

# Electronic cigarette users lack intention to quit vaping

## Abstract

Electronic cigarettes have become a popular smoking cessation device so it is the objective of this study to explore their addiction potential and the intentions of electronic cigarette users. This study aims to determine whether users intend to quit or reduce vaping. An online survey link was posted on social media forums and 259 self-confessed vapers completed an online questionnaire. The majority of vapers had not attempted to reduce vaping (73.4%), with little intention to quit vaping within the next two months (96.6%). Most commonly 6mg of nicotine was used (76.8%) and 4.2% of participants had no previous smoking history. The majority (56%) of vapers reported a moderate nicotine dependency. As expected, regression analysis revealed that nicotine dependency was predicted by age and strength of e-liquid concentration. We conclude from our study findings that the majority of vapers do not intend to reduce or quit using electronic cigarettes and this issue has fundamental implications regarding the long-term negative effects of vaping; that will take time to unfold and further research to fully appreciate.

**Keywords:** cigarette, vaping, users, smoking, nicotine, tobacco

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## Introduction

Electronic cigarettes (e-cigarettes) are a consumer product sold as an alternative to traditional cigarettes. These devices operate using a battery and a tank filled with e-liquid to deliver nicotine orally; mimicking the actions of smoking, making them effective smoking cessation tool.<sup>1</sup> E-cigarette users are commonly referred to as vapers to differentiate them from smokers. Smoking has been on the decline over the past 50 years due to public health concerns and an increase in awareness (Action on Smoking and Health, 2016). Approximately 19% of the UK population smoke cigarettes, amounting to 9.6 million adult smokers in Great Britain.<sup>2</sup> A report published by<sup>3</sup> indicated that smoking costs the National Health Service approximately £2 billion a year. With smoking being such a health hazard and the cause of many diseases, a wide range of nicotine replacement products are available on the market as harm reduction strategies.

E-cigarettes have become a popular method to assist smoking cessation and are often perceived by smokers as a preferred smoking cessation tool.<sup>4</sup> Suggests that e-cigarette users report bad experiences with Nicotine Replacement Therapy (NRT), having negative side effects and are ineffective at preventing relapse. A review conducted by<sup>5</sup> claimed that e-cigarettes are popular amongst younger adults when compared with other age groups. They also reported that as many as 10% of adolescent vapers are doing so without previous history of smoking.

There has been a growing concern around the health risks associated with e-cigarettes, their accessibility and use by teenagers as a preferred method to receive nicotine. There is a growing debate about the effectiveness of using e-cigarettes as a tool for quitting smoking,<sup>6</sup> in 38 studies analysed, the odds of quitting smoking was 28% lower among those who used e-cigarettes compared with those who did not. These concerns are supported in a follow-up study by<sup>7</sup> who indicated beneficial effects of vaping as a smoking cessation method. There is also evidence to suggest that younger smokers are using the device as an alternative to smoking<sup>8</sup> and there are concerns around teenagers being aware that e-cigarettes are less harmful than smoking cigarettes.<sup>8</sup> Found that 9.6% of adolescents in their sample

used e-cigarettes. Krishnan-Sarin, Morean, Camenga, Cavallo and Kong's findings among American high and middle school adolescents further support this, reporting that e-cigarettes were the first nicotine product tried by over half of their sample. This may support the claim<sup>7</sup> that e-cigarettes present a gateway to nicotine addiction by increasing the chances of non-smokers moving to cigarettes.<sup>9,10</sup>

<sup>11</sup>Found that while e-cigarettes are becoming more popular among adolescents, this trend was not responsible for the parallel rise in smoking in Poland. With e-cigarettes being a relatively recent nicotine replacement product available on the market, the long term risk for teenagers using them as a gateway to cigarette smoking remains speculative; however there are further concerns that arise from e-cigarette use. Another concern is whether this behaviour maintains nicotine addiction rather than ceases it, which is not uncommon considering how some individuals maintain their use of Nicotine Replacement Therapy (NRT) long after the recommended time frame<sup>12</sup> indicated that ex-smokers often have periods of relapse before returning to abstinence. E-cigarettes have proven to be effective as a standalone tool for quitting smoking,<sup>13</sup> however they could also encourage maintenance, rather than reduce dependency.

