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INTENTION TO EXPERIMENT WITH E-CIGARETTES IN A CROSS-SECTIONAL SURVEY OF UNDERGRADUATE UNIVERSITY STUDENTS IN HUNGARY

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Abstract

Background—Electronic cigarettes are often used to promote cessation. Only a few studies have explored the motivations for e-cigarette experimentation among young adults.

Objectives—The goals of this study were to assess the intention to try e-cigarettes among Hungarian university students and to develop a motivational scale to measure vulnerability to e-cigarette experimentation.

Methods—826 Hungarian university students completed an internet-based survey in 2013 to measure motives for trying e-cigarettes. We conducted exploratory factor analyses and identified factors that promote and deter experimentation. Logistic regression analysis was performed to test the concurrent predictive validity of the identified motivational factors and we used these factors to predict e-cigarette experimentation, controlling for other known correlates of e-cigarette use.

Results—24.9% of the participants have ever tried an e-cigarette and 17.2% of current nonsmokers experimented with the product. Almost 11% of respondents intended to try an e-cigarette in the future, yet only 0.6% were current e-cigarette users. Six factors were identified in the motivational scale for experimentation, four that promote usage (health benefits/smoking cessation; curiosity/taste variety; perceived social norms; convenience when smoking is prohibited) and two that deter usage (chemical hazard; danger of dependence). In a logistic regression analysis, the curiosity/taste factor was the only motivational factor significantly associated with the intention to try e-cigarettes in the future.

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DECLARATION OF INTERESTS

None declared.

Conclusions—This is the first study to test a motivational scale about what motivates e-cigarettes usage among university students. Additional research is needed to better understand these factors and their influence on e-cigarette uptake.

INTRODUCTION

Electronic cigarettes or e-cigarettes are the most common type of Electronic Nicotine Delivery Systems (ENDS) designed for nicotine delivery and have rapidly become one of the most commonly used ENDS (World Health Organization [WHO], 2009; Dockrell, Morrison, Bauld, & McNeill, 2013; Pepper & Brewer, 2013). In a recent systematic review, Pepper and Brewer (2013) found that e-cigarette awareness increased from 16% to 58% from 2009 to 2011 among US adults, while the proportion of ever use of e-cigarettes rose from 1% to 6%. Results from the Eurobarometer survey on tobacco in 2012 indicate that 69% of persons aged 15 and older in the European Union have heard about e-cigarettes, 7% have ever tried them, and 2% used them regularly or occasionally (Eurobarometer 385, 2012). There are limited data on e-cigarette use among adults and adolescents in Hungary, an EU member country located in Central Europe. Data from the Eurobarometer surveys in 2012 and in 2014 demonstrated that 9% of Hungarian persons aged 15 years have ever tried e-cigarettes, 3% of the sample had used it regularly in 2012, and 0% used e-cigarettes in 2014 (Eurobarometer 385, 2012; Eurobarometer 429, 2015). Based on the Eurobarometer 385 report, 22.3% of Hungarian smokers reported ever use of e-cigarettes, while only 19% of smokers responded similarly in the next Eurobarometer survey in 2014 (Vardavas, Filippidis, & Agaku, 2014; Eurobarometer 429, 2015). Representative national surveys conducted by the National Institute for Health Development in years 2012 and 2013 found that regular e-cigarette use increased from 2% to 4.2% among smokers older than 17 years old (Balku, Demjén, Vámos, & Vitrai, 2012; Balku, Demjén, Kimmel, Varsányi, & Vitrai, 2014). The Global Youth Tobacco Survey conducted in years 2012 and 2013 detected a decrease in past 30 days use of e-cigarettes among Hungarian adolescents (13% and 9%, respectively) (Balku, Demjén, Kimmel, & Vitrai, 2013). These findings are contrary to international studies reporting that ever use of e-cigarettes were highest among young adults and adolescents with a particularly rapid increasing e-cigarette use trend in Polish adolescents (Adkison et al., 2013; Dockrell et al., 2013; Eurobarometer 385, 2012; Eurobarometer 429, 2015; Goniewicz & Zielinska-Danch, 2012; Pearson, Richardson, Niaura, Vallone, & Abrams, 2012; Goniewicz, Gawron, Nadolska, Balwicki & Sobczak, 2014).

