Increasing Anti-Tobacco Industry Attitudes Among Youth: A Pilot Study of a Multiplayer Educational Board Game

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Abstract

Objective: An anti-tobacco educational board game, *Smoke Stacks*, was designed to engage youth in critical thinking regarding marketing practices of tobacco companies and tobacco's harmful effects. A pilot study was conducted to examine whether playing this theoretically informed board game increased knowledge about tobacco use and negative attitudes toward tobacco companies, and decreased behavioral intentions to use tobacco.

Materials and Methods: Sixty-seven teenagers aged 14–18 participated in the game assessment. Pre-/postevaluation methods were used to assess change in participant attitudes, knowledge, and intentions following gameplay.

Results: Compared to baseline, participants reported substantially increased self-perceived knowledge of the health effects of tobacco ($P=0.001$) and were significantly more likely to agree that tobacco companies encourage young people to start smoking ($P=0.001$), and that tobacco companies deny that cigarettes cause cancer and other diseases ($P=0.002$).

Conclusion: This pilot study demonstrates that youth who played *Smoke Stacks* gained perceived knowledge and increased negative attitudes toward tobacco company tactics for encouraging smoking and discounting potential health risks of cigarettes.

Keywords: Tobacco, Denormalization, Embedded design, Theory of planned behavior

Introduction

PREVENTING THE USE of tobacco products among teenagers is a crucial step in reducing tobacco's health burden. Although there have been significant declines in teenage smoking rates over the past two decades, up to 2016, this decline has not been entirely linear.¹ Between 2011 and 2014, for instance, smoking rates stabilized.² The World Health Organization Framework Convention on Tobacco Control describes the tension between the public's health and the long history of tobacco industry practices as a "fundamental and irreconcilable conflict between the tobacco industry's interests and public health policy interests."³ Despite the health risks, tobacco companies have historically targeted youth in their marketing strategies, considering young tobacco-users as critical to their overall sustainability and success.^{4,5} Some youth-focused prevention strategies highlight the conflict between health and marketing, using a tobacco industry "denormalization" approach.⁶ For example, the truth[®] campaign, one of the largest and most successful of denormalization campaigns, featured teenagers confronting the tobacco industry with historical tobacco industry claims and

has been credited for achieving 22% of the total decline in youth smoking nationwide between 1999 and 2000.⁷ Longitudinal data have demonstrated that such anti-tobacco media campaigns have significant results in the reduction of 2-year quitting and smoking reduction among young adult daily smokers.⁸

Apart from traditional broadcast media, digital and analog games provide an additional avenue for distributing health promotive and anti-tobacco messaging to youth. Beginning in the late 1970s, so-called serious or educational games were developed to reach young people with educational content.⁹ Educational games and socially oriented "serious games" aim to increase learning through immersive experiences and heightened engagement, using the processes of game mechanics persuasively, in a technique known as "procedural rhetoric."¹⁰ Due to the widespread popularity of digital media as a delivery mechanism, digital games have, in recent years, also been used to address a wide range of social attitudes and health behaviors¹¹ and to generally promote prosocial behavior.¹² The project of using games for education, however, also extends into the analog realm, and the vocabulary of "procedural rhetoric" has also found

application in the domain of card and board games.¹³ Board and card games have been designed to educate players on a variety of health-related issues,¹⁴ from increasing nutrition knowledge and changing dietary behavior¹⁵ to promoting dialogue about HIV-related stigmas.¹⁶ These analog educational games deploy not only text and images but also tap into the medium-specific affordances of games, including mechanics, rules, and social participatory play.

The use of games as components anti-tobacco campaigns is not unprecedented. In the realm of digital games, this tradition goes back to the late 1990s and includes Innovation Training Systems' development of an anti-tobacco computer game¹⁷ and the use of interactive game content on the "Ask Dr. Popkin" website.¹⁸ Even so, whether an educational game can effectively increase negative attitudes toward tobacco remains understudied. This study describes the design,

creation, and initial evaluation of *Smoke Stacks* (Fig. 1), a board game based upon the tenets of the theory of planned behavior (TPB), intended to "denormalize" the tobacco industry to shift teenagers' attitudes toward the industry.

