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Willingness to try e-cigarettes among UK adolescents

Abstract

Purpose: To investigate factors that lead to willingness to try e-cigarettes among UK adolescents. **Methods:** A sample of 16-19 year-old pupils (n=256) completed a questionnaire. **Results:** Smoking status significantly predicted over a third of the variance of willingness to try an e-cigarette and a further 7.8% was significantly predicted by a positive prototype of a smoker and a negative prototype of an e-cigarette user. Moreover, tobacco flavoured e-cigarettes were less favourable than alternative flavours such as fruit, chocolate and mint. **Conclusions:** It is important for e-cigarette advertising and marketing to be free of persuasive material and positive connotations around smoking.

Keywords: Electronic cigarette; Flavour; Adolescents; Nicotine; Smoking.

Introduction

Electronic cigarettes (e-cigarettes) are battery powered devices that allow users to inhale nicotine, emulating the behaviour of smoking a conventional combustible cigarette (Action on Smoking and Health, 2014). E-cigarettes research has found utilisation higher in current and former smokers than never smokers (Etter and Bullen, 2011; Pearson, Richardson, Niaura, Vallone and Abrams, 2012; Brown et al, 2014b; Harrington et al, 2014; Giovenco, Lewis and Delnevo, 2014; Ruther et al, 2014; Tan and Bigman, 2014) and a large proportion of users are men (Etter and Bullen, 2011; Goniewicz, Lingas and Hajek, 2013; Etter, 2010, Siegel, Tanwar and Wood, 2011; Foulds, Veldheer and Berg, 2011; Ruther et al, 2014).

Most e-cigarettes resemble a cigarette, cigar or pen. The first generation products are available as disposables or rechargeable and sometimes in packs that resemble cigarette packaging. These are the most commonly seen and often used by those new to e-cigarette products (McQueen, Tower and Sumner, 2011). The later developed e-cigarette devices are known as second generation products and often do not resemble cigarettes. They are larger, about the size of a conventional fountain pen, where the batteries can be combined with various cartridges changing flavours and strengths. These are predominately used by experienced e-cigarette users that are moving on from using first generation products (McQueen et al, 2011; Dawkins, Turner, Roberts and Soar, 2013). Lastly, the third generation products are also known as modified e-cigarettes or mods and have the functionality of the second generation products, in addition to being modified or personalised for the user.

There is a large range of consumer choice (Brown and Cheng, 2014; Ayers, Robisl and Brownstein, 2011), with flavoured products such as tobacco, mint-menthol, fruit, coffee, vanilla and chocolate being popular among users (Etter and Bullen, 2011). The availability of flavoured e-cigarettes, particularly those outside of tobacco flavour have raised some concerns that they may be appealing to adolescents (Cobb, Byron, Abrams and Shields, 2010; Akre and Suris, 2015) as seen in the case of flavoured alcoholic drinks, alcopops, targeted at young people (Hastings, Anderson, Cooke and Ross, 2005; Jones and Reis, 2012).

In the UK, although the regulation on the age of sale of e-cigarettes and other nicotine containing products prohibits sale to those under the age of 18 years, children and adolescents are aware the products exist. In 2013, it was reported that 66% of children in the UK were

aware of the e-cigarette but use was low, with 7% of 11-18 year olds had tried it once and 2% more often (Action on Smoking and Health, 2014). More recently, 94.5% e-cigarette product awareness was reported in a sample of 256 UK adolescents (Clarke and Lusher, 2015a). Moreover, in non-smokers, willingness to try an e-cigarette was a significant predictor of both susceptibility to use an e-cigarette and to smoke a cigarette within the next year (Clarke and Lusher, 2015b). Research exploring e-cigarette use among adolescents is paramount as these are a high risk group for smoking initiation and fear exists that e-cigarettes will cause a gateway effect (Akre and Suris, 2015; Grana, 2012; Choi, Fabian, Mottey, Corbett and Forster, 2012; Pepper, McRee and Gilkey, 2013). The gateway effect refers to an adolescent becoming addicted to a e-cigarette and then switching to a conventional tobacco cigarette (Grana, 2012; Bell and Keane, 2012) because of the highly addictive nature of nicotine and some of the similarities that exist between e-cigarettes and conventional cigarettes.