The majority of e-cigarette users believe that e-cigarettes are safer alternative than commercial cigarettes and are an effective quit aid (Adkison et al., 2013; Dockrell et al., 2013; Etter & Bullen, 2011; Goniewicz & Zielinska-Danch, 2012; Pepper & Brewer, 2013). Promotion of e-cigarettes for adult smokers is based mainly on the premise that e-cigarettes promote quitting and reduce harms associated with smoking manufactured cigarettes (e.g., heart disease, cancer) (de Andrade, Hastings, Angus, Dixon, & Purves, 2013). Safety concerns related to e-cigarettes, including short- and long-term effects of use, composition of the e-liquid and vapour and quality control of manufacturing of the product, raise questions regarding their utility as a nicotine-delivery substitute (Bahl et al., 2012; Hua, Alfi, & Talbot, 2013; Pepper & Brewer, 2013; Trehy et al., 2011; Williams, Villarreal, Bozhilov,

Lin, & Talbot, 2013; Goniewicz et al., 2014). Currently, there is insufficient evidence to suggest that e-cigarettes are more (or less) effective in smoking cessation compared to nicotine replacement therapies (NRTs), therefore some have argued that e-cigarettes should not be recommended as a cessation aid at this time (Bullen et al., 2013; Foulds, Veldheer, & Berg, 2011; Grana, Benowitz, & Glantz, 2013; Pepper & Brewer, 2013).

In addition to using e-cigarettes for cessation, other reasons for trying and using e-cigarettes include bypassing smoking restrictions in indoor places, avoiding secondhand-smoke exposure, and saving money (although cost-savings vary widely across studies) (Dockrell et al., 2013; Etter & Bullen, 2011; Pepper & Brewer, 2013). Tobacco companies and independent e-cigarette companies are criticized for trying to expand their market towards new non-addicted target groups, especially youth and non-smokers (de Andrade et al., 2013). Recent literature suggests that e-cigarette companies emphasize different flavors, various designs, higher convenience in use and discount prices of the product to promote their products and to expand their market (Cobb, Brookover, & Cobb, 2013; de Andrade et al., 2013). They also use social media platforms to promote and create a socially attractive, “must have accessory” image (de Andrade et al., 2013; Prochaska, Pechmann, Kim, & Leonhardt, 2012). In Hungary, there are no available data on e-cigarette marketing and sales. The sale and use of these products are legal, however, the sale of nicotine containing cartridges and liquids is illegal because they are considered medicinal products (Hungarian Focal Point for Tobacco Control).

Only a few studies have explored the motivations for first experimentation with e-cigarettes. In a survey of college students in North Carolina, e-cigarette use was motivated by sensation seeking and not by quitting intention (Sutfin, McCoy, Morrell, Hoepfner, & Wolfson, 2013). Another study reported that freshman and sophomore university students perceived e-cigarette use to be acceptable in public places, and this perception was a significant predictor of the intention to try e-cigarettes (Trumbo & Harper, 2013). In a focus group study, young adults aged 18–26 years also viewed e-cigarettes more publicly acceptable and a more convenient and modern product than cigarettes (Choi, Fabian, Mottey, Corbett, & Forster, 2012). Recently, researchers demonstrated that curiosity, appealing flavors and peer influence were the most important reasons for e-cigarette experimentation among US adolescents and young adults (Kong, Morean, Cavallo, Camenga & Krishnan-Sarin, 2015).

E-cigarette use is an emerging public health concern because using e-cigarettes may serve as a gateway to cigarette smoking (Choi et al., 2012; Cobb, Byron, Abrams, & Shields, 2010; Lee, Kimm, Yun, & Jee, 2011; Pepper & Brewer, 2013; WHO, 2009). In a recent paper by Leventhal et al. (2015), “e-cigarette use was prospectively associated with increased risk of combustible tobacco use initiation” among baseline never smoker adolescents. Although the majority of e-cigarette users are young, current smokers (Choi & Forster, 2013; Balku et al., 2013; Goniewicz & Zielinska-Danch, 2012; Sutfin et al., 2013), nonsmokers’ intention to try and use e-cigarettes is not negligible. Smoking trajectories may provide a useful corollary to e-cigarette use patterns. Among cigarette smokers, susceptibility to try cigarettes is predictive of later regular smoking (Pierce, Choi, Gilpin, Farkas, & Merritt, 1996). Only a few studies have examined the intention and motivational factors to try an e-cigarette among young non-smokers. For example, half of young adults in a focus group, regardless of their

