Could adolescents be the vehicle that transfers a no-smoking rule from school to home?

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ABSTRACT

INTRODUCTION Banning smoking at home, schools, children's playgrounds and indoor environments, constitutes an integral part of tobacco control efforts to prevent uptake of smoking among young teenagers. We aimed at exploring the role of teenagers as facilitators of change in enforcing a home no-smoking rule following school-based anti-tobacco programs and examining the effect of home no-smoking rule on teenagers' intention to smoke.

METHODS A school-based intervention-control study was implemented during the 2016–2017 academic year among middle-school students in Athens, Greece. The experiential learning intervention was delivered using an interdisciplinary approach, bridging excerpts from ancient classical Greek myths and ancient classical literature, with their decoded archetypal symbols applied in a smoking and tobacco control paradigm. An anonymous self-administered questionnaire was used at baseline, and at follow-up at 3 months to evaluate program effectiveness. A chi-squared test was used for categorical variables and a t-test for continuous variables. Cohen's distance (d) was employed to examine the intervention effect size. A two-tailed $p \leq 0.05$ was considered statistically significant using IBM SPSS V.22.

RESULTS In all, 351 students participated. At baseline, 47.5% in the intervention group reported a home no-smoking rule and 86% indicated being unlikely to smoke, these increased to 61.3% ($p=0.016$) and 98.2% ($p<0.001$) at follow-up, respectively. Cohen's d value was calculated to estimate the effect size of intervention. A large effect size of intervention was found in the intervention group ($d=1.24$), whilst $d=0.19$ in the control group.

CONCLUSIONS Our study showed that our intervention led to the increase of no-smoking rules at home and to a negative intention towards smoking of adolescents. Consequently, we provide evidence that students are effective vehicles for carrying anti-smoking messages to their home environment including the no-smoking rule. Additionally, we confirmed previous reports that home no-smoking rule is associated with a negative intention to smoke and risk of smoking.

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INTRODUCTION

Tobacco control programs span through a myriad of approaches, including relevant legislation, tobacco control policies, anti-tobacco population campaigns, school-based preventive programs, and smoking cessation services[1]. A smoking ban at home, schools, children's playgrounds and indoor environments in general constitutes an integral part of tobacco control efforts aiming to prevent the uptake of smoking among young teenagers[2,3]. While the change in beliefs and attitudes about smoking among teenagers imposes complex challenges, home no-smoking rules represent a relatively simple and practical approach for smoking prevention[4]. Specifically, this rule has been shown to lower the risk of smoking initiation among adolescents, even if their friends[5] or both parents are smokers[3,6]. Furthermore, it empowers tobacco control attitudes and lowers teenagers' perceived prevalence of smoking[7]. In addition, it eliminates images of role models of smoking at home[8], and increases the intention to quit smoking among family members leading to successful smoking cessation[9], and overall decreased risk of adolescent smoking[10-12]. Lastly, a home no-smoking rule protects children from secondhand and thirdhand smoke[2,13], and may also serve as a non-smoking norm at home even if parents are smokers[14].

In contrast, smoking at home facilitates the exposure of teenagers to smoking behavior and negative parental role modeling and has been associated with positive beliefs, attitudes and expectations towards tobacco. In addition, it leads to a higher intention to smoke as well as a higher probability of smoking among teenagers[15-18]. Furthermore, it facilitates access to cigarettes and other tobacco products, while it undermines the value of role modeling of non-smoking parents or other adult household members[19,20].

While the above-cited studies have shown an association of the home no-smoking rule with different aspects of adolescent smoking, there is little in the international literature on whether teenagers may also serve as vehicles of change at home using a bottom-up approach. Therefore, our study aimed to improve adolescents' knowledge so that they can act as facilitators of change in enforcing the home no-smoking rule following school-based anti-tobacco programs.

METHODS

The study was implemented during the 2016–2017 academic year among middle-school students in Athens, Greece, under permission from the Greek Ministry of Education and approval from the Bioethics Committee of Evangelismos Hospital (16/6/2016, Protocol number 131), an affiliated hospital of the National and Kapodistrian University, Medical School. The study was implemented in five middle schools. Students from 1st to 3rd middle-school grade were invited to participate in either in the intervention or control group. Written informed consent was signed by students' parents who participated in the study.