Materials and Methods

The game

Smoke Stacks was designed as part of a suite of games using the *Hexacago* game board. The intention of the board is to allow health and social issues to be approached from a multisystem perspective, integrating urban social and political systems into considerations of individual behavior. *Smoke Stacks* aims to shift players' attitudes and normative beliefs toward the tobacco industry and behavioral intent to refrain from tobacco use. This design approach is informed

FIG. 1. The *Smoke Stacks* game board.

by the TPB, a behavioral theory, in which behavioral change occurs through shifting attitudes, normative beliefs, and behavioral intentions.¹⁹

To operationalize the TPB, *Smoke Stacks* was developed to shift players' attitudes and normative beliefs toward the tobacco industry and behavioral intentions to refrain from tobacco use. *Smoke Stacks* is played from the perspective of a tobacco company. To operationalize "denormalization," the key factor in the truth, the game uses an embedded design technique called "strategic inversion" that uses satirical distance to approach its core theme in a subversive manner that is more accessible to players.²⁰ Previous games to use this approach include *Killer Flu*, a 2009 videogame about epidemiology and pandemics, in which the player occupies the role of the flu and attempts to infect as much of the simulated population as possible. Similarly, *Smoke Stacks* puts the player in an initially appealing position of power (i.e., a tobacco company), but gradually reveals the manipulative approaches and health harms perpetuated by the tobacco industry.

Smoke Stacks is designed for four to eight players. Each player adopts the role of a tobacco company advertising executive, with the goal of accumulating the highest profit. Constructing a marketing campaign requires three cards: a marketing channel card, a product card, and an advertisement card.

Marketing channel cards are the media that tobacco products are advertised through. Each card specifies a dice roll, representing the medium's potential effectiveness. Product cards are the tobacco substances that the player manufactures and sells. Sales prices listed on the card accurately reflect real-world prices, which determine the money obtained during a turn. Advertisement cards define the overall marketing campaign. These cards correspond with customer tokens on the game board, each defined by attributes and aspirations (e.g., "American," or "sophisticated"). Players can hold up to two advertisement cards, allowing them to target multiple customers during their turn.

After initial set-up, *Smoke Stacks* has three play phases: bid, market, and resolve. During bidding, marketing campaign cards are auctioned off. Players can strategically block their opponents by driving up the bidding price for particular cards, or out-bidding for cards they do not need or necessarily want. However, once a player has won a card, they forfeit their bids for the remainder of the phase. During marketing, players choose a neighborhood and roll dice according to their marketing channel card, determining the number of customers who have purchased a player's tobacco product. Due to the random distribution of customer tokens on the game board, players may not be able to acquire the full number of customers indicated by the roll. In this way, diverse marketing strategies are rewarded. In the resolve phase, players receive money for each customer they collected and retained.

At the end of the second round, another die roll, "the health die," comes into effect. With this roll, customers begin suffering the negative health consequences of tobacco use. These customers are then placed on a special board, where the increasing number of morbidities and mortalities activates additional game rules corresponding to historical tobacco legislation (e.g., Federal Cigarette Labeling and Advertising Act or The Tobacco Master Settlement Agree-

ment). Thus, players "denormalize" tobacco use as they draw a connection between their profit and morbidity in the Chicago communities where they live. The game ends once the legislation is up to date; the player with the most money is the "winner." Even so, all the players are faced with the detrimental health costs of their tobacco advertising campaigns and sales.

Game evaluation procedures

The pilot study was conducted between October and December 2014. Students were recruited through flyers distributed to schools and youth-serving organizations as well as through website and social media platforms. Eligibility criteria included being 14–18 years old and attending a high school in the Chicago metropolitan area. Given the exploratory nature of this study, which focused mainly on the feasibility and acceptability of a game-based intervention on tobacco use, convenience sample was recruited. Thus, a power calculation was not used as we lacked sufficient outcome data from which to estimate power.

To evaluate the game, participants completed a pregame survey. Immediately following the survey, the game was introduced. A member of the research team read from a script explaining the rules of the game. Participants then played through the game in groups of four to eight players. A research team member helped facilitate gameplay and was available for rule clarification. All groups played the game once, and the average play session length was ~60 minutes. Following gameplay, participants completed an immediate-postsurvey. All methods and procedures were approved by the Institutional Review Board of the University of Chicago's Biological Sciences Division. All participants provided written informed consent or assent for minors before study enrollment and participation in the research session. Written parental consent was also obtained for all participants younger than the age of 18 years. Both informed consent forms and minor assent forms were read aloud to ensure participant comprehension. The IRB protocol was determined to be minimal risk to participants as all participation was voluntary and surveys were confidential.