smoking status, were open to trying an e-cigarette if offered by friends (Choi et al., 2012). On the other hand, the majority of surveyed college students on a US campus showed little intention to use e-cigarettes in the next six months (Trumbo & Harper, 2013). In another study, Pepper and Reiter (2013) found that the willingness to try e-cigarettes was lower among non-smoker adolescent males compared to smokers. In sum, we know little about motives that can promote or prevent the intention to try e-cigarettes in the young adult, non-smoking population.

Understanding those factors that increase the attractiveness of e-cigarettes to youth would be a key step in reducing its experimentation and creating effective preventive messages towards youth (Pepper & Brewer, 2013). This study aims to (1) assess the prevalence and correlates of e-cigarette experimentation among university students; (2) to develop a measure of motivations of intention to try e-cigarettes among non-e-cigarette users, (3) and to measure the association between the motivational factors and intention to try e-cigarettes.

METHODS

Sample and procedure

Undergraduate students from two universities in Budapest, Hungary were invited to participate in a web-based, cross-sectional study. One university includes students pursuing degrees in the health care professions (e.g., medicine, pharmacy, dentistry), while the other university serves students pursuing degrees in the humanities and social sciences (e.g., psychology, history). Students received an email generated via the official electronic mailing system of each university, which included a link to complete the online, anonymous survey. The email solicitation was repeated three times within three weeks and the link to complete the survey remained active from January to May 2013. Prior to completing the survey, each student was informed that this was a research study. The study was approved by Institutional Review Boards of both universities. Of the participating students (N=857), respondents who did not respond to the e-cigarette questions were excluded from the analyses (N=31). The final analytical sample included 826 university students.

Measures

The questionnaire consisted of 58 closed-ended questions with multiple answer options grouped into four categories: I) demographics; II) current and past cigarette smoking behavior; III) opinions, experimentation and experiences with an e-cigarette; and IV) waterpipe use and motivations for it. For the current study, demographics included age, gender and university affiliation (health care vs. non-health care university). Current cigarette smoking status was self-reported (“Do you currently smoke cigarettes on a daily basis, less than daily, or not at all?”) and were categorized as daily, occasional/nondaily smokers and nonsmokers. Two items encompassed e-cigarette experimentation; one of them asked all participants “Have you ever tried an electronic cigarette, even one puff?” (yes/no). The other question asked participants who have never tried an e-cigarette whether they plan to use an e-cigarette in the future with a closed-ended multiple-choice question with six response options, which were collapsed into a dichotomous variable because of sample size limitations (“Yes, within 30 days/Yes, within 6 months/Yes, within one year/Yes, sometimes

in the future but not nowadays”=“Yes”; “No/I do not know”=“No”.) Current e-cigarette use was assessed with one question (“How often do you use e-cigarettes?”) and respondents could report daily, occasional or non-use of the product. Based on the review of existing e-cigarette literature, we composed motivational items for trying e-cigarettes (Etter, 2010; Etter & Bullen, 2011; Goniewicz, Lingas, & Hajek, 2013). Statements were addressed to all participants as follows: “Whether you plan to try an e-cigarette or not how do these aspects weigh in your thinking?”. Using a four-point Likert scale (1=not at all important reason to 4=very important reason), sixteen “pros” and eleven “cons” items were asked from all of those who have never tried an e-cigarette regardless of whether they were planning to try it or not. Items are listed in Table 2 and Table 3.

