

Adolescents' Perceived Risk of Harm Due to Smoking: The role of extracurricular activities

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Abstract

Purpose: Tobacco use initiated during adolescence often leads to continued use in adulthood. There are multiple factors influencing initiation, including low perceived risk of harm. Adolescents involved in school-based extracurricular activities have opportunities to interact with coaches, leaders, and group supervisors who may influence their perception of risk. The purpose of this study was to examine the role of extracurricular activities and adolescents' perceived risks of harm of tobacco use, utilizing an existing dataset.

Methods: The 2016 National Survey on Drug Use and Health (NSDUH) dataset was used for a cross-sectional study of youth, ages 12 to <18 years. Adolescents involved in one or more school-based, extracurricular activities were compared with adolescents involved in no activities. The key variable was the response to the NSDUH question regarding perceived risk of harm from daily smoking (≥ 1 packs of cigarettes). Chi-square tests and multinomial logistic regression were used to analyze the data.

Results: At the time of the 2016 NSDUH study period, among the adolescents aged 12 to <18 years ($n=4,308$), 17.5% indicated that they did not participate in any extracurricular activities and 10.6% reported no/slight perceived risk of harm associated with tobacco use. Adolescents who did not participate in extracurricular activities were more likely to report no/slight risk of harm from smoking (Adjusted Odds Ratio, AOR= 2.21 [95%CI: 1.62, 3.02]) as opposed to the perception of great risk of harm.

Conclusion: Adolescents who are not involved in extracurricular activities are more likely to endorse the perception that cigarettes have no/slight risk of harm. School-based extracurricular activities may provide unintended benefits to adolescents; health care professionals, including dental hygienists, should be aware of this associated health benefit.

Key words: adolescent smoking, perceived health risk, tobacco use, extracurricular activities, dental public health

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Introduction

Adolescence, the life stage of increasing independence, development, and change, is also a period associated with increased risk-taking behaviors.¹ Adolescent autonomy often occurs during the same time as reduced adult supervision. There are risk-taking, novelty-seeking, independence-seeking behaviors during adolescence, that theoretically increase success in separating from the family, transitioning into adulthood, and finding a mate.¹ However, this developmental pattern may have consequences that are at odds with modern life, such as living longer with a parent or parents, being financially dependent upon one's family longer, and selecting a mate later in life.¹ Opportunities frequently arise during

adolescence to initiate or engage in risk-taking behaviors, some of which may be biologically driven, that would not be sanctioned by parents/guardians/other adults. These risk-taking behaviors include the unhealthful use of a wide range of substances, particularly alcohol and tobacco. Research has shown that adolescent risk-taking behaviors increase in the presence of peers, even when the adolescent has been provided information regarding negative outcomes.² Adolescents engaging in inappropriate risk-taking behaviors pose concern to their parents/guardians and other caring adults, including counselors, teachers, and health care providers.³

There are numerous negative health consequences associated with tobacco use, including smoking-related cancers, cardiovascular and metabolic diseases, pulmonary disease, and conditions associated with negative pregnancy and childbirth outcomes.⁴ Additional consequences include lung cancer and coronary heart disease from secondhand smoke as well as fires.⁴ Some of the specific oral health implications of tobacco use include oral cancer, periodontal disease, tooth loss, gingivitis, halitosis, and palatal petechiae. Since 1964, over 20 million deaths in the United States (US) have been attributed to smoking.⁴ Over 90% of adult smokers began using tobacco before the age of 18.⁴ It is also concerning that 68.9% of cigarette smokers who ever tried a cigarette just once, progressed to daily smoking.⁵ Tobacco use remains a major public health issue and is of particular relevance to oral health care professionals. Overall health as well as oral health are impacted by tobacco use and dental professionals have been called on to promote never beginning to use tobacco, as well as tobacco cessation, through a variety of programs.