Moreover, given the relatively unknown long-term consequences of vaping, it is important to examine user's willingness to quit nicotine addiction. A recent review conducted<sup>14</sup> on the harmful effects of nicotine found that it presented various health hazards on organs in both humans and animals; and their review excluded all tobacco and cigarette smoking studies. It is imperative that we investigate the long-term effects of nicotine delivered through e-cigarettes as<sup>15</sup> have shown in their study on nicotine inhalation, indicating multiple health hazards through absorbing nicotine orally. Finally, there are rising concerns around the chemicals used in e-cigarettes. E-liquid contains chemicals that when inhaled have been related to respiratory disease.<sup>16</sup> Regardless, reducing nicotine intake, in any form, will decrease the health hazards associated with smoking. The aims of this study were therefore firstly to explore e-cigarette user's intentions to cease vaping and their dependence levels, and secondly, to determine whether vapers smoke before using e-cigarettes, and if so, how successful this method has been at assisting users to cut down or stop tobacco use.

## Methods

### Participants

Two hundred and fifty nine participants completed an online survey (completion rate 86%). Only fully completed questionnaires were used in the final analyses and data were screened and cleaned accordingly. Participants consisted of 217 (83.8%) men and 42 women. The sample was mainly Caucasian (89%) with a wide age range (15–63 years). Vaping history ranged from one month to several years. Participants were members of online e-cigarette communities where information and help around e-cigarettes are shared. All participants identified as vapers or e-cigarette users with an active interest in e-cigarettes; thus limiting the sample to vapers who are interested in online forums and groups around e-cigarettes and are therefore unrepresentative of all e-cigarette users. Due to the nature of online surveys, geographical information was varied and uncontrolled in this study. Participants were identified by IP address and no personal details beyond demographic details including age, gender, ethnicity and education were collected in order to maintain anonymity. No monetary reward was offered and participants were free to withdraw at any point.

### Materials

The survey collected demographic details and information on e-cigarette use, which included reasons for starting, tobacco consumption after starting to vape, cigarette cravings after vaping and attempting to cut down e-cigarette use. Information was also collected on the type of e-liquid used, including strength of nicotine mixture and milligrams for each millilitre (0mg, 6mg, 12mg, 18mg and 24mg). Questions were asked about tobacco use, preferred flavour (fruity, tobacco, menthol, other) and whether participants intended to quit vaping within the next two months. This information was gathered to assess vaping habits and users intentions around quitting e-cigarettes. Measure severity of dependence including adapted versions of the Fagerstrom Test for Nicotine Dependence,<sup>17</sup> Smoking History Questionnaire<sup>18</sup> and The Severity of Dependence Scale were used.<sup>19</sup>

### Procedure

Following ethical approval from the University's psychology research ethics committee, the survey was hosted on and a link to the survey was placed on several social media group websites and online e-cigarette forums following administrator's permission, who were informed that the study was part of a non-funded research project and was not sponsored by any company. The participants were presented with a brief and upon providing consent were invited to complete the survey. On completion, a debrief was presented with links to stop smoking services. The survey ran for one month before data were exported into SPSS 23 for analyses.

### Results

The majority of participants had been using e-cigarettes for over a year (65.6%, mean 23 months). When asked why they had started vaping, 69.5% wanted an alternative to smoking, 4.6% wanted a partial alternative, 12% had tried it out of curiosity, 4.6% reported that had tried it as a result of being recommended by a friend and 9.3% reported 'other' reasons. A large majority (93.8%) reported that their tobacco consumption had decreased substantially since starting to vape. Only 0.8% reported increased tobacco consumption since starting to vape and 5.4% reported that it had remained the same.

These statistics support e-cigarettes as an effective smoking cessation tool.

The majority (73.4%) of vapers reported that they had not attempted to reduce vaping. When asked if they had been successful at reducing e-cigarette use, 69.1% said that this did not apply to them, whilst 18.5% reported that they had been successful at reducing their e-cigarette use and 12.4% had been unsuccessful at reducing their use of e-cigarettes. Alarming, the vast majority (96.9%) of vapers reported no intention to quit vaping in the next two months. This demonstrates that vapers in this study had little-to-no intention to quit or reduce vaping.

