


Effect of a 'tobacco-free nicotine' claim on intentions and perceptions of Puff Bar e-cigarette use among non-tobacco-using young adults

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ABSTRACT

Introduction Puff Bar disposable e-cigarettes are now marketed with a 'tobacco-free nicotine' claim. We assessed the effect of this claim on non-tobacco-using young adults' perceptions of and intentions of using Puff Bar.

Methods We conducted an online randomised between-subjects experiment among non-tobacco-using young adults (ages 18–29 years; n=1822). Participants viewed depictions of Puff Bar e-cigarettes with the claim that the product contains 'tobacco-free nicotine' (experimental group; n=909) or simply 'nicotine' (control group; n=913). Multivariable regressions were used to assess the associations between experimental conditions and Puff Bar use intentions, harm perceptions, use expectancies and perceived relative use of Puff Bar versus other e-cigarettes, controlling for participant characteristics.

Results Compared with the control group, the experimental group who saw the 'tobacco-free nicotine' claim reported higher intentions of using Puff Bar (coefficient=0.17, p<0.001). The experimental group had a lower likelihood of perceiving Puff Bar use as 'extremely or very harmful' (OR=0.63, p<0.001) and 'strongly or somewhat' agreeing with the negative expectancy of using Puff Bar (OR=0.67, p<0.001). Additionally, the experimental group reported being 'much more or more likely' to use Puff Bar over other e-cigarettes (OR=1.67, p<0.001).

Discussion Puff Bar's tobacco-free nicotine claim may increase non-tobacco-using young adults' intentions of using Puff Bar and reduce harm perceptions and negative expectancy towards using Puff Bar. The claim may also prompt the use of Puff Bar over other e-cigarette brands and types. These findings are concerning given the health effects and regulations for tobacco-free nicotine products are not immediately clear.

INTRODUCTION

In February 2020, flavoured cartridge-based e-cigarettes (except for tobacco and menthol flavours) were restricted from the market by the US Food and Drug Administration (FDA).¹ Between August 2019 and May 2020, national sales for e-cigarettes decreased, except for disposable e-cigarette devices, which saw an increase from 10.3% to 19.8% in retail e-cigarette sales.² Additionally, during the same time period, the use of disposable e-cigarettes increased from 2.4% to 26.5% and 3.0% to 15.2% among high school and middle school current e-cigarette users, respectively.³

The disposable e-cigarette brand that most notably gained popularity during this time was Puff Bar products,⁴ which came in a variety of youth-appealing flavours such as Banana Ice, Apple Pear, Grape and Mango.⁵ Convenience store data from April to June 2020 showed that Puff Bar sales totalled over \$3 million with volumes of over 300 000 disposable units per week.⁶ In July 2020, the FDA issued a warning letter to Cool Clouds Distribution, the owner of Puff Bar, requesting that the company 'remove their flavoured disposable e-cigarettes and youth-appealing e-liquid products from the market' because they lacked the required premarket authorisation.⁷ In response, Puff Bar announced that they would cease all online sales and distribution of their products.⁸

Shortly afterward, in February 2021, Puff Bar reintroduced their product, claiming that it now used 'tobacco-free nicotine' and '[did] not contain tobacco or anything derived from tobacco'.⁵ Since re-entering the market, by April 2021, Puff Bar has seen notable success: Puff Bar held approximately half of the disposable e-cigarette market share (51.3%), making it the most popular disposable e-cigarette product in the USA.⁹ Beyond Puff Bar, a proliferation of disposable e-cigarette products (eg, BLVK, Cloud Nurdz, Syn Bar) using 'tobacco-free nicotine' have recently appeared on online e-cigarette retailer websites.¹⁰ These brands claim that their products are 'cleaner', 'purer', 'have higher quality' and 'tastier' compared with regular e-cigarette products made with tobacco-derived nicotine.¹⁰

Therefore, to prevent further uptake of e-cigarette products among young people who are naïve to tobacco products, it is increasingly important to understand the influence of 'tobacco-free nicotine' claims marketed by Puff Bar and other disposable e-cigarette products. We implemented a randomised between-subjects experiment to examine the effect of Puff Bar's tobacco-free nicotine claim on the intentions and perceptions of using Puff Bar products among non-tobacco-using young adults.