Measures

Baseline measures included sociodemographic characteristics (e.g., age, sex, and race/ethnicity) and questions about lifetime and current tobacco use. Participants also answered questions about tobacco knowledge, attitudes, and behavioral intentions to use tobacco. Measures of tobacco attitudes were adapted from the Legacy Media Tracking Survey, which was used to evaluate the truth campaign (Table 2). One item inquired about perceived knowledge of the health effects of tobacco. Two additional items explored interest in anti-tobacco advocacy. Participants were also asked to respond to four items on behavioral intention to use tobacco and electronic cigarettes "soon" and "anytime during the next year." Response categories ranged from 1 = "definitely no" to 4 = "definitely yes." The postgame survey included questions about tobacco knowledge, attitudes, and behavioral intentions. Participants also answered questions about the play experiences and opinions of the game. Two items addressed game relevance: "Do you think the game *Smoke Stacks* is relevant to your family (yes/no)?" and "Do you think

TABLE 1. PARTICIPANT CHARACTERISTICS (N=67)

Variable	% Yes (n)
Sex	
Women	55 (37)
Men	45 (30)
Race/Ethnicity	
American Indian	3 (2)
Asian	3 (2)
Black/African American	76 (51)
Latino/Latina	7 (5)
Multiracial	10 (7)
Age	
14	28.4 (19)
15	31.3 (21)
16	20.9 (14)
17	14.9 (10)
18	4.5 (3)
Current tobacco use (past 30 days)	1.5 (1)
Current electronic cigarette use (past 30 days)	6 (4)
Lifetime tobacco use	19.4 (13)
Lifetime electronic cigarette use	6 (7)
Gamers by type (once a week or more)	
Cell phone	70.1 (47)
Console	53.7 (36)
Computer	37.9 (25)
In-person (board or card games)	25.4 (17)

the game *Smoke Stacks* is relevant to your community (yes/no)?” To assess what parts of the game most resonated with the players, participants were provided the stem, “The game made me think about” followed by 10 statements about the game (e.g., “the health effects of tobacco,” “the many ways companies can advertise”) and instructed to check the three responses that best reflected their thoughts on the game.

Data analysis

Descriptive statistics were used to describe the study participants and variables such as tobacco use and gameplay frequency. Pre-/postcomparisons using paired *t*-tests and McNemar chi-square tests explored differences in self-reported knowledge of the health effects of tobacco use. Wilcoxon signed rank tests were used for nonparametric data. All quantitative analyses were performed using Stata13.

A logistic regression model, including sociodemographic characteristics, tobacco company attitudes, and tobacco use,

was used to examine associations between individual and outcome variables.

Results

Participants

There were 67 participants, 55% of whom were young women. The median age of participants was 15 years. The sample was predominantly African American (76%). Additional demographic variables are reported in Table 1.

Table 2 details all pre-/postcomparisons for tobacco knowledge, attitudes, and beliefs about tobacco companies. Self-reported perceived knowledge of the health effects of tobacco significantly increased pre-/postgameplay (mean $[M]=2.81$ [95% confidence interval, $CI=2.61-3.01$] vs. $M=3.31$ [95% $CI=3.15-3.47$], respectively [$t=-4.79$, $P<0.001$]). In addition, endorsement for two attitudinal items regarding tobacco companies significantly increased in agreement: (i) Tobacco companies try to get young people to start smoking ($M=3.42$ [95% $CI=3.16-6.68$] vs. $M=3.86$ [95% $CI=3.59-4.13$] [$t=-3.34$, $P=0.001$]) and (ii) Tobacco companies deny that cigarettes cause cancer and other harmful diseases ($M=3.37$ [95% $CI=3.09-3.65$] vs. $M=3.76$ [95% $CI=3.49-4.03$] [$t=-3.28$, $P=0.001$]). Marginally significant changes were observed in agreement with the statement: Tobacco companies deny that cigarettes are addictive ($M=3.49$ [95% $CI=3.23-3.75$] vs. $M=3.66$ [95% $CI=3.37-3.95$] [$t=1.53$, $P=0.108$]). No other significant differences were observed for tobacco attitudes and beliefs.

Marginal but not significant differences were detected for behavioral intentions to use tobacco and e-cigarettes soon ($P<0.10$). There were no significant differences observed for behavioral intentions for tobacco or e-cigarette within the next year. Less than half (42%) of participants, reported that *Smoke Stacks* was relevant to their family, and 87% found that *Smoke Stacks* was relevant to their community. The most frequently endorsed statement relating to the game was that, *The game made me think about the health effects of tobacco* (60%), followed by *The game made me think about the many ways tobacco companies can advertise* (40%), and *The game made me think about a family member who uses tobacco* (37%). No significant associations were found for socio-demographic characteristics, including age, gender, and race/ethnicity, and intervention outcome variables (e.g., tobacco company attitudes, knowledge, and game relevance), for both pre- and postassessments. A significant association was found between age and lifetime history of tobacco product

TABLE 2. PRE-POSTGAME ATTITUDES TOWARD TOBACCO COMPANIES (N=67)