Vapers were asked about the type of e-liquid they used and 76.8% preferred a mixture of 6mg of nicotine (14.7% reported preferring 0mg nicotine). Stronger nicotine mixtures were less favourable with 12mg used by 5.8% of the sample, 18mg used by 1.9% and 24mg used by 0.8%. Respondents did not favour tobacco flavours with 85.7% not using them, but 71.8% used fruity flavours, 3.5% used menthol and 1.9% used homemade flavours.

Participants smoking history was varied and the average age of onset was 15 years of age. Of those who had smoked daily, they had done so for an average of 15 years. From this sample of vapers, 95.8% had smoked previously. The majority indicated a low dependence score, with scores of 1 (18.5%), 2 (21.2%) and 3 (15.8%) on the SDS. Medium dependency scores were 4 (8.5%), 5 (4.2%), 6 (3.1%) and high scores of 7+ were reported by 3.6% of respondents. We found a positive correlation between nicotine mixtures and SDS scores  $r=(259) 0.20, p < 0.05$ , indicating higher nicotine concentrations are related to higher dependence levels. The majority of participants (55.6%) showed a moderate dependence on the FTND. Over a quarter (27%) scored low to moderate nicotine dependence and 11.6% reported a high dependency. FTND scores also correlated with nicotine mixtures  $r = (259) 0.24 p < .001$ , with higher nicotine concentrations relating to higher FTND scores.

Multiple regression analysis was used to identify predictors of vapers levels of nicotine dependency and a significant regression model emerged ( $f(5,253) = 7.141, p = .001$ ), with an  $R^2$  of .12. Months spent vaping did not predict nicotine dependency ( $\beta = .055, p > 0.05$ ) or attempts to cut down vaping ( $\beta = -.287, p > 0.05$ ). Age was a significant predictor of nicotine dependency ( $\beta = 193, p < .005$ ), along with gender ( $\beta = -.185, p < .005$ ) and nicotine mixture level ( $\beta = .212, p < .001$ ).

### Discussion

The current study examined vapers intentions to quit e-cigarettes and their levels of nicotine dependency. To be expected, age predicted nicotine dependency, which may be due to longer periods of smoking in older individuals, despite age not always being attributed to difficulty in smoking cessation.<sup>20</sup> While e-cigarettes are not the same as conventional cigarettes, the behaviour is comparable when assessing reduction. Messer, Trinidad, Al-Delaimy and Peirce<sup>21</sup> examined differences between young and older smokers and found that younger vapers were more likely to quit smoking. They attributed this to more widespread interest in quitting as well as lower levels of dependence. This may explain the age correlation between nicotine dependence through e-cigarettes. This issue warrants further investigation, not only to examine adolescents taking up vaping, but also to examine the intentions of older individuals in order to help tailor interventions appropriately.

Men in this sample had higher nicotine dependence levels than women. This may be connected to recent trends showing that more men are giving up smoking.<sup>2</sup> Dependence levels may be a result of higher nicotine strength being used by men as in previous studies.<sup>22</sup> However, due to the small sample size and limited number of women in our study, the claim remains somewhat speculative. Moreover, cultural factors were not measured and in many cultures women openly smoking is taboo.<sup>23</sup> This could be applied to e-cigarettes and could help to explain the limited online presence of women on e-cigarette forums and social media groups. More in depth research is necessary to examine e-cigarette use among women specifically.

Typically, higher nicotine concentration is associated with nicotine dependence. This is due to higher nicotine delivery from such mixtures maintaining the addiction, which supports Dawkins and Corcoran's<sup>24</sup> findings and strengthens the claim that e-cigarettes are a viable alternative to smoking if they assist in maintaining a moderate addiction even after smoking abstinence. This does however raise concerns around non-smokers using these devices, which may present a gateway into smoking. In practice this means ensuring that younger vapers are using lower nicotine mixtures do not increase the chances of developing a more severe dependency on this stimulant drug. It also emphasises the importance that if private smoking cessation services are offering the e-cigarette as a tool to assist smoking cessation, then they should be mindful to emphasise gradual nicotine reduction as part of the regime. Given the greater satisfaction reported by vapers, this may present a barrier to nicotine reduction.<sup>1</sup> It is arguable as to when is the right moment to start reduction, as lowering the nicotine mix too early may hamper the effectiveness of the e-cigarette as a cessation method.