METHODS

Study design and experiment exposure

Between April and July 2021, we recruited young adults from Qualtrics, an online platform that is well suited for conducting behavioural science experimental studies. Eligibility criteria included being between 18 and 29 years old and being either a never tobacco user or a tobacco experimenter (experimenters defined as those who had never



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regularly used tobacco and were currently not using tobacco). After completing a questionnaire about their sociodemographic background and tobacco use history, all participants ($n=1822$) first viewed identical descriptions of Puff Bar products (see online supplemental figure 1). Participants were then randomly assigned to one of two nicotine messages. The experimental group ($n=909$) saw 'All Puff Bar products contain tobacco-free nicotine. They do not contain tobacco or anything derived from tobacco.' The control group ($n=913$) saw 'All Puff Bar products contain nicotine.' The Puff Bar descriptions and the nicotine message seen by the experimental group were directly obtained from the Puff Bar's official website in February 2021.⁵ Both groups then completed identical measures related to Puff Bar use (see post-exposure measures below).

Post-exposure measures of Puff Bar outcomes

The intention of using Puff Bar products was measured by the question, 'If you had an opportunity to use a Puff Bar product, would you use it?' Participants were asked to move a 100-point scaled ruler to indicate the intention of using the product (0=definitely no; 100=definitely yes).¹¹ Numerical responses were used for analysis. Harm perceptions of using Puff Bar products were measured by 'How harmful do you think Puff Bar products are to health?'^{12 13} The response options were dichotomised as 'extremely harmful/very harmful' versus 'somewhat harmful/slightly harm/not harmful at all'.^{12 13} Participants also indicated whether they felt positive ('I think I might enjoy, experience pleasure or feel good using Puff Bar products') or negative ('I think I might feel bad, sick or embarrassed using Puff Bar products') expectancies^{14–16} of using Puff Bar products. The response options were dichotomised as 'strongly agree/somewhat agree' versus 'neither agree or disagree/strongly disagree'. Finally, perceived relative use of Puff Bar versus other e-cigarettes was measured by 'Would you be more or less likely to use a Puff Bar product versus using other e-cigarettes?'^{17 18} The responses were dichotomised as 'much more likely/more likely' versus 'much less likely/less likely/equally likely'.

Participant characteristics

Sociodemographic characteristics (eg, age, sex, race/ethnicity, education), tobacco use environment (eg, living with others who use tobacco, having best friend(s) who use tobacco) and tobacco use history were also measured (see table 1 for a full list of variables).

Statistical analysis

We first used Pearson χ^2 tests to examine whether randomisation yielded differences in participant characteristics between experimental conditions. We then employed multivariable linear and logistic regressions to examine the associations between the experimental conditions and each post-exposure Puff Bar measure controlling for participant characteristics. Statistical significance was set to 0.05 (two tailed). Data were analysed using Stata V.16.0 (College Station, Texas, USA).

RESULTS

Participant characteristics and experimental condition

The mean age of the analytical sample was 23.0 years ($SD=3.5$), and slightly less than half of the participants (43.7%) were male. Additionally, 18.6% and 21.7% of the participants had ever used e-cigarettes and other tobacco products, respectively. None of the participant characteristics differed significantly between experimental conditions ($p>0.05$).

Effect of the 'tobacco-free nicotine' claim exposure on Puff Bar outcomes

The multivariable linear regression (table 1) showed that those in the experimental group who saw the 'tobacco-free nicotine' claim reported higher intentions of using Puff Bar products (coefficient=0.17; 95% CI=0.15 to 0.20; $p<0.001$) than those in the control group. The multivariable logistic regressions showed that those in the experimental group had a reduced likelihood of perceiving Puff Bar products as 'extremely harmful/very harmful' (adjusted OR (AOR)=0.63; 95% CI=0.52 to 0.77; $p<0.001$) and reporting that they 'strongly agree/somewhat agree' with the negative expectancy of using Puff Bar products (AOR=0.67; 95% CI=0.55 to 0.82; $p<0.001$) than those in the control group. Additionally, those in the experimental group had a higher likelihood of reporting 'much more likely/more likely' to use Puff Bar products versus other e-cigarettes (AOR=1.67; 95% CI=1.28 to 2.19; $p<0.001$) than those in the control group. Finally, we found that positive expectancy of Puff Bar use between experimental conditions was only moderately different (AOR=1.22; 95% CI=0.93 to 1.61; $p=0.157$).

DISCUSSION

This randomised between-subjects experiment found that viewing the tobacco-free nicotine claim may cause non-tobacco-using young adults to develop higher intentions of using Puff Bar products along with lower harm perceptions and negative expectancy of using the products. Additionally, seeing the claim may lead to a higher likelihood of using Puff Bar products versus other e-cigarettes, potentially suggesting that young adults who are new to tobacco products may initiate or regularly use e-cigarettes with Puff Bar products rather than other types or brands of e-cigarettes.