Considering the high conversion rate, adolescence is an important time to address and reduce tobacco experimentation.⁵ An increase in activities, with adult oversight of adolescent time, may be helpful in reducing the conversion rate. Extracurricular activities, such as sports, cheerleading, choir, band, student government, and clubs all have adult coaches, leaders, and group supervisors. Sports participation, recreational physical activity, and physical education classes have been shown to have the potential for preventing or delaying unhealthful use of harmful substances.⁶

While a number of studies have examined the specific relationship between sports and unhealthful substance use, results are inconclusive.⁷⁻⁹ Some researchers identified a lower use of cigarettes in adolescents involved in sports as compared with adolescents who were not involved with sports.^{6,10} However, other studies have indicated that the protective effects are dependent on the type of sport, such as the non-contact sports of cross-country, gymnastics, swimming, tennis, track and volleyball. Negative effects have been found in high-contact sports such as football, wrestling, hockey, and lacrosse.¹¹ In a meta-analysis of tobacco use among male high school athletes, sports participation was shown to be a predictor for smokeless tobacco use but not cigarette use.¹²

In regards to other extracurricular activities, researchers who examined non-sport activities (music, choir, dance, band, and clubs), as well as sports, found that students, ages 10 to 14 years, were less likely to use tobacco if they participated in team sports; while the role of other activities failed to reach significance.¹³ Another study examining the role

of extracurricular activities, showed that adolescents participating in extracurricular activities were less likely to use tobacco; however, the effect of the activities diminished over time.¹⁴

The Health Belief Theoretical Model (HBTM) of Behavior is based on the concept that the likelihood of adopting preventive, healthful behaviors is influenced by demographic/socio-psychological variables.¹⁵ According to the HBTM, individuals are willing to adopt or aspire to certain health-related behaviors or habits in order to avoid illness/sickness/poor health outcomes, if certain constructs are met. The HBTM of Behavior includes: the individual's perceptions of susceptibility to poor health consequences; severity of the consequences; benefits to complete the preventive, healthful behavior; barriers to take action to complete the healthful behavior; and the self-efficacy to accomplish the healthful behavior.

Two other features of HBTM of Behavior, cues to action to encourage an action, and modifying variables, such as demographic and psychosocial variables, also are recognized as influencing healthful behavioral practices. Perception of harm as it relates to health consequences of tobacco use is a variable of particular interest.¹⁶ Perceived harm is recognized as a key component of several other behavioral health change theories, and is targeted in interventions. Risk perception is a critical determinant of health behavior. Successful interventions include changing these perceptions to improve health behaviors.¹⁶

Adolescence is a formative period and an opportune time to engage change; it is possible that by modifying risk perception in adolescence through school-based activities will prevent or delay future tobacco use. The purpose of this study was to determine if there is an association between adolescents participating in extracurricular activities at school and their perception of harm from smoking ≥ 1 packs of cigarettes daily.

Methods

The study received approval as a non-human subject exempt study (secondary data analysis) from the West Virginia University Institutional Review Board (protocol number: 1801928895). The data source was obtained from the publicly available 2016 National Survey on Drug Use and Health (NSDUH) Center for Behavioral Health Statistics and Quality, 2017.^{17,18} Researchers at the Center for Behavioral Health Statistics and Quality conduct a yearly survey of civilian, non-institutionalized residents in the US, ages 12 years and above, concerning tobacco, alcohol, and other substance use, through in-person interviews at the participant's

residence, following an introductory letter.^{17,18} States within the US were the first level of stratification in the sample. Each state was then further stratified into equally populated sampling regions, census tracts, census block groups, area segments and dwelling units; sample sizes were proportional to the state population.^{17,18} Participants were then screened and interviewed; data were encrypted and transmitted to the contracted data collection/analysis corporation.^{17,18} Interviews were randomly selected for verification, after which the data were cleaned; imputations were made as necessary; and analysis weights were created (Center for Behavioral Health Statistics and Quality, 2017).^{17,18}

Study design

This study used a cross-sectional design; researchers conducted a secondary data analysis of existing data. Questionnaire data collected from the 2016 NSDUH were used for analysis. Inclusion criteria were participants between the ages 12 to less than 18 years; participants who responded to the question concerning perception of risk of harm from smoking one or more packs of cigarettes per day; and, participants who responded to the question regarding number of school-based extracurricular activities in which they participated. There were 4,308 eligible participants.