Studies examining gender differences and smoking initiation of conventional cigarettes, found that boys were more susceptible to smoking than girls (Veeranki et al 2014), with boys initiating smoking at a lower age than girls (Okoli et al, 2013). Moreover, earlier research found that boys were more influenced to smoke by their best friend than girls (Urberg, Degirmencioglu and Pilgrim, 1997) and where as girls are more likely to obtain their first cigarette from a family member and boys initiation was more likely to take place at school (Okoli et al, 2013). This provides some indication that gender could influence smoking susceptibility in youth (Veeranki et al 2014; Okoli et al, 2013; Urberg et al, 1997), however whether gender would influence willingness to try e-cigarettes in adolescents has yet to be investigated.

The willingness model (Gibbons and Gerrard, 1995), which suggests that health related decisions involve social reaction processes that influence spontaneous willingness (rather than planned intentions) demonstrates that adolescents are less likely to predict how they would behave in a given situation and more likely to take risks than adults. The model poses that if a particular behaviour is associated with a negative image, young people will want to avoid the behaviour and avoid a negative social reaction and similarly, building positive images of behaviour, young people will want to associate themselves with that perception. Interestingly, previous smoking research has found that image stereotypes like sexy and stylish are more likely to be associated with smoking susceptibility (McCool, Cameron and

Petrie, 2013) and rejecting negative labels attached to smoking increases the likelihood of young adults smoking (Dietz, Sly, Lee, Arheart and McClure, 2013). Therefore understanding whether the type of prototype perceptions adolescents place on e-cigarette users and smokers has an impact on their willingness to try the products, could be beneficial to curb potential nicotine use in adolescents. A previous study that examined social prototypes (both negative and positive) of smokers, found that non-smoking adolescent boys who had more negative beliefs about the typical smoker were less willing to try the e-cigarette (Pepper, Reiter, McRee, Cameron, Gilkey and Brewer, 2013).

Unconventional flavours mask the taste of tobacco which could be appealing to youths as seen in research on flavours and conventional cigarette and cigar products (King, Tynan, Dube and Arrazola, 2014; Ashare et al, 2007). Previous research found usage of such products were two-fifths of middle and high school students (King et al, 2014) and flavoured cigarettes elicited higher positive expectancies than the tobacco flavoured equivalent for all students including non-smokers (Ashare et al, 2007). However, despite the findings of the impact of flavoured conventional products, research into flavoured e-cigarettes in the adolescent population is scarce. One study conducted in the US, found no difference between willingness to try an alternative flavoured e-cigarette, versus tobacco flavoured, e-cigarette, contrary to the findings on conventional flavoured products, but it was highlighted that failure to specify tobacco flavoured in the survey may have skewed the results of the study (Pepper et al, 2013b). More recently, Shiffman et al (2015) found that interest in flavoured e-cigarettes was low for both non-smoking teens and adult smokers.

Given the research on the impact of flavours with conventional cigarettes and alcopops (Hastings et al, 2005; Jones and Reis, 2012; King et al, 2013; Ashare et al, 2007), the rise in e-cigarette use in adolescents (Kinnunen et al, 2013) and the paucity of peer reviewed and published research on e-cigarettes and the impact of flavours in adolescents, the current study aimed to investigate the impact flavours have on adolescents willingness to try the e-cigarette. Moreover, the present study examined the potential impact of positive and negative social prototypes of smokers and users on willingness to try.

Methods

Participants

Participants were selected using purposive sampling from two London, UK sixth form schools. Of the total sample (n=311), 17.7% were removed due to missing data, leaving a sample size of 256 participants. Three quarters of the sample (n = 190) were girls and a quarter (n = 66) were boys, all aged 16 to 19 years. The majority were under the legal age to purchase tobacco products and e-cigarette products, with nearly two-thirds (n = 155) aged 16 years, and a third (n = 84) aged 17 years. Just over one quarter of participants were smokers and approximately the same amount of participants lived with someone who smokes.