The intervention used an experiential learning approach that included the reading of an excerpt from the Histories Book 5: *Terpsichore* [Herodotus' Histories (5.92)] [21]. This is a parable from the story of the tyrant of Corinth, Periandros, who was wondering how to protect his power and was told that the best way was to destroy the strong sheaves of the field, representing the most accomplished members of the society. Using this parable, adolescents were paralleled with the strongest sheaves, which have the potential to become the modifiers of society and play an active role in shaping a healthier community away from substance abuse and addiction. This was followed by a class discussion of its meaning through a focused retrieval and decoding of archetypal symbols, as reflected and applied in real-life scenarios, including tobacco control messages. After the intervention, students participated in role-playing and encouraged to declare their contribution as the strong sheaves of the community. As a follow-up activity, students were guided to write a letter to their parents to motivate them to implement the no-smoking rule at home.

Our intervention occurred in school classrooms of 20–25 students during their everyday program and lasted for two school hours plus the in-between break. Students from both groups completed anonymous self-administered questionnaires twice (before and after the intervention). Data collection lasted for about seven months (academic year 2016–2017) at five public schools in the northwestern suburbs of Athens. To avoid performance bias, the experiential learning intervention was carried out by the same investigator in all class sessions. The

home no-smoking rule was documented by students' reports at baseline and at the follow-up at 3 months using the following multiple-choice item: 'What rules are applied at your home related to smoking?'. Responses included: 1) No one is allowed to smoke inside the house, 2) Smoking at home is allowed only for guests, and 3) Smoking is freely allowed for everyone. A pre- and post-intervention item was also used to evaluate students' intention to smoke regarding their likelihood of taking up smoking in the future (12 months) following the intervention.

Data were entered into a computerized database and analyzed using the statistical package for social sciences (IBM SPSS v 22). Associations were assessed between a home no-smoking rule and the intention to smoke among students in the intervention and control groups at baseline and at the follow-up at 3 months.

Chi-squared tests were used for categorical variables and t-tests for continuous variables. To discretely assess students' knowledge, attitudes and intention toward smoking, a total score was calculated for each outcome. For corresponding questions: positive answers were tabulated as 1, negative answers as -1, and neutral answers as 0. The score of the knowledge and attitudes scale takes values from -16 (incomplete knowledge and attitudes) to +16 (full knowledge and attitudes). Attitudes scores ranged from -9 to +9, respectively. A two-tailed p-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 351 students participated in our study, with 181 (51.6%) in the intervention group and 170 (48.4%) in the control group. The mean age of student participants was 13.00±0.96 years; 12.76±0.91 years in the intervention and 13.26±0.95 years in the control group (p<0.001). The majority of participants were female (191; 54.5%), and the distribution of middle-school students across grades was 202 (57.5%) in Grade 1, 68 (19.4%) in Grade 2, and 81 (23.1%) in Grade 3. There was a significant difference in age distribution between the intervention and control groups.

In the intervention group, 80.7% of students before the intervention and 94.5% (p<0.001) after the intervention replied that they believe they will not smoke in the future (Table 1). There was no impact of gender between the intervention and control group (p=0.335) and the gender ratio was very close to 1:1. Within males, the belief that they will not smoke increased (75.9% pre vs 91.9% post, p=0.015). In females, similar results emerged (85.1% pre vs 96.8% post, p=0.017).

In the intervention group, reporting that no one is allowed to smoke at home increased after the intervention (47.5% vs 61.3%, p=0.016), whilst in the control group, no significant change was noticed (51.8% vs 50%, p=0.922) (Table 2). Reporting

