



Original Article

Perceptions of the Harm and Addictiveness of Conventional Cigarette Smoking Among Adolescent E-Cigarette Users

 Olusegun Owotomo, M.D., M.P.H.^a, Julie Maslowsky, Ph.D.^{b,*}, and Alexandra Loukas, Ph.D.^a
^a Department of Kinesiology & Health Education, University of Texas at Austin, Austin, Texas

^b Department of Kinesiology & Health Education, Population Research Center, University of Texas at Austin, Austin, Texas

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A B S T R A C T

Purpose: Although existing evidence indicates that e-cigarette use is a risk factor for cigarette smoking initiation, mechanisms of this association are not yet known. E-cigarette users perceive e-cigarette use to be less harmful relative to conventional cigarettes, but their absolute perceptions of addictiveness of conventional cigarette smoking are unknown. This study examines how e-cigarette users compare with nonusers (non-e-cigarette users/nonconventional cigarette smokers), conventional cigarette smokers, and dual users on perceptions of harm and the addictiveness of conventional cigarette smoking and on other known predictors of cigarette smoking such as peer smoking, influence of antismoking ads, and risk-taking propensity.

Methods: National samples of 8th- and 10th-grade students from 2014 and 2015 ($N = 14,151$) were obtained from the Monitoring the Future Study. Multivariate logistic regression models were used to examine relationships between adolescent smoking status and perceptions of harm and the addictiveness of conventional cigarette smoking while controlling for potential confounders.

Results: E-cigarette users had lower perceptions of the addictiveness of conventional cigarette smoking compared with nonusers but higher than cigarette smokers and dual users. E-cigarette users reported lower influence by antismoking ads, more conventional cigarette-smoking peers, and greater risk-taking propensity than nonusers. E-cigarette users and cigarette smokers did not differ in their perceived harm of conventional cigarette smoking or in their risk-taking propensity.

Conclusions: E-cigarette users' attitudes and perceptions regarding conventional cigarette smoking may leave them vulnerable to becoming conventional cigarette smokers. Future studies should explore the prospective relationship between smoking-related perceptions of conventional cigarette smoking among e-cigarette users and the onset of cigarette smoking.

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IMPLICATIONS AND CONTRIBUTION

This study reveals attitudes and perceptions among e-cigarette users that may leave them vulnerable to cigarette smoking: lowered perceptions of cigarettes' addictiveness, less influence by antismoking ads, and more peers who smoke compared with nonusers. Findings suggest adolescent smoking prevention campaigns should emphasize the addictiveness of all forms of tobacco use.

Conflicts of interest: The authors have no conflicts of interest to disclose.

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* Address correspondence to: Julie Maslowsky, Ph.D., Department of Kinesiology & Health Education, University of Texas at Austin, 2100 San Jacinto Blvd, D3700, Austin, TX 78712.

E-mail address: maslowsky@austin.utexas.edu (J. Maslowsky).

Nicotine addiction is an established outcome of conventional cigarette smoking in adolescents [1,2] and may occur even before the onset of daily smoking [3,4]. It underlies the progression from cigarette experimentation to sustained smoking, which precipitates smoking-related diseases [5]. Adolescents may be vulnerable to nicotine addiction because of ongoing brain

development [6] and greater brain sensitivity to nicotine [7]. Nicotine delivered to the brain can impair working memory, attention, executive functioning, and impulse control [8–10]. Further, adolescents' smoking-related perceptions may influence their smoking behavior, increasing the risk of nicotine addiction. For example, adolescent smokers have poor insight regarding their risk for nicotine addiction and difficulty quitting smoking once addicted [11–16]. This suggests the need for research to inform educational interventions that heighten adolescents' perceptions of the addictive potential of all tobacco products including e-cigarettes.

While the prevalence of conventional cigarette smoking has declined over the years, the prevalence of electronic cigarette (e-cigarette) use continues to increase and has surpassed that of conventional cigarette smoking among adolescents [17,18]. E-cigarettes have become a major source of nicotine to adolescents. The reported use of e-cigarettes in the past 30 days increased from .6% in 2011 to 5.3% in 2015 among middle school students and from 1.5% in 2011 to 16% in 2015 among high school students [17].