Data analysis

Descriptive statistics were calculated for all variables in the analysis. Correlates of experimentation and use of e-cigarettes were tested using multivariate binary logistic regression with age, gender, university affiliation and smoking status as covariates. To identify the motives of intention to try e-cigarettes, we performed two exploratory factor analyses on the motivational items for trying e-cigarettes; pros and cons items were analyzed separately with principal axis factoring and oblimin rotation among those who have not previously tried e-cigarettes. Therefore, correlations between factors were permitted. We used scree plot, Kaiser's criteria, and interpretability of solution in determining the number of factors extracted. In further analyses, we used the factor scores as a closer estimation of latent variables. To test the concurrent predictive validity of the identified pros and cons factors, we used logistic regression analysis to predict the intention to try e-cigarettes in near future. All analyses were conducted with SPSS version 17.0.

RESULTS

Descriptive statistics

Descriptive statistics of the sample and comparison of participants who have ever tried e-cigarettes with participants who have never tried e-cigarettes are presented in Table 1. The samples of the two universities did not differ by gender ($\chi^2=0.30$, $p=0.583$) or age ($t=1.22$, $p=0.223$). More than one-fifth of the sample (21.1%) were current smokers (11.4% daily smokers and 9.8% occasional smokers), and a significantly greater proportion of respondents enrolled in the non-health care university were smokers compared to students in health care university (27.2% vs. 18.0%, respectively, $\chi^2=10.00$, $p<0.001$). Overall, 24.9% ($N=206$) of the participants reported that they have ever tried e-cigarettes, while 0.6% ($N=5$) of respondents reported daily or nondaily/occasional use of e-cigarettes. Ever use of an e-cigarette did not differ significantly between health care and non-health care university students (25.3% vs. 24.3%, respectively, $\chi^2=0.10$, $p=0.758$). Among those who have never tried the product, almost 11% ($N=67$) intended to try an e-cigarette in the near future.

Correlates of e-cigarette use

Participants who experimented with e-cigarettes were more likely to be older, male, daily or occasional smokers and studied at the health care university (see Table 1). Altogether, 46.1% ($N=95$) of current daily or occasional smokers ever tried e-cigarettes, however, only 3.2%

(N=3) of them were current e-cigarette users. Nevertheless, 17.2% of current nonsmokers (N=111) also experimented with e-cigarettes and 1.8% (N=2) were current e-cigarette users. All current e-cigarette users were female and studied at the health care university. The rates of intention to try an e-cigarette were 32.6 % (N=15) among occasional smokers, 27.5% (N=11) among daily smokers, and 7.7% (N=41) among nonsmokers.

Exploratory factor analysis to develop a measure of motivations of intention to try e-cigarettes among non-e-cigarette users

We used exploratory factor analyses among respondents who had never tried e-cigarettes to assess the promoting and deterrent factors for future experimentation with e-cigarettes (N=468 and N=500, respectively). Principle axis factoring of promoting factors was performed on 16 pro items with oblique (oblimin) rotation. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis (KMO=0.863). Bartlett's test of sphericity ($\chi^2_{(120)}=4278.5$, $p<0.0001$) indicated that correlations between items were sufficiently large for factor analysis. Four factors had eigenvalues over the Kaiser's criterion of 1.00 and in combination explained 60.5% of the variance. On the scree plot there were two major inflexions, the first at the third factor and the other at the fourth factor. Taking into account the interpretability of the fourth factor we retained a four-factor solution. Table 2 presents the standardized factor loadings after rotation. We used the cut-off values of 0.40 to identify the factor loadings as salient. The items that cluster on the same factors suggest the following four factors: (1) health benefits/smoking cessation aspects; (2) curiosity/taste variety aspects; (3) perceived social norms; and (4) convenience when cigarette smoking is not permitted. Correlations between factors ranged between 0.05 and 0.42.

We repeated the previous analysis on the 11 deterring items with oblique (oblimin) rotation. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, (KMO=0.905). Bartlett's test of sphericity ($\chi^2_{(55)}=3231.8$, $p<0.0001$) indicated that correlations between items were sufficiently large for factor analysis. Two factors had eigenvalues over the Kaiser's criterion of 1.00 and in combination explained 58.1% of the variance. On the scree plot there was one clear inflexion at the second factor which supports the two-factor solution. Table 3 shows the standardized factor loadings after rotation. The two factors include: (1) fear or danger of dependence; and (2) concerns of the chemical hazards associated with e-cigarette use. The correlation between these two factors was 0.61.

