically significant.

Conclusions: The worksite holds promise as a possible venue for tobacco prevention and cessation interventions for youth although further research is needed to increase the efficacy of interventions for this setting.

Introduction

Cigarette smoking in adolescents is a serious public health concern. The Healthy People 2010 objectives call for a 54% reduction in 30-day smoking prevalence and a 9% increase in cessation attempts by adolescents in grades nine to 12 [1]. Despite recent declines in 30-day smoking prevalence among teens, [2, 3] these objectives remain largely unmet. To meet the Healthy People 2010 objectives, innovative approaches are needed to boost the effectiveness of tobacco use prevention and cessation efforts among adolescents. School-based and community-based programs have been the primary locations for smoking prevention and cessation programs; however, these channels alone may not be sufficient to reduce smoking in older adolescents [4]. Similar to adults, interventions in the worksite environment may

offer adolescents support for individual behavior change attempts [5].

No studies to date have specifically examined the feasibility and efficacy of implementing behavioral tobacco control interventions in worksites for employed teens. This paper reports the results of the evaluation of a smoking cessation and prevention program for teens working in grocery stores. After eating and drinking places, grocery stores are the second largest employer of teens during the school year. Between 1996 and 1998, 13.6% of boys and 9.9% of girls ages 15 to 17 were employed in this industry [6].

SMART Teens Against the Risks of Tobacco was a Phase-2 methods development study to design and test intervention and evaluation methods for reducing smoking among employed teens. The National Cancer Institute's methodological framework for cancer control research presents Phase-2 studies as an important step in developing new approaches to health promotion. Lessons learned from a Phase-2 study may be used to inform a full-scale Phase-3 efficacy study. The study was implemented in two stages: (1) initial formative research

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and intervention design, and (2) a randomized controlled pilot study of the behavioral intervention implemented in grocery stores. The purpose of this paper is to report the results of the pilot study and the implications for further research.

Methods

Study setting

Intervention implementation and evaluation were conducted in nine grocery stores located in the Boston, Massachusetts, metropolitan area that were part of a single chain. To be eligible for the randomized trial, stores were required to employ at least 40 teens and be willing to be randomized to an intervention or control condition. We recruited and randomized 12 of 52 grocery stores located within a 45-mile radius of Boston, Massachusetts. Of these, three stores were dropped from the study because of excessive turnover of teen participants (two stores) or store closing (one store). The study was completed in four intervention and five control stores between September, 1999, and August, 2000. The study design was approved by the Institutional Review Board of the institution in which the study was located.

Intervention methods

The SMART intervention framework incorporated theories based on a social influences model [7, 8] and used peer-led methods of intervention delivery [9, 10]. The intervention focused on increasing social and behavioral skills related both to the prevention of smoking uptake and to smoking cessation [11, 12]. We used the planning process suggested by Perry [13] in which we: (1) identified factors predictive of teen smoking from the literature and from our qualitative research, (2) formulated intervention objectives stating how the intervention would change the predictive factors, and (3) planned program activities that have been shown to be associated with behavior change in teens, would attract employed teens to participate, and were feasible in the grocery store environment. We identified three categories of factors that predict teen tobacco use: social/environmental factors (social norms, role models, social support, barriers and opportunities for quitting), personal factors (beliefs about the health and social consequences of smoking, knowledge of nicotine addiction, awareness of resources for quitting, functional meaning of smoking, self-efficacy for quitting, and self esteem), and behavioral factors (behavioral intentions, skills to refuse to take up smoking or quit

smoking, communication, goal setting, and stress management). Based on these factors we developed intervention objectives to guide our program activities. Examples of intervention activities designed to address social/environmental objectives included information on bulletin boards and table tents designed to correct the common mis-perception that most teens smoke. To address personal factors we conveyed information on nicotine addiction in games and teen-to-teen interviews. To enhance teens' ability to resist influences to smoke from friends, siblings and the tobacco industry, peer leaders led discussions at teen advisory board meetings and we designed contests in which teens learned to deconstruct advertising.

Data collection

Cross-sectional samples of teen employees completed self-administered surveys prior to the beginning of the intervention activities (baseline) and following 12 months of intervention (final). All teens between the ages of 15 and 18 employed in the nine study stores at the time of the survey were eligible to participate. Non-paid workers, temporary employees, and workers on leave of absence were excluded from the survey. Eligible teens were identified from store lists provided by the individual store managers. Teens took the survey in the store on work time. Each participant provided written consent prior to survey administration. We offered incentives in the form of cash, gift certificates, or food to increase participation and compensate teens for their time.