Measures

The outcome variable was based on the NSDUH question: *“How much do people risk harming themselves physically and in other ways, when they smoke one or more packs of cigarettes per day?”*^{17,18} The raw data were presented with the potential responses of “no risk; slight risk; moderate risk; and, great risk.” Participants were grouped into three categories: 1) no/slight risk of harm; 2) moderate risk of harm; and, 3) great risk of harm. The primary independent variable of interest was school-based extracurricular activities from the NSDUH question: *“During the past 12 months, in how many different kinds of school-based activities, such as team sports, cheerleading, choir, band, student government, or clubs, have you participated?”*^{17,18} The raw data were presented with the potential responses of “none; one; two; and, three or more.” The response was dichotomized to no activities, and ≥ 1 activities.

Other available variables were considered in the study with regards to the HBTM of Behavior. The following were chosen relating to the theory’s inclusion of demographic/socio-psychological variables: sex (female, male); age in years (12-13, 14-15, 16-17); family income level (less than \$20,000, \$20,000-\$49,999, \$50,000-\$74,999, \$75,000 and above); metropolitan/non-metropolitan residence (large metropolitan, small metropolitan, non-metropolitan); and parental support (a summative scalar variable). The

summative parental support variable was based upon never, seldom, sometimes, and always responses (coded 1, 2, 3, 4, respectively) which were added to create a summative score from seven NSDUH parental involvement questions. The following variables were chosen in relationship to the HBTM of Behavior inclusion of perceived benefits minus perceived barriers: smoking status (current smoker; former smoker; never smoker) and sensation seeking/enjoyment in dangerous things (a summative scalar variable from four NSDUH questions) were included as factors related to risk assessment (Figure 1).

Smoking status was determined from the responses to the questions regarding whether the participant had ever smoked; negative responses were categorized into the never smoker group. If the participant responded with a positive response to the ever-smoking question, he or she was identified as a current smoker if he/she had smoked within the past 30 days. Participants were identified as a former smoker if it had been

Figure 1. Interview items used to construct summative scores for parental support and sensation seeking*

- How often did your parents check on whether you had done your homework?
- How often did your parents provide help with your homework when you needed it?
- How often did your parents make you do chores around the house?
- How often did your parents limit the amount of time you watched TV?
- How often did your parents limit the amount of time you went out with friends on school nights?
- How often did your parents let you know when you’d done a good job?
- How often did your parents tell you they were proud of you for something you had done?
- How often do you get a real kick out of doing things that are a little dangerous?
- How often do you like to test yourself by doing something a little risky?
- How often do you wear a seatbelt when you ride in the front passenger seat of a car?
- How often do you wear a seatbelt when you drive a car? (only applies to respondents of driving age)

*Summative parental support variable based on: never, seldom, sometimes, and always. Responses were coded 1, 2, 3, 4, respectively

more than 30 days since the last time he/she had smoked. Health insurance (yes, no) was included as a factor related to the HBTM of Behavior “inclusion of cues for healthful action.” Improved access to access to care through health insurance increases access to health-related information developed to cue healthful behavior change.

Statistical analyses

Data analyses were conducted with SAS[®] version 9.3 (SAS Institute, Inc., Cary, NC). Variables were analyzed for frequency. A Chi-square test was completed to identify bivariate associations of the perception of harm from smoking ≥ 1 packs of cigarettes per day and the other categorical variables. Multinomial logistic regression was used to analyze the association among the variables. Analyses were adjusted for strata, design, and sample weights; significance level was $p \leq 0.05$.

Results

The sample consisted of participants who were ages 12 to less than 18 years ($n=4,308$). There was an equal distribution of sex (53.0% male, 47% female), and age (31.8% 12-13 years; 33.6% 14-15 years; 34.7% 16-17 years). The majority of the adolescents had health insurance (95.8%) and self-identified as never smokers (84.0%). Approximately half were non-Hispanic white (52.1%) and lived in large metropolitan areas (51.3%).

There were 17.5% of adolescents who reported no school-based extracurricular activities. In terms of perception of the risk of harm from smoking ≥ 1 packs of cigarettes per day, 10.6% reported there was no/slight risk of harm, 20.3% reported moderate risk of harm, and 69.1% who reported great risk of harm associated with smoking ≥ 1 packs of cigarettes per day. Sample demographics are shown in Table I.