Participants who were smokers ranged from smoking at least one a day (28.1%) to less than once a month (35.9%). Of those that smoked daily, they had been smoking for approximately 23 months (m = 22.78, SD = 21.05). Although there was individual variation, on average participants reported smoking around 7 cigarettes per day (m = 7.11, SD = 3.74), with their first cigarette 31-60 minutes after waking. Prior use of an e-cigarette was 14.5% across the entire sample of participants.

Measures and Procedure

Survey data were collected from pupils in class during a series of 45 minute workshops held during school time.

As a previous study (Pepper et al, 2013b) examined whether flavoured products influence willingness to try e-cigarettes, permission was sought to use and adapt items in order to allow for later comparisons. The newly created survey was piloted on a small sample and some items were adjusted, such as presenting words such as 'flavoured', 'unflavoured', 'e-cigarette' and 'cigarette' in large coloured font as participants in the pilot stage felt they overlooked small differences between these words in normal font. Pilot data was excluded from the main analysis, due to changes made to the survey.

The survey obtained demographic information from participants such as gender, age and ethnicity, in addition to asking whether pupils had heard of the e-cigarette. For those pupils who had not heard of an e-cigarette, a detailed written statement was provided, explaining what an e-cigarette is: *e-cigarettes look like regular cigarettes but they are different. They create a mist that you breathe in like smoke, but they are not made with tobacco.* The survey assessed willingness to try tobacco flavoured e-cigarettes and alternative flavoured e-cigarette, where unflavoured referred to tobacco flavoured products by asking: *If one of your*

best friends were to offer you a regular unflavoured e-cigarette, would you try it? And: If one of your best friends were to offer you a flavoured e-cigarette (chocolate, mint, apple etc), would you try it?

Items were included to ascertain perception of smoking prototypes in relation to tobacco cigarettes, first and second generation e-cigarettes, where a picture of a modified e-cigarette was shown to participants when they got to that question. This was assessed using three items, which asked participants to: *Consider a person who smokes (a cigarette/an e-cigarette/a modified e-cigarette) and: How would you describe this person using the following descriptions?* Eight objectives were included, four items that assessed a positive prototype *stylish, tough, cool* and *independent*, and four items that assessed a negative prototype *unattractive, immature, inconsiderate* and *trashy* were used. Participants rated each description using a five point scale ranging from *not at all* to *very much*. Counterbalancing was used to account for any potential order effects in the survey and the eight descriptions assessing smokers or e-cigarette users prototypes were randomly assigned for each survey. Due to the partial independence of the two types of social prototypes, the positive and negative scales were scored separately. Both the summed positive score and the negative score range from 4 to 20, with higher scores indicating a higher positive social perception of the prototype. Internal reliability of positive and negative social prototypes were excellent, $\alpha = 0.856$ and $\alpha = 0.917$ respectively, with only a slight improvement to 0.925 for negative social prototype if *unattractive* was removed and so the item remained.

The survey required participants to state their smoking status and participants were classified as a non smoker if they responded 'Never, I am not a smoker'. All other responses were classed as smokers (*less than once a month; at least once a month; at least once a week; and at least once a day*). As wanting to smoke and the number of cigarettes smoked per day are strong indicators of physiological dependency, time to first cigarette and number of cigarettes smoked were used to measure level of nicotine addiction (Fagerstrom, Heatherton and Kozlowski, 1990; DiFranza et al, 2013). The survey assessed length of time smoked, in addition to an item which sought information on whether the participant lived in a smoking household, particularly as parents are less likely to smoke outside when their children are older (14-17 years old) (Hawkins and Berkman, 2011). This question was phrased 'Do you live in a household where someone smokes?' and participants could tick either 'yes' or 'no'