The results from our study are concerning given how little is known about the potential harm and addictive risks of consuming e-cigarettes with tobacco-free nicotine, which is often made by synthetic nicotine in a laboratory.^{19 20} For instance, some formulations of synthetic nicotine are sold as a racemic mixture (50/50 ratio) of S-nicotine and R-nicotine. While tobacco-derived nicotine consists almost exclusively of S-nicotine and has been widely studied, less is known about the metabolic and pharmacological effects of R-nicotine.²¹ More research is needed to understand the short-term and long-term harm and abuse liability of using synthetic nicotine-based e-cigarette products.

Additionally, because the FDA's regulatory authority and most state and local tobacco control policies only cover products 'made or derived from tobacco,'^{22 23} it is not immediately clear how the emerging products that contain synthetic nicotine will be regulated. Without intervening, Puff Bar and other disposable e-cigarette products using tobacco-free nicotine may undermine national-level and local-level tobacco control measures, including flavoured e-cigarette sales restrictions and minimum age sales restrictions of 21 years.

A limitation of this study is that it only investigated the effect of Puff Bar's tobacco-free nicotine claim. More research is needed to examine the impact of such claims used by other disposable e-cigarette brands and other types of products such as nicotine pouches (eg, NIIN, FR3SH). The effects of similar claims ('non-tobacco nicotine' and 'synthetic nicotine') on young people's intentions and perceptions of using the products also warrant further evaluation.

Given the results, it is imperative to understand the potential population impact of tobacco-free nicotine marketing claims. Public health authorities can consider regulating these claims

Table 1 The effects of exposure to a 'tobacco-free nicotine' claim on Puff Bar use intentions and perceptions among non-tobacco-using young adults (ages 18–29 years, n=1822)

	Post-exposure outcomes related to Puff Bar e-cigarette products				
	Intentions of using Puff Bar*	Perceiving Puff Bar 'extremely harmful/very harmful'†	'Strongly or somewhat agree' with positive expectancy of using Puff Bar‡	'Strongly or somewhat agree' with negative expectancy of using Puff Bar§	'Much more or more likely' to use Puff Bar than other e-cigarettes¶
		Adjusted ORs (AORs)			
	Coefficients (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Experimental condition					
Experimental group	0.17 (0.15 to 0.20)	0.63 (0.52 to 0.77)	1.22 (0.93 to 1.61)	0.67 (0.55 to 0.82)	1.67 (1.28 to 2.19)
Control group	Reference	Reference	Reference	Reference	Reference
Age					
18–20	0.30 (0.26 to 0.34)	1.09 (0.82 to 1.47)	2.30 (1.52 to 3.49)	1.13 (0.84 to 1.52)	2.37 (1.58 to 3.54)
21–24	0.03 (0.00 to 0.06)	0.98 (0.77 to 1.24)	1.35 (0.95 to 1.90)	1.15 (0.90 to 1.47)	1.48 (1.06 to 2.08)
25–29	Reference	Reference	Reference	Reference	Reference
Biological sex					
Female	Reference	Reference	Reference	Reference	Reference
Male	0.12 (0.10 to 0.15)	0.72 (0.59 to 0.89)	1.04 (0.77 to 1.39)	0.67 (0.54 to 0.82)	0.88 (0.66 to 1.17)
Sexual orientation					
Heterosexual	Reference	Reference	Reference	Reference	Reference
Other**	0.16 (0.13 to 0.19)	0.66 (0.53 to 0.83)	1.21 (0.89 to 1.65)	0.91 (0.71 to 1.15)	1.28 (0.95 to 1.73)
Race/ethnicity					
Non-Hispanic white	Reference	Reference	Reference	Reference	Reference
Non-Hispanic black	0.55 (0.51 to 0.59)	0.87 (0.63 to 1.18)	1.01 (0.64 to 1.61)	0.48 (0.35 to 0.65)	1.52 (1.02 to 2.26)
Hispanic	0.32 (0.28 to 0.36)	1.03 (0.76 to 1.38)	1.03 (0.68 to 1.56)	0.57 (0.43 to 0.76)	0.78 (0.51 to 1.21)
Non-Hispanic other††	0.55 (0.52 to 0.59)	0.66 (0.47 to 0.91)	1.64 (1.08 to 2.48)	0.63 (0.45 to 0.88)	1.27 (0.83 to 1.94)
Education level					
≤High school	−0.07 (−0.11 to −0.04)	1.00 (0.77 to 1.30)	0.61 (0.42 to 0.89)	0.78 (0.60 to 1.03)	1.08 (0.76 to 1.12)
Some college	0.03 (−0.00 to 0.07)	1.20 (0.93 to 1.56)	1.00 (0.70 to 1.43)	1.14 (0.87 to 1.49)	1.20 (0.64 to 1.19)
≥Associate degree	Reference	Reference	Reference	Reference	Reference
Subjective financial situation					
<Live comfortably‡‡	0.75 (0.61 to 0.91)	0.78 (0.64 to 0.95)	1.04 (0.78 to 1.38)	0.87 (0.71 to 1.08)	1.03 (0.78 to 1.35)
Live comfortably	Reference	Reference	Reference	Reference	Reference
Living with others who use tobacco					
Yes	0.01 (−0.02 to 0.04)	0.99 (0.77 to 1.30)	0.83 (0.58 to 1.18)	1.03 (0.79 to 1.35)	0.67 (0.47 to 0.97)
No	Reference	Reference	Reference	Reference	Reference
Having best friend(s) using tobacco					
Yes	0.49 (0.45 to 0.51)	0.71 (0.58 to 0.88)	2.11 (1.56 to 2.85)	0.69 (0.56 to 0.86)	1.52 (1.14 to 2.04)
No	Reference	Reference	Reference	Reference	Reference
Tobacco marketing exposure in the past year					
Yes	0.24 (0.20 to 0.27)	0.95 (0.73 to 1.22)	1.44 (0.97 to 2.13)	0.98 (0.76 to 1.26)	1.46 (1.01 to 2.11)
No	Reference	Reference	Reference	Reference	Reference
Ever using e-cigarettes					
Yes	0.72 (0.68 to 0.75)	0.71 (0.52 to 0.98)	1.77 (1.21 to 2.60)	0.72 (0.52 to 0.99)	1.70 (1.15 to 2.52)
No	Reference	Reference	Reference	Reference	Reference
Ever using other tobacco products§§					
Yes	0.22 (0.18 to 0.25)	0.73 (0.56 to 0.95)	1.21 (0.84 to 1.73)	0.75 (0.57 to 0.98)	0.98 (0.67 to 1.42)
No	Reference	Reference	Reference	Reference	Reference