Over half of the sample in our study showed a moderate dependency on e-cigarettes and the majority of vapers indicated that they were not planning to quit vaping within the next two months. This is also evident by the length of time they had been vaping, in most cases several years. This is likely due to identifying as a vaper and being part of a community around these devices. Individuals reducing nicotine levels may distance themselves from such communities, as smokers do when quitting by distancing themselves from friends who smoke. This also supports the research conducted by Dawkins, Turner, Roberts and Soar<sup>25</sup> who found that e-cigarettes were effective but required much longer to reduce. E-cigarettes may be too effective at replicating smoking behaviour and therefore present more difficulty in reducing nicotine compared to other NRT's and this point warrants further exploration. Examining the intentions of vapers allows health care professionals to tailor interventions accordingly and to provide further information around e-cigarettes that may be more applicable to certain types of smokers who are not satisfied with other NRT methods.

There are some quality concerns regarding e-cigarettes being a consumer product that is manufactured worldwide and presenting the risk of non-regulated e-liquid products being sold containing chemicals that can present health risks.<sup>26</sup> Whilst the UK is creating regulations on e-cigarette production, there are still risks posed by imported suppliers. Research carried out by Etter, Zäther and Svensson<sup>27</sup> indicated that e-liquid bottles often contain chemicals that are not listed on the label; as well as variation in nicotine levels. Finally, the long-term risks of maintaining a dependency on nicotine can increase the chances of users relapsing back to cigarettes.<sup>28</sup>

Findings from the present study should be considered in light of the design and methodological limitations of this study. We collected data through an online survey, which reduces the application of the findings due to the geographical limitations and caution from making generalisations based on a specific sample. Firstly, the sample was recruited from online social media groups for e-cigarette users. Participants are more likely to maintain vaping due to the investment into the hobby and identifying as vapers. By identifying with online communities and participating amongst them, it becomes an identity that may create social barriers in reducing the behaviour so future research should attempt to use varied data collection methods for this inquiry. Secondly, it is challenging to put findings into context, as cultural factors and social norms were not considered in this study. With different cultures viewing smoking differently and various age groups experience alternative perceptions of risk. E-cigarette use is expanding among the younger population,<sup>5</sup> e-cigarettes are also a relatively new device for public use that varies globally on legislation and social perceptions, therefore cultural views require further consideration. A third problem is that there have been at least three generations of e-cigarettes over the last decade. The variation in e-cigarettes has created devices suited to different individuals. A main divide is the type of mechanism used, which is mainly around the amount of vapour production and nicotine delivery efficiency.<sup>29</sup> Third generation devices are referred to as Advanced Personal Vaporizers (APV's) and these devices are larger and use more reusable parts inside, but cost more from stores. These differences present a problem when it comes to data analysis, as highlighted by Farsalinos and Polosa's.<sup>30</sup> If e-cigarettes continue to evolve at this rate, then this will raise difficulties in applying research findings to practical settings as different devices will have altered risks and specific problems.

In conclusion, e-cigarettes currently provide a more socially acceptable alternative to cigarette smoking, which may create additional barriers to nicotine reduction. Smoking cessation services need to consider the effects of e-cigarettes on nicotine dependency. The results of this study support the view that e-cigarettes maintain addiction and the habit of smoking. The majority of participants in our study were not intending to quit e-cigarettes and had maintained vaping for years after giving up conventional cigarettes. This raises concerns around the long-term use of nicotine and e-cigarettes. Our findings indicate that older individuals are more likely to maintain this addiction so efforts should be made to help young people kick this habit before it is too late.<sup>31,32</sup>

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## Conflict of interest

Author declares that there is no conflict of interest.

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