Table 1. Intention to smoke

Intention	*Intervention group (n=181)* n (%)	*Control group (n=170)* n (%)	*p*
I will smoke in the future (Before intervention)			0.764
Not possible	146 (80.66)	140 (82.35)	
Possible	30 (16.57)	24 (14.12)	
Very possible	5 (2.76)	6 (3.53)	
I will smoke in the future (After intervention)			<0.001
Not possible	171 (94.48)	128 (75.29)	
Possible	9 (4.97)	35 (20.59)	
Very possible	1 (0.55)	7 (4.12)	
Gender			0.335
Males	87 (48.07)	73 (42.94)	
Females	94 (51.93)	97 (57.06)	
I will smoke in the future (Intervention group: n=174 males)	**Before intervention**	**After intervention**	0.015
Not possible	66 (75.86)	80 (91.95)	
Possible	18 (20.69)	6 (6.90)	
Very possible	3 (3.45)	1 (1.15)	
I will smoke in the future (Intervention group n=188 females)	**Before intervention**	**After intervention**	0.017
Not possible	80 (85.11)	91 (96.81)	
Possible	12 (12.77)	3 (3.19)	
Very possible	2 (2.13)	0 (0.00)	
I will smoke in the future (Intervention group n=362)	**Before intervention**	**After intervention**	<0.001
Not possible	146 (80.66)	171 (94.48)	
Possible	30 (16.57)	9 (4.97)	
Very possible	5 (2.76)	1 (0.55)	

that both parents do not smoke did not statistically change in either the intervention group (48.1% pre vs 42.5% post, p=0.291) or in the control group (50% vs 53.5%, p=0.515). In the intervention group, the existence of a no-smoking ban was statistically significantly associated with the intention to smoke among teenagers (p<0.001) both before and after the intervention (Table 2). The intention to smoke in the next 12 months and parental non-smoking status were neither associated before (p=0.053) nor after

Table 2. Association between the no-smoking rule at home and the intention to smoke

	No one allowed to smoke at home n (%)	*Only visitors allowed n (%)*	*Allowed n (%)*	*p*
Home no-smoking rule***				
Intervention group				0.016
Before intervention	86 (47.5)	39 (21.5)	56 (30.9)	
After intervention	111 (61.3)	35 (19.3)	35 (19.3)	
Control group				0.922
Before intervention	88 (51.8)	39 (22.9)	43 (25.3)	
After intervention	85 (50.0)	42 (24.7)	43 (25.3)	
Parents smoking	**Both parents smoke**	**Parents do not smoke**		
Intervention group				0.291
Before intervention	94 (51.9)	87 (48.1)		
After intervention	104 (57.5)	77 (42.5)		
Control group				0.515
Before intervention	85 (50.0)	85 (50.0)		
After intervention	79 (46.5)	91 (53.5)		
Home no-smoking rule and intention to smoke***	**No one allowed to smoke at home**	**Only visitors allowed**	**Allowed**	
Intervention group				
Will not smoke in the future	74 (86.0)	36 (92.3)	37 (66.1)	Before intervention p<0.001
Possible to smoke in the future	12 (14.0)	3 (7.7)	15 (26.8)	
Very possible to smoke in the future	0 (0.0)	0 (0.0)	4 (7.1)	
Will not smoke in the future	109 (98.2)	30 (85.7)	32 (91.4)	After intervention p<0.001
Possible to smoke in the future	2 (1.8)	4 (11.4)	3 (8.6)	
Very possible to smoke in the future	0 (0.0)	1 (2.9)	0 (0.0)	
Control group				
Will not smoke in the future	82 (93.2)	28 (71.8)	30 (69.8)	Before intervention p<0.001
Possible to smoke in the future	5 (5.7)	8 (20.5)	10 (23.3)	
Very possible to smoke in the future	1 (1.1)	3 (7.7)	3 (7.0)	
Will not smoke in the future	77 (90.6)	27 (64.3)	24 (55.8)	After intervention p<0.001
Possible to smoke in the future	7 (8.2)	12 (28.6)	16 (37.2)	
Very possible to smoke in the future	1 (1.2)	3 (7.1)	3 (7.0)	
Parents smoking and intention to smoke	**Both parents smoke**	**Both parents do not smoke**		
Intervention group				
Will not smoke in the future	70 (47.6)	77 (52.4)		Before intervention p=0.053
Possible to smoke in the future	21 (70.0)	9 (30.0)		
Very possible to smoke in the future	3 (75.0)	1 (25.0)		
Control group				
Will not smoke in the future	98 (57.3)	73 (42.7)		After intervention p=0.435
Possible to smoke in the future	6 (66.7)	3 (33.3)		
Very possible to smoke in the future	0 (0.0)	1 (100.0)		

*Adolescents' intention to smoke in the future (following 12 months); their belief /prediction about the likelihood of themselves to smoke in the following 12 months. **No smoking rule at home; smoking is not allowed at home as a family rule.

the intervention (p=0.435) (Table 2).