All bolded entries indicates $p < 0.05$.

*Puff Bar intentions were a numerical value range from 0 (definitely no) to 100 (definitely yes).

†Base outcome: reporting Puff Bar products 'somewhat harmful/slightly harm/not harmful at all'.

‡Base outcome: reporting 'neither agree or disagree/strongly disagree/disagree' with positive expectancy of using Puff Bar products.

§Base outcome: reporting 'neither agree or disagree/strongly disagree/disagree' with negative expectancy of using Puff Bar products.

¶Base outcome: reporting 'equally likely/less likely/much less likely' to use Puff Bar products than other e-cigarettes.

**'Other' category for sexual orientation includes asexual, bisexual, gay, lesbian, pansexual, queer, questioning or unsure, and other identities.

††'Other' category for race/ethnicity includes Asians, American Indian or Alaska Native, Native Hawaiian or Pacific Islanders, and other racial groups.

‡‡'Live comfortably' included categories of 'met needs with a little left', 'just meet basic expenses' and 'don't meet basic expenses'.

§§Other tobacco products included cigarettes, hookah, cigarillos or little cigars, premium or large cigars, smokeless tobacco, nicotine pouches and heated tobacco products.

Brief report

and relevant products to prevent tobacco use surging among tobacco-naïve populations. In addition, it is vital to continue monitoring the marketing activities of Puff Bar and other companies selling tobacco-free nicotine products on social media and other marketing channels frequented by young people.

What this paper adds

- ⇒ Little evidence is available assessing the effect of 'tobacco-free nicotine' claims marketed by Puff Bar e-cigarettes.
- ⇒ The results from this randomised experiment showed that non-tobacco-using young adults who viewed Puff Bar's 'tobacco-free nicotine' claim reported higher intentions of using Puff Bar compared with those who viewed the regular nicotine claim.
- ⇒ Viewing 'tobacco-free nicotine' claim was also associated with lower harm perceptions and lower negative expectancy of Puff Bar use.
- ⇒ Those who viewed the 'tobacco-free nicotine' claim also reported a higher likelihood to use Puff Bar over other e-cigarettes compared with those who viewed the regular nicotine claim.

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