Correlates of intention to experiment with e-cigarettes

We performed multivariate regression analyses to predict intention to try e-cigarettes using the factor scores from the “motivation to try” measure, while controlling for potential confounding variables such as gender, age, smoking status and university affiliation. The odds ratios are presented in Table 4. Curiosity/taste variety was associated with intention to try among both smokers (OR=2.07, 95%CI: 1.00–4.27) and nonsmokers (OR=2.57, 95%CI: 1.82–3.64), fear of dependence was negatively associated with intent to try among nonsmokers only (OR=0.60, 95%CI: 0.38–0.93). The other factors identified in the motivation to try measure were not significantly associated with intention to experiment with e-cigarettes. Nonsmoking students studying at the health care university showed

significantly increased odds of intention to try e-cigarettes compared to non-health care university students in the multivariate model (OR=2.61, 95%CI: 1.03–6.65).

In order to test the difference between current smokers and nonsmokers in motivations for e-cigarette use while controlling for gender, age and type of university, we performed multiple linear regression analysis, and found that smoking status was significantly associated with the following motivational factors: health benefits ($\beta=-0.122$, $p<0.010$), fear of dependence ($\beta=-0.120$, $p<0.010$) and fear of chemical hazards ($\beta=-0.133$, $p<0.10$). Smokers tend to put less emphasis on health benefits motivations and they were less afraid of dependence and chemical hazards of e-cigarettes.

DISCUSSION

Our study indicated that one-quarter of the undergraduates at two Hungarian universities have experimented with e-cigarettes, however less than 1% of respondents reported current use. Comparing the rates of e-cigarette experimentation and its current use with the rates reported in previous surveys in similar age groups, our findings reveal much higher experimentation rate and considerably lower current use in this sample (Choi & Forster, 2013; Latimer, Batanova, & Loukas, 2014; Sutfin et al., 2013; Trumbo & Harper, 2013; Zhu et al., 2013;). The proportion of young adults who had experimented with e-cigarettes varied from 4.9% to 13% in U.S. samples (Choi & Forster, 2013; Sutfin et al., 2013; Trumbo & Harper, 2013; Zhu et al., 2013), while another study reported that 19% of Polish university students had ever tried this product (Goniewicz & Zielinska-Danch, 2012). We also found that a relatively large proportion of young people intended to try e-cigarettes in the future. A potential explanation for the low rate of e-cigarette use in our survey could be that two-thirds of the sample is future health care professionals, and they may be more health conscious and have a lower prevalence of tobacco and/or e-cigarette use. Another speculative reason for our finding could be the less pervasive marketing and lower availability of e-cigarettes in Hungary, however there is no available data on e-cigarette marketing and sales in the country.

Consistent with prior studies (Sutfin et al., 2013; Goniewicz et al., 2013; Pepper & Brewer, 2013), we found that smokers reported the highest rate of experimentation of e-cigarettes. However, the rate of e-cigarette experimentation among nonsmokers in our sample exceeds previous estimations. Experimentation with e-cigarettes in nonsmokers might be the first step toward nicotine addiction, and ultimately regular cigarette smoking. However, the gateway effect of e-cigarettes to combustible tobacco products is an emerging area of research, and prospective studies are needed to clarify the association (Schneider & Diehl, 2015). Furthermore, a considerable proportion of both smokers and nonsmokers expressed their intention to try e-cigarettes in the future in the sample. Only a handful of studies have examined e-cigarette experimentation among young adult nonsmokers. One study demonstrated that 2.7% of never cigarette smokers had ever used e-cigarettes (Choi & Forster, 2013), another survey showed 12% ever use rate among college students (Sutfin et al., 2013) and a recent study detected 13.2% lifetime e-cigarette use among never cigarette smoker college students (Kong et al., 2015). The popularity and awareness of e-cigarettes are increasing among young people and well-designed marketing efforts could gradually

increase the interest of non-smoking youth towards the intention to experiment with e-cigarettes (Centers for Disease Control and Prevention [CDC], 2013; Lee et al, 2011; Pepper & Brewer, 2013; Pepper & Reiter, 2013).