A total of 322 teens (77% of those eligible) completed the baseline survey, while 252 (72%) responded to the survey at final. There were 78 teens who completed both surveys. At baseline, 14 teens who were not yet 15 years old completed the survey and these teens were excluded from analysis.

Measures

Both baseline and final questionnaires measured socio-demographic factors and assessments of smoking and quitting behavior. We computed three dichotomous measures assessing current smoking behavior: *current smoker* (smoked on one or more days in the last month), *frequent smoker* (smoked on 20 or more days in the last month), and *heavy smoker* (smoked 13 cigarettes per day or more on the days smoked). Among teens who reported smoking in the last 30 days we computed two dichotomous measures to ascertain *intention to quit in the next 30 days* and *quit attempt in the last six months*.

Analysis

The unit of randomization and intervention was the grocery store, while the unit of measurement was the teen employee. We conducted all analyses taking into consideration the clustering of the teens in stores. The dependent variables were binary variables as described above. The two samples represented independent cross-sectional samples of teen employees at the two time points. We computed a logistic regression analysis with intervention group and time of the survey (baseline or final) as fixed effects and the grocery store as a random effect. We used iteratively re-weighted likelihood's to fit the logistic regression model [14]. To test the difference between the intervention and control groups, we computed the odds ratio (OR) for the interaction effect of intervention group and time of the survey, its standard error and the 95% confidence interval. All analyses were carried out using the personal computer version of SAS statistical software [15].

Results

Table 1 presents the socio-demographic characteristics of working youth at baseline and final by intervention group. There were no significant differences between intervention and control groups at baseline nor at final in any of these characteristics. The teens were predom-

inantly white, non-Hispanic and were evenly distributed by gender. Virtually all of the teens were in school and almost one-third worked more than 20 hours per week during the school year.

Table 2 compares cigarette smoking and quitting of teens in the intervention and control stores. At baseline, compared to teens in the control stores, a higher percentage of teens in the intervention stores reported being current smokers, having smoked on 20 or more days in the last month and having smoked at least 13 cigarettes per day. The decrease in current and frequent cigarette use from baseline to final was greater among teens in the intervention stores as compared to those in the control stores. This is reflected in the odds ratios greater than unity. Nevertheless the confidence intervals for the odds ratios are wide and include unity, indicating that the intervention effect is not statistically significant. The percentage of teens who smoked at least 13 cigarettes per day changed very little in both groups. Intention to quit smoking among current smokers increased more among teens in the intervention stores compared to teens in the control stores. Although the odds ratio for comparing the improvement in the intervention group to that of the control is 1.75, the confidence interval is wide and includes unity. Among current smokers, the percentage of teens who made quit attempts increased in both groups but increased slightly more in the control group than in the intervention group.

Table 1. Characteristics of teens at baseline and final by intervention group

	Intervention		Control	
	Baseline (n = 149) %	Final (n = 108) %	Baseline (n = 159) %	Final (n = 144) %
<i>Age</i>				
15	34	33	22	26
16	28	26	32	26
17	23	24	26	26
18	15	17	20	23
<i>Gender</i>				
Boys	47	52	43	56
Girls	53	48	57	44
<i>Race/Ethnicity</i>				
Hispanic	6	4	8	8
White, non-Hispanic	74	64	60	58
Black, non-Hispanic	6	10	8	12
Asian	5	8	19	10
Other	10	14	9	11
<i>Attend school</i>				
Yes	99	93	97	94
<i>Hours worked per week</i>				
20+ in school year	29	33	27	40
<20 in school year, 20+ in summer	37	30	41	32
<20 in school year or summer	31	38	31	28

Table 2. Adjusted^a percentage of teens with selected smoking behaviors at baseline and final by intervention group, odds ratios (and 95% confidence limits) for improvement in intervention group *versus* control

	Intervention		Control		OR ^b	95% Confidence limits
	Baseline	Final	Baseline	Final		
<i>Current smoker (n=472)</i>						
Smoked in the last 30 days	31.9%	23.0%	22.4%	20.2%	1.38	(0.18, 10.57)
<i>Frequent smoker (n=472)</i>						
Smoked on 20+ days in the last 30	14.3%	10.9%	10.0%	10.9%	1.49	(0.19, 11.45)
<i>Heavy smoker (n=473)</i>						
13+ cigarettes/day	5.7%	6.6%	2.6%	2.5%	0.74	(0.12, 4.55)
Among current smokers						
<i>Intention to quit (n=113)</i>	40.6%	52.8%	51.9%	50.3%	1.75	(0.42, 7.34)
<i>Tried to quit last six months (n=117)</i>	38.6%	42.3%	33.8%	44.8%	0.73	(0.05, 10.01)

^a Percentages adjusted for the clustering of teens in stores.