Data were analysed using SPSS Statistics 20. Willingness to try the e-cigarette was analysed using a sequential hierarchical multiple regression to explore the association between the criterion variable and the relevant predictor variables; gender, living in a smoking household, social prototypes of smokers and e-cigarette users, when controlling for smoking status and in some cases controlling for willingness to try as well. Sequential hierarchical multiple regression was used to understand the strength of the association with the criterion variable and the strength of the predictor in adding to the predictive power assessed. Using this method provided insight into the variables required to predict willingness to try an e-cigarette. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. Associations amongst the predictor variables were examined and these are presented in table 1. All associations were weak to strong, $r = .02$, $p > .05$ to $r = .78$, $p < .05$, with only one correlation coefficient $>.7$, at $r = .78$ indicating that multicollinearity was unlikely to be a problem (Tabachnick and Fidell, 2007). When observing the impact that flavours had on favourability, the percentages of smokers and non-smokers willingness to try flavoured and tobacco flavoured e-cigarettes was reviewed to examine differences.

Table 1

Results

Just over one quarter of participants were smokers and the same amount lived with someone who smokes. Smokers ranged from smoking at least one a day (28.1%) to less than once a month (35.9%). Of those that smoked daily, they had been smoking for approximately 23 months ($m = 22.78$, $SD = 21.05$) and although there was individual variation, on average were smoking around 7 cigarettes per day ($m = 7.11$, $SD = 3.74$), with first cigarette 31-60 minutes from waking.

A third of participants reported that they were willing to try the e-cigarette if it was offered by one of their best friends, and this was similar for both sexes. As predicted, smokers were more willing to try an e-cigarette than non-smokers, for boys and girls. Hierarchical multiple regression was performed to investigate the degree to which gender, living in a smoking household and social prototypes of smokers, first generation and second generation e-

cigarette users predicted willingness to try an e-cigarette, when controlling for smoking status. As detailed in table 2, in the first step of the model, in which smoking status was the only predictor, a third of the variance of willingness to try an e-cigarette was explained as statistically significant ($F(1,254) = 141.81, p < .05$). In step 2, all other variables were included: gender, living in a smoking household and social prototypes of smokers and both type of e-cigarette users, adding a further 7.8% variance of willingness to try an e-cigarette (R^2 change = .078, $F(8,246) = 4.27, p < 0.05$). The model overall explained 41.6% of the variance in willingness to try an e-cigarette (Adjusted $R^2 = 0.416$) and was significant ($F(9,246) = 21.18, p < .05$). The significant predictors in step 2 of the model were positive prototype of a smoker and negative prototype of an e-cigarette user. Therefore, the more adolescents positively perceived a smoker the more they were willing to try an e-cigarette, and the more someone negatively perceived someone who used an e-cigarette, the less they were willing to try the product.

When observing the impact that flavours had on favourability, differences between percentages of smokers and non-smokers willingness to try tobacco flavoured and alternative flavoured e-cigarettes such as fruit, chocolate and mint was measured. The majority of smokers (90.6%) were more willing to try a flavoured e-cigarette versus tobacco flavoured products (73.4%). With around a third (33.9%) of non-smoking participants willing to try a flavoured e-cigarette as opposed to tobacco flavoured version (12%). This demonstrates a strong preference for flavoured products, which remained present regardless of smoking status.

Boys were more willing to try a flavoured e-cigarette (39.4%) than an tobacco flavoured e-cigarette (25.8%). When examined by smoking status, nearly all of the boys who smoked (94.4%) were more willing to try a flavoured e-cigarette (83.3%) rather than tobacco flavoured and in non-smokers this trend continued, but at a lower level with 18.8% willing to try flavoured versus 4.2% tobacco flavoured e-cigarettes. Over a half (51.1%) of the girls were willing to try a flavoured e-cigarette compared to just over a quarter (27.9%) willing to try a tobacco flavoured e-cigarette. When examined by smoking status, the majority (89.1%) of girls who smoked were willing to try a flavoured e-cigarette compared to just over two thirds (69.6%) willing to try a tobacco flavoured e-cigarette. In non-smokers this trend was

similar but at a lower rate, with 38.9% willing to try a flavoured compared to 14.6% willing to try a tobacco flavoured e-cigarette.