Prior to 2016, the U.S. Food and Drug Administration had no regulatory authority over e-cigarettes, and the manufacturing, labeling, distribution, and marketing of e-cigarettes were largely unregulated [19]. Although research on the health risks of e-cigarettes is still ongoing, e-cigarettes that contain nicotine have addiction potential because they deliver nicotine to the blood [20,21]. In addition, recent studies have demonstrated longitudinal associations between e-cigarette use and conventional cigarette smoking in adolescents, even among the least susceptible, who had no intentions to smoke conventional cigarettes at baseline [22,23]. Thus, e-cigarette use may facilitate the initiation of conventional cigarette smoking among adolescents, potentially resulting in nicotine addiction [22–25].

Although existing evidence indicates that e-cigarette use is a risk factor for cigarette smoking initiation [22–25], the mechanisms of this association are not yet known. Perceptions of harm and the addictiveness of conventional cigarette smoking are important predictors of adolescent smoking behavior, which may differ depending on smoking status and may influence the transition between tobacco products. Previous comparative studies on adolescents' perceptions of harm and the addictiveness of cigarette smoking have generated two major findings. First, conventional cigarette smokers acknowledge the physical harm associated with their behavior but underestimate the risk of nicotine addiction and believe they are less likely to become addicted to nicotine in comparison with the average smoker [11,13,26,27]. This has been referred to as optimistic bias—a perception of one's risk as less than that of others [28]. Second, in comparative perceptions of harm and the addictiveness of one tobacco product to another, adolescents perceive conventional cigarettes to be more harmful and addictive than e-cigarettes [29–34]. Adolescent e-cigarette users, dual users, and nonusers believe e-cigarettes are less harmful than conventional cigarettes [29–35]. Similarly, adolescent conventional cigarette smokers with a history of e-cigarette use are more likely than those with no such history to believe e-cigarettes are less harmful than conventional cigarettes [29].

While the extant literature has generated informative data on adolescents' perceptions of the relative risks of nicotine addiction, studies that specifically examine adolescents' absolute risk perceptions of the addictiveness of conventional cigarette smoking are lacking. In contrast to relative comparisons of one tobacco

product to another or a comparison of one's own addiction risk to others', absolute risk directly captures adolescents' self-perceptions of addiction and health risks of specific tobacco products. Research on e-cigarette users' absolute risk perceptions of the addictiveness of conventional cigarette smoking is limited. It is important to examine the perceptions that e-cigarette users hold regarding the addiction risk of conventional cigarette smoking because it may provide insights into why they use e-cigarettes and whether and how they are vulnerable to initiating conventional cigarette smoking. In addition, a comparison of perceptions of the risk of conventional cigarette smoking between e-cigarette-only users and dual users (smokers of both conventional cigarettes and e-cigarettes) is warranted. Previous research has documented significant differences between e-cigarette users and dual users in socio-cognitive protective and risk factors, problem behavior risk factors, and use of other substances, indicating that the etiology of nicotine addiction in dual users may differ from that of exclusive e-cigarette or cigarette smokers [35]. As the popularity of e-cigarettes continues to rise, it is important to understand how e-cigarette users compare with nonusers, conventional cigarette smokers, and dual users on absolute perceptions of the addiction risk of conventional cigarette smoking, and on other known predictors of conventional cigarette smoking such as peer smoking, the influence of antismoking ads, and risk-taking propensity. Such understanding will help to better characterize the adolescent e-cigarette user population and design effective campaigns to communicate potential harms and the addictiveness of e-cigarettes.

In the current study, we examine how e-cigarette users compare with nonusers, conventional cigarette smokers, and dual users on smoking-related perceptions in a national sample of 8th- and 10th-grade students. Specifically, we examine absolute risk perceptions of the addictiveness of conventional cigarette smoking, perceived harm of conventional cigarette smoking, and perceived harm of e-cigarette use. Our study extends the literature by describing e-cigarette users' absolute risk perceptions of the addictiveness and harm of conventional cigarette smoking while accounting for other factors such as sociodemographic variables, peer smoking, perceived influence of antismoking ads, and risk-taking propensity.

Methods

Study participants

National samples of 8th- and 10th-grade students from 2014 to 2015 ($N = 14,151$) were obtained from the Monitoring the Future Study, an annual national cross-sectional survey on adolescent substance use and related behaviors [36]. Participants were included in the current sample if they were classified as white, black, or Hispanic (all other races/ethnicities are combined in the data and therefore uninterpretable) and had nonmissing data on both outcome measures, and e-cigarette and cigarette use. Data were accessed through the Inter-University Consortium for Political and Social Research (www.icpsr.umich.edu). This study was exempt from institutional review board oversight.

Measures

Conventional cigarette smoking was measured via one item: "How frequently have you smoked cigarettes during the past 30

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