Results of bivariate Chi Square analyses on the variables of interest and the perceived risk of harm from smoking ≥ 1 packs of cigarettes per day are also presented in Table I. Significant differences were identified in school-based extracurricular activities when compared with race/ethnicity, age, family income, smoking, enjoyment of dangerous things, and parental support. Categories with the highest weighted percentages of “no/slight risk” perceptions as compared with the lowest weighted percentages were found in participants with fewer extracurricular school-based activities (8.4% difference), Non-Hispanic blacks (8.7% difference), children ages 12-13 years (4.0% difference), participants from families with incomes less than \$20,000 (8.8% difference), and current smokers (5.1% difference).

Adolescents who had no extracurricular, school based-activities were shown to be more likely to consider smoking

to be either no/slight risk or moderate risk, than great risk, as compared to cohorts with one or more extracurricular, school-based activity. The unadjusted odds ratio (UOR) was 2.29 [95% Confidence level {CI} 1.71, 3.06]; $p < .0001$. The UOR for indicating moderate risk of harm from smoking as compared to great risk of harm from smoking was 1.33 [95%CI: 1.04, 1.72]; $p = 0.024$.

Multivariate logistic regression results are presented in Table II. In the analysis adjusted for sex, age, race, health insurance, smoking, residence, income, parental support and sensation seeking/enjoyment in dangerous things, the adjusted odds ratio (AOR) was 2.21 [95%CI: 1.62, 3.02] $p < .0001$, for no/ slight risk of harm from smoking as compared to great risk of harm from smoking. The AOR for moderate risk of harm from smoking as compared to great risk of harm was 1.23 [95%CI: 0.95, 1.61]; $p = 0.107$.

There was an association of the perception of no/slight risk of harm from smoking as compared with great risk of harm in current smokers versus never smokers: UOR=1.90 [95%CI: 1.12, 3.23]; $p = 0.0190$; AOR = 2.69 [1.58, 4.60]; $p = 0.001$. Similarly, current smokers versus never smokers were also more likely to endorse moderate, as compared with great risk of harm from smoking: UOR= 1.77 [95%CI: 1.26, 2.48]; $p = 0.0190$; AOR= 2.06 [95% CI: 1.48, 2.85]; $p < .0001$. For former smokers versus never smokers, the perception of no/slight risk of harm from smoking as compared with great risk of harm had: UOR = 1.13 [95%CI: 0.64, 1.99]; $p = 0.6787$; and the AOR=1.43 [95%CI: 0.79, 2.58]; $p = 0.232$. For former smokers versus never smokers and the perception of moderate risk of harm as compared with great risk of harm, the odds ratios were: 1.34 [95%CI:1.01, 1.79]; $p = 0.0459$; and the AOR=1.41 [95%CI: 1.02, 1.96]; $p = 0.039$. Also, current smokers were more likely to have no versus ≥ 1 school-based extracurricular activities than never smokers: UOR = 2.70 [95%CI:1.92, 3.80]; $p < .0001$; AOR= 1.99 [95%CI:1.37, 2.89]; $p < .001$. Former smokers were more likely than never smokers to have no versus ≥ 1 school-based extracurricular activities than never smokers: UOR= 1.98 [1.46, 2.69]; $p < .0001$; AOR= 1.86 [95%CI: 1.34, 2.59]; $p < .0001$.

Discussion

This study examined adolescents’ perception of risk of harm from daily smoking of ≥ 1 packs of cigarettes and the role of school-based extracurricular activities. Adolescents who did not participate in any school-based extracurricular activities were more likely to report no/slight risk of harm from smoking as compared to adolescents who participated in one or more school-based extracurricular activities. These

Table I. Sample demographics (2016 NSDUH^{17,18})