^b Odds ratio for improvement in intervention group *versus* control.

Discussion

This is the first study to examine the feasibility and efficacy of a tobacco control prevention and cessation intervention for employed teens through the workplace. Results indicate that smoking behavior improved somewhat more among teens in the intervention stores compared to those in the control stores. The percentage of teens who reported smoking in the last 30 days decreased 28% in the intervention stores compared to a 9% reduction in control stores. Among teens who smoked in the last 30 days, the percentage reporting that they intended to quit in the next 30 days increased 30% in the intervention stores compared to a slight decrease in the control stores. Despite the greater decrease in smoking prevalence and the greater increase in intention to quit in the intervention group, none of the odds ratios were statistically significant.

The Hutchinson Smoking Prevention Project [16], which was rigorously designed and implemented, failed to show an effect of the social influences approach to school-based smoking prevention on smoking prevalence. This null effect has invoked a call for new methods and venues [17]. Several studies have documented the increased risk of smoking among employed adolescents and youth who work long hours [18, 19].

Implementing a tobacco control intervention in the worksite for adolescents, however, has inherent challenges. Staff found that high turnover rates made it difficult to follow a cohort of teens. Approximately 20% of the teen workforce turned over every 60 days in this study sample. At that rate only 26% of teens employed at

the beginning of the intervention would be employed in the same store 12 months later. In fact we found that of the 322 respondents at baseline, 78 (24%) responded to the final survey. Other challenges include the fast pace of the retail sector, inconsistent management support and stability, variable store culture, irregular schedules and part-time employment. Furthermore the intervention targeted a subset of the workforce, those ages 15 to 18. These factors may have limited the worksite-wide influences on tobacco use that might otherwise have been achieved.

A strength of this pilot study is that we were able to implement a randomized design in which stores, not individual teens, were randomized to the intervention or control condition. This cluster randomized design is common in intervention studies that address health behavior and is appropriate when the intervention builds on the social influences of the worksite [20]. Furthermore, the cross-sectional assessments give the best estimate of the worksite level of the smoking behaviors, given that the intervention targets individuals through the social context of the work-place. These design elements are unusual in a Phase-2 study but give us the best effect size and intra-class correlation (ICC) estimates for designing a Phase-3 randomized study.

As a Phase-2 pilot study, however, we did not have *a priori* estimates of effect size or within worksite correlation (intra-class correlation, ICC) for determining the sample size. The intervention effect found was weaker than we had originally estimated and the ICC was greater. This led to reduced power to detect the observed intervention effects as statistically significant. For

current use of cigarettes, we had an average of 26 teens per store at each survey time and the ICC was 0.10, yielding a variance inflation factor of 3.6. Given the magnitude of the results observed, we would need 174 stores with 26 teens per store per intervention arm or 141 stores with 100 teens per store to have 80% power to achieve a 95% confidence interval that excluded unity.

The teens in this study were employed in grocery stores, the second largest employer of teens during the school year. Nevertheless these stores may not be representative of all places of teen employment, particularly employment of teens no longer in school. Assessment of smoking status was based on self-report and was not verified using biochemical or bogus pipeline methods. We were unable to verify reported non-smoking due to the legal and practical implications of biochemical testing in the work environment.

In summary, this Phase II methods development study provided an opportunity to test intervention and evaluation methods previously unexplored. The intervention was moderately effective in reducing cigarette use and in increasing intention to quit in teens employed in grocery stores. For a Phase-3 study, the intervention and evaluation methods should be adapted to increase the effect and to assure adequate power to detect a meaningful effect as statistically significant. In particular we recommend modifying the intervention to be delivered to the entire work-force, as a means of influencing the worksite-wide social norms that provide support for non-smoking behavior. In addition, the social influences based intervention components should be combined with interventions at the environmental or organizational levels to address the multiple factors that may influence youth smoking [17].

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