Currently, the role of e-cigarette use in the promotion of regular cigarette smoking is unknown. Only one prospective study has assessed changes in e-cigarette experimentation in this age group and reported that experimentation with e-cigarettes increased 11.9% at one-year follow-up among baseline former smokers and 2.9% among baseline nonsmokers (Choi & Forster, 2014). Additional longitudinal research is needed to evaluate the transitions in e-cigarette and cigarette use among this population.

In order to understand the factors that contribute to experimentation, we designed a motivational questionnaire to predict intention to try e-cigarettes. Motives are central cognitive factors in legal and illegal drug use including alcohol (Kuntsche, Knibbe, Gmel, & Engels, 2005), marijuana use (Simons, Correia, Carey, & Borsari, 1998), and cigarette smoking (Piper et al., 2004; Vajer, Urbán, Tombor, Stauder, & Kalabay, 2011). This is the first study that explored the pros and cons motives for trying e-cigarettes among young adults. Using factor analysis with items previously identified as correlated with e-cigarette use, we identified four promoting and two deterring motivational factors. The four pro motives were health benefits, curiosity/taste variety, perceived norms, and convenience. Health benefit motives are related to the beliefs that e-cigarettes are less harmful than regular cigarettes, and that e-cigarette can aid in smoking cessation. Curiosity/taste variety is related to different flavors and possible sensory experiences provided by this product. Although curiosity and taste variety seem to be different motives, they were represented in one factor in the factor analysis, probably due to the fact that e-cigarette marketing emphasizes mainly the different flavors. Further studies could clarify if the same motivational factors are observed in other samples, and whether curiosity and taste emerge as two distinct factors. Perceived norms are related to social motives of its use. Convenience motive is related to the acceptability of e-cigarettes when regular cigarettes cannot be used. We identified two cons motives related to experimentation, including danger of dependence and fear of chemical hazards. Danger of dependence deters experimentation out of fear of the user becoming addicted to e-cigarettes. Fear of chemical hazards refers to the lack of chemical safety in connection with the use of e-cigarettes.

Consistent with previous research among similar age groups, the strongest predictor of intention to try e-cigarettes was current daily and occasional smoking status in multivariate models (Choi & Forster, 2014; Trumbo & Harper, 2013). It is frequently assumed that health benefits of cessation and intention to quit smoking explain young adults' intention to try e-cigarettes and in addition, because these products are widely promoted as a quit tool and as a less harmful alternative than regular cigarettes (de Andrade et al., 2013; Prochaska et al., 2012). However, our results showed negative or no association between perceived health benefits as a motivation for future e-cigarette experimentation among young adults. Curiosity/taste and a lack of fear of dependence were the significant motivational predictors of intention to try e-cigarettes.

Our finding is consistent with the study of Sutfin et al. (2013) who reported the attraction of e-cigarettes to novelty seekers and another survey which explored curiosity as the most important reason for e-cigarette experimentation (Kong et al., 2015). Sensation or novelty seeking – two closely related constructs – are reliable predictors of any type of drug use (Roberti, 2004). Previous studies also demonstrated that sensation seeking is associated with expected positive sensory and taste stimulation from cigarette smoking in adolescents, and the expectancies regarding taste and sensory stimulation also mediates between sensation seeking and smoking behavior (Urbán, 2010). Curiosity/taste was positively associated with intention to try e-cigarettes among both current smoker and nonsmoker participants, however, fear of dependence decreased the intention to try for nonsmokers only. Although prior studies have reported the importance of social acceptability and the use of e-cigarettes to bypass smoking bans (Choi et al., 2012; Dockrell et al., 2013; Kong et al., 2015; Trumbo & Harper, 2013), our results did not identify a relationship between these factors and the intention to try e-cigarettes. Differences in smoking bans and enforcement across the studies could explain this finding. In addition, convenience might be a more important motive for heavy smokers and less important among university students who are more likely to be occasional/social smokers.

This study is the first to estimate the intention to try e-cigarettes among university students in Hungary and to test and utilize a motivational scale for intention to try e-cigarettes. Nonetheless, there are at least four major limitations that need to be acknowledged. The first limitation is the possibility of sampling bias. Our study is based on a voluntary, convenience sample of university students from two universities, therefore the generalizability to non-student and older populations is limited. However, these data serve as starting point for future research and had sufficient sample size to psychometrically develop a scale to measure the motivational factors that contribute to e-cigarette usage. The second limitation is related to the cross-sectional design in which the direction of causality is uncertain. The third limitation concerns self-reported data which is prone to the weaknesses of all survey methodologies, including recall bias and social desirability. The fourth limitation is that we did not control for multiple entries during the online survey. However, the participation in this study did not involve any incentives, therefore we suppose the motivation for multiple entries was unlikely.