We observed a statistically significant improvement in knowledge acquisition in the intervention group, which was not seen in the control group. Overall, the mean knowledge score was increased by 1.24 standard deviations in the intervention group and by 0.19 standard deviations in the control group, which indicates that the intervention is effective in the improvement of knowledge that leads to the enhancement of the no-smoking rule at home. Further, we observed an increase in non-smoking intention in the intervention group, as students reported that they were unlikely to smoke in the 12 months following the intervention.

DISCUSSION

We found that the observance of the home no-smoking rule was associated with students' lower intention to smoke in the future, in agreement with the literature, which documents that environments free from tobacco smoke protect students from exposure to secondhand smoke[8,13,22] and from the uptake of smoking behavior[3,6,12,15]. Furthermore, our school-based intervention contributed to the diffusion of tobacco control messages to students' parents and to a higher percentage of enforcement of the home no-smoking rule.

The relevant literature shows that parents' smoking behavior has a significant effect on children smoking choices. Children may also exert a positive impact on parents' attitudes and behavior as well as influence community norms and serve as vehicles of change[23]. Genuine open discussions between parents and their children regarding smoking behavior may also have positive outcomes in preventing teenagers' smoking initiation[24].

Experiential learning programs at schools appear effective in engaging students in active participation. In addition, the combination of experiential learning with multidisciplinary approaches using ancient Greek literature, applied in our program, provided students with the opportunity to deviate from the passive role of listener and engage in active participation, developing creative and critical thinking, and providing a level platform for all students to be involved irrespective of their academic performance[25-27].

Our study provided evidence that adolescents could act as vehicles of non-smoking messages from school to home. Therefore, our findings could encourage students and children to undertake active roles in educational and community settings to diffuse public health messages in general and tobacco control messages in the home, with family and in community environments.

Strengths and limitations

The strengths of our study are that we used a simple, solid, clear home no-smoking rule as an easily implemented guideline, which has a significant and multi-level effect on adolescents' and adults' smoking. We also used an experiential learning method that is a successful approach for engaging students without triggering resistance to transfer knowledge and skills related to tobacco control messages at home, where an innovative component, classic texts of the ancient Greek literature, was added.

The limitations of our study include the use of a convenience student sample and a self-reported questionnaire that may lead to socially acceptable responses. However, although the student participants were enrolled from five schools in the northwest region of Athens based mainly on the collaboration of school directors, we believe that the selected student population may be relatively representative of the students attending public schools in Athens because the student population of the public education system is more or less homogeneous with respect to socioeconomic status and school performance, as research has indicated that socioeconomic status can mediate adolescents' SHS exposure[28]. Additionally, most of the literature concerning adolescents' smoking refers to the use self-reported questionnaires and not biochemical markers, as smoking in adolescence is usually occasional. Moreover, the effectiveness of the intervention was evaluated only at the follow-up at 3 months, however, peer reviewed literature supports that short-term positive finding are usually persistent over longer periods[29] . Data collection was available from students who were present on the day of intervention and at follow-up. In accordance with wider literature, absent students tend to demonstrate lower academic achievement and appear more susceptible to addictive behaviours[30,31]. However, potentially high-risk students were not

differentially absent from one of the two comparison groups. Finally, students who did not participate may introduce selection bias since they may originate from households with lower awareness about smoking[32]. Nevertheless, in our study, the proportion of student smokers was similar in both groups.

CONCLUSIONS

The findings of our study support that our experiential learning program was successful in improving adolescent students' knowledge about smoking. It also re-confirmed that the home no-smoking rule had a measurable and significant effect on a negative intention to smoke among adolescents. Children from a home with indoor smoking restrictions were less likely to express an intention to smoke in the next 12 months. In addition, we documented that students from the intervention group were effective facilitators of tobacco control messages to their home environment, thereby increasing the percentage of home no-smoking rules enforced at follow-up. This is an important finding, showing that students may also be successful transmitters of anti-smoking messages and may have a loud voice on such matters. Increasing the prevalence of home no-smoking rule leads to several advantages including the decrease of second- and third-hand smoke exposure and associated risks for adolescents and adults, decreased risk of smoking uptake from adolescents, and propagation of such rules in homes of students who will become adults and future parents.

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CONFLICTS OF INTEREST
The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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DATA AVAILABILITY
The data supporting this research is available from the authors on reasonable request.

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