	Total sample		Perception of risk of harm of ≥ 1 packs cigarettes/day						p-value
			No/slight risk Smoking harm		Moderate risk Smoking harm		Great risk Smoking harm		
	n 4,308	Wt %* 100	n 423	Wt %** 10.6	n 835	Wt %** 20.3	n 3,050	Wt %** 69.1	
Sex									
Female	2,013	47.0	193	9.9	401	21.5	1,419	68.6	
Male	2,295	53.0	230	11.2	434	19.2	1,631	69.6	
Race/Ethnicity									
Non-Hispanic White	2,252	52.1	159	7.7	378	16.6	1,715	75.6	
Non-Hispanic Black	622	15.2	89	16.4	144	24.9	389	58.8	
Hispanic	920	23.0	115	13.4	208	25.9	597	61.7	
Other	514	9.7	60	10.1	105	21.6	349	62.3	
Age in years									
12-13	1,395	31.8	168	13.1	259	18.9	968	68.0	
14-15	1,485	33.6	128	9.7	277	20.3	1,080	70.0	
16-17	1,428	34.7	127	9.1	299	21.5	1,002	70.0	
Family income level									
Less than \$20,000	841	18.6	124	15.4	200	24.5	517	60.1	
\$20,000 - \$49,999	1,335	30.8	142	11.4	281	22.8	912	65.7	
\$50,000 - \$74,999	673	15.1	72	12.2	103	16.2	498	71.6	
\$75,000 and above	1,459	35.5	85	6.6	251	17.6	1,123	75.8	
Health Insurance									
Yes	4,148	95.8	400	10.4	799	20.0	2,949	69.5	
No	160	4.2	23	14.4	36	25.8	101	59.8	
Metropolitan/non-metropolitan									
Large metropolitan	1,763	51.3	188	11.5	363	20.4	1,212	68.1	
Small metropolitan	1,581	31.6	134	9.2	299	19.8	1,148	71.0	
Non-metropolitan	964	17.1	101	10.3	173	20.8	690	68.8	
Smoking									
Current smoker	282	5.9	38	15.3	73	27.9	171	56.7	
Former smoker	457	10.2	45	11.0	101	23.9	311	65.1	
Never smoker	3,569	84.0	340	10.2	661	19.3	2,568	70.5	
Extracurricular school-based activities***									
No activities	758	17.5	117	17.5	166	22.4	485	60.1	
1 or more activities	3,540	82.4	306	9.1	669	19.8	2,565	71.1	
Parental support (mean, SE)									
	13.41	(0.1)	12.7	(0.3)	13.4	(0.2)	13.5	(0.1)	<.0001
Sensation seeking (mean, SE)									
	5.07	(0.04)	4.97	(0.1)	5.00	(0.01)	5.1	(.1)	<.0001

* wt%= weighted column percent

**wt% =weighted row percent;

***School activities = team sports, cheerleading, choir, band, student government, clubs, etc.

Table II. Odds Ratios and Multinomial Logistic Regression of School Activities on Increasing Perception of Risk of Harm (2016 NSDUH, n=4,308)