Careful consideration is needed concerning the generalizability of our results and the replication of this study is warranted. Future studies should include representative and different socioeconomic characteristics samples. However, this is the first study to measure motives for trying e-cigarettes extensively among young adults. Our results revealed the utility of pros and cons measures to estimate the motivation to try e-cigarettes and highlighted the importance of curiosity and fear of dependence as important correlates of e-cigarette experimentation among university students.

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Table 1

Descriptive statistics and a multivariate model to explain the experimentation with e-cigarettes (N=826).

Characteristic N (%) or Mean (SD)	Total sample N=826	Experimented with e-cigarette N=206	Not experimented with e-cigarette N=620	t or χ^2 (p)	Multivariate binary logistic model [#] OR [95% CI]
Mean Age (SD) in years	21.73 (2.09)	22.13 (2.21)	21.6 (2.04)	3.17 (p<0.01)	1.07 [0.99–1.16]
Gender N (%)					
Women	645 (78.1)	150 (23.3)	495 (76.7)	4.46	0.68 [0.46–1.01]
Men	181 (21.9)	56 (30.9)	125 (69.1)	(p<0.05)	1.00 (Ref.)
University affiliation N (%)					
Health care	538 (65.1)	136 (25.3)	402 (74.7)	0.10	1.28 [0.89–1.84]
Non-health care	288 (64.9)	70 (24.3)	218 (75.7)	(p>0.05)	1.00 (Ref.)
Smoking status N (%)					
Daily smokers	98 (11.9)	58 (59.2)	40 (40.8)	99.1	6.96 [4.39–11.05] [*]
Nondaily smokers	83 (10.0)	37 (44.6)	46 (55.4)	(p<0.001)	4.01 [2.46–6.54] [*]
Nonsmokers	645 (78.1)	111 (17.2)	534 (82.8)		1.00 (Ref.)
Intention to try e-cigarette N (%)	67 (10.8%)	N/A	67 (10.8)	N/A	N/A

Note:

OR=Odds ratio; 95% CI: 95% confidence interval; N/A: Not Applicable.

^{*} p<0.05.[#] This model predict the experimentation with e-cigarette with variables listed in the present table (*Nagelkerke* $R^2=16.7\%$).

Table 2

Exploratory factor analysis of pro items regarding e-cigarette use (N=468).

Pro e-cigarette use items	Health benefit	Curiosity/taste variety	Perceived norms	Convenience
<i>Standardized factor loadings</i>				
I would like to prevent the development of tobacco-related serious diseases.	0.86	0.19	0.01	0.13
It can help to reduce the number of cigarettes smoked.	0.81	−0.27	−0.03	−0.07
It can help to quit smoking completely.	0.79	−0.31	−0.09	0.00
It can help in the transition period of quitting.	0.79	−0.20	−0.10	−0.09
I think that it is less harmful than regular cigarettes, therefore, I can protect my health.	0.69	0.15	0.00	0.03
I would disturb less my environment as it has no real cigarette smoke.	0.66	0.06	0.05	−0.14
If I cannot completely quit smoking then at least I get only nicotine.	0.45	0.02	−0.03	−0.20
I am curious what can be the use of it.	0.11	0.69	−0.14	−0.01
The different flavors caught my attention.	−0.07	0.66	0.03	−0.10
Others use it in my environment.	−0.04	−0.01	0.89	0.04
Others suggested that I should try it.	−0.07	−0.08	0.86	−0.02
I have heard nothing but good things about it from others.	0.19	0.01	0.64	−0.06
It is increasingly widespread.	−0.01	0.23	0.47	−0.05
I should not go out to smoke from enclosed places.	−0.02	0.02	0.04	0.92
I could smoke in places where it is prohibited.	−0.03	0.08	−0.02	0.71
E-cigarette use would be accepted/allowed at my workplace.	0.18	−0.06	−0.15	0.59
Eigenvalue	5.95	2.48	1.47	1.27
Explained variance (%)	37.2	15.5	9.2	7.9
Cronbach's alpha	0.90	0.68	0.82	0.81

Note: Principal Axis factoring was used. Bolded factor loadings are higher than 0.40.