As shown in Table 2, multiple regression analysis was carried out to identify predictors of adolescents' willingness to try flavoured and tobacco flavoured e-cigarettes. In step one of the model, smoking status was the only significant predictor of willingness to try flavoured ($F(1,254) = 142.71, p < .05$) and tobacco flavoured ($F(1,254) = 105.33, p < .05$) versions, accounting for about a third of the variance in willingness to try. In step 2, gender, living in a smoking household and social prototype of smokers, first generation e-cigarette users and second generation e-cigarette users were added, adding a further 7% of the variance in willingness to try an e-cigarette. This increase was significant for flavoured (R^2 change = .071, $F(8,246) = 3.42, p < 0.05$) and tobacco flavoured (R^2 change = .074, $F(8,246) = 4, p < 0.05$) products. The model explained nearly a third of the variance for willingness to try a flavoured (Adjusted $R^2 = 0.341, F(9,246) = 15.64, p < .05$) and tobacco flavoured (Adjusted $R^2 = 0.413, F(9,246) = 20.91, p < .05$) e-cigarette. The significant predictors in step 2 of the model were positive prototype of a smoker and negative prototype of an e-cigarette user for both flavoured and tobacco flavoured versions. Therefore for both tobacco flavoured and alternative flavoured versions of e-cigarettes, the more adolescents positively perceived a smoker the more they were willing to try an e-cigarette, and the more someone negatively perceived someone who used an e-cigarette, the less they were willing to try the product.

Table 2

Discussion

The current study explored willingness to try an e-cigarette in a UK adolescent population and the impact flavours can have on an adolescents willingness to try. Previous studies (Pepper et al, 2013b; Shiffman et al, 2015) have explored the impact of flavours and suggest that the flavour of an e-cigarette did not impact on e-cigarette favourability. The present study examined the impact of flavour however the distinction of what was meant by unflavoured e-cigarettes could have been further made by specifically stating tobacco flavoured rather than unflavoured in the survey questions. Results in the current study different from previous research (Pepper et al, 2013b; Shiffman et al, 2015) and illustrated that flavoured e-cigarettes were more favourable than tobacco flavoured versions, in line with

qualitative reports from adolescents that the sweet taste of e-cigarettes contributed to their appeal (Akre and Suris, 2015). Regardless of gender or smoking status, the flavoured e-cigarettes were preferred, with around a third of non-smokers willing to try a flavoured e-cigarette. These findings provide evidence that flavoured e-cigarettes are more appealing to adolescents, both smokers and non-smokers, thus supporting recent concerns (Cobb et al, 2010). The potential appeal of flavoured products to young people raises concerns, particularly when e-liquids are extremely toxic (Bahl et al, 2012), but also that flavours can mask the taste of tobacco, which could be appealing to youths, as are flavoured conventional cigarettes more appealing to youths as demonstrated in the literature (King et al, 2014; Ashare et al, 2007). The conflicting results between the current study and previous studies and the impact of various flavoured e-cigarette products, highlights the need for more research to examine this further. However, it must also be taking into account that the current studies reference to tobacco flavour e-cigarettes as unflavoured could have implicated the results as participants may not have been answering the unflavoured questions with tobacco flavour in mind, which is what the researchers were investigating. The amount of research examining flavours is scarce, and more research is encouraged, which takes into account the limitations of previous work. It is also imperative that the marketing and advertising of e-cigarettes are mindful that the marketing of flavours could increase an adolescents' willingness to try these products.

This study found that smoking status and both positive and negative prototypes of a smoker and e-cigarette user significantly predict adolescents' willingness to try an e-cigarette. In the current study, beliefs about prototypes were assessed separately for smokers, a first generation e-cigarette user and a modified e-cigarette user and participants were asked to rate a range of descriptions they would associate with them. Positive prototypes included stylist, tough, cool and independent characteristics, whereas negative prototypes were made up of unattractive, immature, inconsiderate and trashy labels. The current study demonstrated that the more negatively individuals perceive a person who uses the e-cigarette, the less they were willing to try the product themselves. Previously, Pepper et al (2013b) found that non-smoking adolescents who held negative beliefs about a typical smoker were less willing to try the e-cigarette. Therefore, collectively these studies suggest that presenting negative connotations of smokers and e-cigarette users could potentially discourage adolescents from trying e-cigarettes.