Attitude item (1 = strongly disagree, 5 = strongly agree)	Pregame, mean (SD)	Postgame, mean (SD)	P
Tobacco companies lie.	3.70 (1.04)	3.79 (1.10)	0.561
Tobacco companies try to get young people to start smoking.	3.42 (1.07)	3.86 (1.11)	0.001
Tobacco companies deny that cigarettes cause cancer and other harmful diseases.	3.37 (1.18)	3.76 (1.13)	0.002
Tobacco companies deny that cigarettes are addictive.	3.49 (1.07)	3.66 (1.20)	0.108
I would like to see tobacco companies got out of business.	3.84 (0.96)	3.93 (0.97)	0.424
I want to be involved in efforts to get rid of smoking.	3.80 (0.95)	3.77 (1.11)	0.784
Taking a stand against tobacco products is important to me.	3.76 (0.82)	3.90 (0.96)	0.151

use (odds ratio [OR]=2.09 [95% CI=1.16–3.75], $P=0.014$), but not by gender or race/ethnicity. The only other significant association was participant reported relevance of the Smokestacks intervention to family members and reported family member tobacco use (OR=2.36 [95% CI=1.11–5.02], $P=0.026$).

Discussion

This study describes the design and evaluation of a board game designed to increase negative attitudes towards tobacco companies and decrease teenagers' intentions to use tobacco products.

Smoke Stacks demonstrates how tobacco works at both a systems level and individual level. The *Hexacago* board allows players to adopt an aerial view of the interaction between tobacco companies and prospective individual customers. Players are positioned as the purveyors of tobacco products, rather than the users. Yet, using strategic inversion, the game gradually reveals to players that they are more akin to targeted tobacco users than the companies. In this way, the game invites youth to step into positions of powerful companies to more fully understand their motivations and to use critical thought to gain awareness of the health harms and ethical problems that this position entails. The game also promotes a change in some attitudes about tobacco companies. Statistically significant change occurred for only three tobacco company measures out of seven. It is not clear why not all attitudes changed; although two, relating to advocacy, were topics not addressed directly in the game.

Youth in our study reported low rates of tobacco use with only one student having smoked a cigarette in the past 30 days. The low prevalence of cigarette smoking may explain why shifts in behavioral intention were not observed among youth who played *Smoke Stacks*. Future research might consider the effects of the game in a higher risk demographic.

Strengths of this study should also be noted. First, it demonstrated that an hour-long board game can influence tobacco attitudes among young people, offering an alternative educational approach to more traditional pedagogical methods. While intensive interventions have been effective in changing a number of health behaviors, there is a need for brief interventions that require less infrastructure. Board games are relatively low cost and easy to disseminate, and self-administered, and thus may offer a novel approach to health behavior change. Second, the *Hexacago* board helps young people understand the tobacco industry via a social ecological perspective.²¹ The “customer” game pieces represent the health effects of tobacco on individuals, whereas the neighborhoods displayed on the *Hexacago* board reveal the community-level impacts of tobacco. Individual players assume the role of a tobacco company, which serves to demonstrate how industry influences tobacco use. Finally, players negotiate the macrolevel policy system over the course of the game as they encounter historical tobacco policies and regulations.

There are a number of limitations to this study. First, the game was studied with a small convenience sample. Second, the game was played once, immediately after the baseline survey. Thus, there is no ability to assess changes in attitudes over time. Third, we did not perform in-depth qualitative research and lack information related to perceived acceptability and usefulness, perceived difficulty, and general en-

joyment. Third, this study assessed the effect of gameplay alone, absent of any insertion into a larger curriculum or even any postgame discussion. Fourth, this game assessed attitudes and intentions, an intermediate outcome. Longitudinal data would be needed to understand actual behaviors. Finally, there are limitations baked into the game board itself. Since *Smoke Stacks* has been designed around the preexisting *Hexacago* board, it is regionally specific. Future iterations of the game would benefit from being more adaptable, including for possible use in an international context.

The aforementioned limitations suggest some future directions for this game. This study was primarily quantitative. Qualitative data could provide additional information about attitudes, satisfaction, and learning from the game. This initial study focused heavily on gauging *Smoke Stack's* efficacy at encouraging critical thinking regarding marketing practices of tobacco companies and tobacco's harmful effects. Future research could more fully integrate measures of participant enjoyment and satisfaction as well as perceived acceptability and usefulness.

Finally, as development of *Smoke Stacks* moves forward, future studies should ideally test the game within the context of a larger curriculum providing in-depth information about tobacco products, including products not mentioned in this game such as electronic cigarettes.

Author Disclosure Statement

Drs. Gilliam and Jagoda co-own Resilient Games Studio, LLC and Ashlyn Sparrow is a director. The company was founded to develop and scale games.

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