Table 3

Exploratory factor analysis of cons items regarding e-cigarette use (N=500).

Cons items regarding e-cigarette use	Danger of dependence	Chemical hazards
<i>Standardized factor loadings</i>		
E-cigarette use maintains the habits I would like to get rid of.	0.82	−0.05
E-cigarette use shows that I am not able to quit smoking	0.81	−0.18
Nicotine in the e-cigarette could develop or maintain my nicotine craving.	0.70	0.17
Using e-cigarette could lead to dependence.	0.62	0.20
It is possible that I would return or convert to regular cigarette.	0.60	0.01
Nicotine in the e-cigarette can also be harmful.	0.57	0.21
Health care organizations are advised not to use e-cigarettes.	0.51	0.33
There is not exact and reliable information on the composition of the vapor and the composition of e-liquid which is used to refill the cartridge.	−0.03	0.90
There is not exact and reliable information on the short- and long term health risks of e-cigarettes.	0.03	0.88
E-cigarettes are manufactured mostly in places where there is no strict quality control.	0.36	0.46
There are countries where e-cigarette use is prohibited.	0.36	0.37
Eigenvalue	6.00	1.12
Explained variance (%)	54.60	10.20
Cronbach's alpha	0.88	0.85

Note: Principal Axis factoring was used. Bolded factor loadings are higher than 0.40.

Table 4

The concurrent predictors of intention to try e-cigarettes among e-cigarette non-experimenters and by smoking status: Univariate and multivariate models.

	Univariate models OR [95% CI]	Multivariate model# OR [95% CI]	Multivariate model# OR [95% CI]	
	Total sample N=468–618	Total sample N=437	Smokers N=63	Nonsmokers N=374
Health benefits/smoking cessation [*]	0.64 [0.50–0.83]	0.79 [0.54–1.16]	0.80 [0.39–1.63]	0.81 [0.51–1.28]
Curiosity/taste variety [*]	2.40 [1.85–3.12]	2.61 [1.90–3.59]	2.07 [1.00–4.27]	2.57 [1.82–3.64]
Perceived social norms [*]	0.84 [0.63–1.12]	0.82 [0.57–1.19]	0.87 [0.40–1.90]	0.82 [0.53–1.27]
Convenience when cigarette smoking is not possible [*]	0.88 [0.67–1.16]	0.80 [0.57–1.11]	0.98 [0.56–1.69]	0.75 [0.47–1.18]
Fear or danger of dependence [*]	0.53 [0.40–0.69]	0.64 [0.44–0.92]	0.76 [0.36–1.61]	0.60 [0.38–0.93]
Chemical hazards of use [*]	0.81 [0.63–1.04]	0.83 [0.61–1.12]	0.92 [0.56–1.53]	0.76 [0.52–1.12]
Age	0.98 [0.86–1.11]	0.99 [0.83–1.18]	0.85 [0.60–1.22]	1.07 [0.87–1.32]
Gender				
Males	0.75 [0.38–1.48]	1.09 [0.43–2.80]	2.03 [0.26–16.12]	0.88 [0.29–2.67]
Females	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
Current smoking status				
Daily smokers	4.52 [2.12–9.75]	13.70 [4.74–39.47]	N/A	N/A
Occasional smokers	5.80 [2.90–11.60]	6.66 [2.67–16.58]		
Nonsmokers	1.00 (Ref.)	1.00 (Ref.)		
University affiliation				
Health care	0.79 [0.47–1.32]	2.75 [1.31–5.75]	2.93 [0.85–10.12]	2.61 [1.03–6.65]
Non-health care	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
Nagelkerke R ²	N/A	38.1%	32.9%	24.1%

Note:

OR= odds ratio; 95% CI: 95% confidence interval. Significant ORs are bolded. N/A: Not Applicable.

^{*} Factor scores are used in the model.