Furthermore, our findings also show that the more positively adolescents perceive smokers, the more they are willing to try an e-cigarette. This is similar to Pokhrel et al's (2014) finding who found positive expectancies to be significantly related to a greater likelihood of e-cigarette use and higher intention of future use. Kinnunen, et al (2013) found that adolescents with a positive attitude towards conventional smoking were more likely to have used an e-cigarette. A recent qualitative study with adolescents reported that e-cigarettes may be appealing to adolescents due to the sweet taste, ease to obtain, hide from parents and use indoors (Akre and Suris, 2015). Given that e-cigarettes are being marketed with a range of avenues of which adolescents have access, it is important that any advertising and marketing laws ensure that no persuasive material or positive connotations around smoking are included in advertisements for these products.

Gender did not predict willingness to try in the current study despite literature supporting the finding that e-cigarette use is higher among boys (Cho et al, 2011; Goniewicz and Zielinska-Danch, 2012) and men (Etter and Bullen, 2011; Goniewicz, Lingas and Hajek, 2013; Etter, 2010, Siegel, Tanwar and Wood, 2011; Foulds, Veldheer and Berg, 2011; Ruther et al, 2014). Moreover, whether an adolescent lived in a smoking household was another factor that did not influence willingness to try. So despite the smoking literature demonstrating that parental smoking can increase smoking susceptibility in adolescents (Selya, Dierker, Rose, Hedeker and Mermelstein, 2012; Engels, Knibbe, Vries, Drop and van Breukelen, 2006; Gilman et al, 2009), our findings say this is not the case for e-cigarettes.

The cross sectional nature of this study needs to be acknowledged as it only allows the identification of associations and not casual relationships. More in-depth qualitative research into why flavours are more appealing to this age group would help inform legislation to restrict sales to under 18's and strengthen legislation on marketing and promotion, particularly flavoured products, to ensure they are not targeted towards youths. Longitudinal studies would give the advantage of following an adolescent potential nicotine use, understanding if and how the gateway hypothesis (Akre and Suris, 2015; Grana, 2013; Pepper, McRee and Gilkey, 2013a) can be applied to this product, as cross-sectional survey data cannot prove a direct casual gateway connection. The current study did not look at whether the prototypes of first generation e-cigarette users differed from the prototypes of

modified e-cigarette users, however on reflection this would have been novel insight and future research should consider investigating this so insight can be gained to understanding adolescents perceptions of the different types of e-cigarette users.

The current study collected data during school time and as part of an educational workshop, as did other studies (Cho et al, 2011; Goniewicz and Zielinska-Danch, 2012; Dautzenberg et al, 2013; Lee, Grana and Glantz, 2014; Camenga et al, 2014a; Camenga et al, 2014b; Pentz et al, 2015, Centre for Disease Control and Prevention, 2013). This could have an effect on knowledge and attitudes of the e-cigarette and thus on the survey results, so should be considered when interpreting results. Furthermore, e-cigarettes are no longer products which look like regular cigarettes, there are large variations on the market, all shapes and sizes, sometimes personalised for the user (Brown and Cheng, 2014; Ayers, Ribisl and Brownstein, 2011) and should be taken into consideration when both designing research and interpreting findings.

We hope that this study has raised some awareness of the potential concerns surrounding e-cigarette use among adolescents. Companies need to be mindful when marketing these products that could be targeting this impressionable group. Marketing and advertising of e-cigarettes needs to consider the impact of flavoured products on young people's willingness to try and ensure they avoid any potential enticement of e-cigarette products to adolescents. The fact that these results also illustrate a positive prototype of a smoker predicted willingness to try e-cigarettes should be considered in relation to marketing and advertising laws. There should be no persuasive encouragement of positive connotations of smoking included in any advertising. Furthermore, the study found a negative prototype of an e-cigarette user discouraged willingness to try e-cigarettes in adolescents.

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