	Unadjusted Logistic Regression		Adjusted Logistic Regression	
	Odds ratio [95% Confidence Interval] <i>p</i> -value		Adjusted odds ratio [95% confidence Interval] <i>p</i> -value	
	Moderate risk to smoking OR [95% CI] <i>p</i> -value	No/slight risk to smoking OR [95% CI] <i>p</i> -value	Moderate risk to smoking OR [95% CI] <i>p</i> -value	No/slight risk to smoking OR [95% CI] <i>p</i> -value
Extracurricular**				
No activities	1.33 [1.04, 1.71] 0.024	2.29 [1.71, 3.06] <.0001	1.23 [0.95, 1.61] 0.107	2.21 [1.62, 3.02] <.0001
1 or more	Reference group	Reference group	Reference group	Reference group
Sex				
Male			0.91 [0.76, 1.08] 0.276	1.23 [0.88, 1.46] 0.343
Female			Reference group	Reference group
Race/ethnicity				
Hispanic			1.77 [1.27, 2.46] 0.001	1.94 [1.33, 2.84] 0.001
Non-Hispanic black			1.84 [1.30, 2.60] 0.001	2.51 [1.67, 3.76] <.0001
Other			1.46 [1.03, 2.07] 0.033	1.51 [0.96, 2.335] 0.071
Non-Hispanic white			Reference group	Reference group
Age				
12-13			0.94 [0.71, 1.25] 0.669	1.81 [1.21, 2.70] 0.005
14-15			0.96 [0.75, 1.23] 0.735	1.26 [0.86, 1.84] 0.2274
16-17			Reference group	Reference group
Family income level				
<\$20,000			1.28 [0.96, 1.73] 0.095	1.81 [1.28, 2.55] 0.001
\$20,000-\$49,999			1.21 [0.95, 1.54] 0.125	1.50 [1.03, 2.17] 0.034
\$50,000-\$74,999			0.87 [0.59, 1.28] 0.478	1.69 [1.17, 2.44] 0.007
≥\$75,000			Reference group	Reference group
Insurance				
No			1.34 [0.77, 2.32] 0.289	1.50 [0.99, 2.26] 0.054
Yes			Reference group	Reference group
Metropolitan/non-metropolitan				
Non-metropolitan			1.10 [0.77, 1.58] 0.584	0.90 [0.63, 1.28] 0.551
Small metropolitan			0.98 [0.78, 1.24] 0.886	0.76 [0.56, 1.02] 0.070
Large metropolitan			Reference group	Reference group
Smoking				
Current			2.06 [1.48, 2.85] <.0001	2.69 [1.58, 4.60] 0.001
Former			1.41 [1.02, 1.96] 0.039	1.43 [0.79, 2.58] 0.232
Never			Reference group	Reference group
Parental support				
			0.98 [0.96, 1.01] 0.199	0.95 [0.92, 0.99] 0.010
Sensation seeking				
			0.98 [0.92, 1.05] 0.562	1.04 [0.95, 1.15] 0.368

*Adjusted model adjusted for sex (female, male); race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other); age in years (12-13, 14-15, 16-17); family income level (<\$20,000, \$20,000-\$49,999, \$50,000-\$74,999, \$75,000 and above); health insurance (yes, no); metropolitan/non-metropolitan (large metropolitan, small metropolitan, non-metropolitan); smoking (current, former, seldom/never); parental support (scalar); and sensation seeking (scalar).

**Extracurricular School Activities=team sports, cheerleading, choir, band, student government, clubs, etc.

results support the theory that an individual's perceived beliefs regarding risks of harm are factors in health behavior consequences, as proposed in the HBTM of Behavior.¹⁵ Although not a focus of this study, associations were also found in the perception of no/slight risk of harm from smoking ≥ 1 packs of cigarettes per day in adolescent who identified as smokers when compared with non-smoking adolescents. Also, adolescent smokers and former adolescent smokers were more likely not to have any school-based extracurricular activities. Due to the nature of the interview questions posed in the data source, it was not possible to determine the type of activity (non-sport, contact sport, or team sport) nor the amount of time that was associated with the activity. Nevertheless, there was a difference in perceptions between the groups not participating and the groups participating in school-based extracurricular activities.

Considering that the vast majority of adult smokers (90%) report having begun smoking as adolescents or pre-teens,¹⁹ there is a critical need to determine effective prevention interventions and opportunities. Encouraging extracurricular, school-based activities may be helpful in shaping perceptions about smoking and ultimately influence health behavior. Understanding adolescent perceptions, knowledge, attitudes, and behaviors with respect to tobacco use, is important in developing interventions.

There are few studies in the literature regarding the effects of school-based extracurricular activities on the perceived beliefs of harm in smoking cigarettes, for direct comparisons with the results of this study. In a literature review on the reasons why children smoke²⁰ only one study was cited regarding the potential protective aspects of sports and regular physical activity classes.⁶ In the study by Dunn, an association was found between physical activity and substance abuse behaviors among high school students, similar to the findings of this study.⁶ The protective effects of sports and other extracurricular activities has been reported in a variety of studies.^{6,10,14} El-Toukhy et al. examined smoking related beliefs using the 2012 National Youth Tobacco Survey data, and found that over two-thirds of all youth surveyed strongly agreed that all tobacco products were dangerous.²¹ Results from this study were consistent with the findings observed by El-Toukhy et al., in that 69.3% of the participants believed there was a perceived of risk of harm from smoking ≥ 1 packs of cigarettes per day.

Adolescents are influenced by the character of the setting in which they live and spend their time, including their social setting.²² Therefore, safe settings, such as those ostensibly provided in school-based extracurricular activities, can make a difference in harm reduction in adolescents.²² School-

based extracurricular activities also have the potential to help adolescents develop self-regulating skills. Sports, music, and other activities require discipline, practice and self-regulation. Higher behavioral self-regulation has been associated with reduced odds of initiating tobacco use.²³

Results from this study may be useful in informing public health interventions and messaging regarding the underlying importance of school-based extracurricular activities beyond the social, physical, or mental benefits that are commonly associated with these activities. Many school-based extracurricular programs have been cut for budgetary reasons; however, their intrinsic benefits should be considered. Structural, school-level participation in organized activities were shown to be negatively associated with smoking in a study of Japanese boys.²⁴ Tobacco cessation interventions are needed and programs are being developed to help teachers and coaches to deliver self-efficacy programs for tobacco use prevention in sports.²⁵ Similar workshops are needed for adults who work with adolescents in similar extracurricular activities.

Study strengths and limitations

A large, nationally representative, current data source was used for the sample population in this study. While the retrospective study design did not permit causality to be determined, there was a strong association between the adolescents who were involved in school-based extracurricular activities and their perceived risk of harm from smoking as compared with adolescents who were not. The study design was limited by the nature of the questions posed to the participants. The question regarding extracurricular activities was restricted to school-based activities. Adolescents may also participate in community-based activities, church-based activities, clubs, and other activities not sponsored by schools that were not captured in this study. In addition, the nature of the question in the data source, which included all school-based activities, did not allow for stratification by contact/non-contact sports, or all-encompassing versus minor participation in the activities. It was not possible to determine whether adult supervision was a mediator in the results or if other smoking patterns would have influenced the findings.

This study only addressed the association of extracurricular activities and the perceived harm of smoking one or more packs of cigarettes per day, a smoking pattern which is not common among adolescents. The data collected did not address other tobacco products, such as smokeless tobacco nor the use of electronic cigarettes. Other studies have indicated an increased risk of smokeless tobacco use among youth engaging in athletics, due to lower perceived risk of harm from this product,^{26, 27} and the emulation of professional

athletes who use smokeless tobacco.²⁸ Similarly, other studies have indicated that the relatively common use of electronic cigarettes is more likely to occur among youth who participate in intramural, competitive, and team sports.²⁹

Adolescents not involved in school-based extracurricular activities are more likely to endorse that perception that cigarettes have no/slight risk of harm rather than great risk of harm than their cohorts who are engaged in one or more school-based extracurricular activities. School-based extracurricular activities may provide unintended benefits to adolescents concerning tobacco use. Further research is needed to address potential confounding factors that may contribute to the perception of harm including family, regional differences, types of activities, and influences/education of coaches or other adult supervisors. Additionally, other forms of tobacco use should be examined. The widespread use of electronic cigarettes, and the ability of the user to easily conceal them, are factors for researchers to explore. Understanding the use of smokeless tobacco products, snuff, snus, cigars, pipes, and hookahs by adolescents would also provide important knowledge to inform policies and provide healthcare providers with information critical for anticipatory guidance.

Health care practitioners in general, have opportunities to speak one-on-one with adolescents within their provider roles. Dental hygienists, as prevention-based health care professionals, have a unique role with the opportunity to develop trust and rapport with patients, especially adolescents. Tobacco use and prevention strategies can be initiated, discussed and reinforced regularly, along with tobacco cessation practices within the dental hygiene care appointment. As health care providers, dental hygienists are invested in their patients' health and well-being. Given the frequency of visits for dental hygiene care, providers have the opportunity to discuss the additional benefits of extracurricular activities, which could lead to delaying or preventing tobacco initiation. Dental hygiene care appointments can provide opportunities to present information concerning risk perception, and support patients in making healthful life choices.

Conclusion

Adolescents who are not involved in extracurricular activities are more likely to endorse the perception that cigarettes have no/slight risk of harm. School-based extracurricular activities may provide unintended benefits to adolescents in promoting the perception that tobacco use is harmful to one's health.

Disclosure

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