

THE UK ELECTRONIC CIGARETTE RESEARCH FORUM

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Electronic Cigarette Research Briefing – December 2018

This research briefing is part of a series of monthly updates aiming to provide an overview of new studies on electronic cigarettes. The briefings are intended for researchers, policy makers, health professionals and others who may not have time to keep up to date with new findings and would like to access a summary that goes beyond the study abstract. The text below provides a critical overview of each of the selected studies then puts the study findings in the context of the wider literature and research gaps.

The studies selected and further reading list do not cover every e-cigarette-related study published each month. Instead, they include high profile studies most relevant to key themes identified by the UK Electronic Cigarette Research Forum; including efficacy and safety, smoking cessation, population level impact and marketing. For an explanation of the search strategy used, please see the end of this briefing.

Some of you have been in touch to report that you haven't received some recent UKECRF briefings. You can find our previous research briefings at www.cruk.org/UKECRF.

If you would prefer not to receive this briefing in future, just let us know.

1. Vaping as an alternative to smoking relapse following brief lapse

- **Study aims**

This UK study examined the experience of lapses to smoking in 40 individuals who reported having quit smoking using an e-cigarette. Researchers used semi-structured qualitative interviews conducted between September 2016 and May 2017 to identify themes around e-cigarette use, brief lapses and abstinence from smoking.

- **Key findings**

19 participants reported either brief or regular lapses to smoking and six had relapsed completely to either dual use or exclusive smoking. Brief lapses were generally attributed to social situations, device malfunctions or individuals forgetting not to smoke.

Many of the sample described 'purposive lapses'. This included two types of lapse: individuals having the occasional cigarette as an indulgence without fear of complete relapse, and individuals having a cigarette as a test of strength of resolve for continued abstinence. Lapses

were therefore described as either insignificant or negatively reinforcing due to the unpleasant sensations of smoking.

However, there were also interviewees that felt that any lapse to smoking would result in complete relapse. Comparisons were drawn by participants to previous quit attempts using other cessation methods where a brief lapse was quickly followed by full relapse.

The researchers identified dual users could be 'sliders' towards abstinence rather than 'switchers'. Some felt under no pressure to quit tobacco which could justify continued use or lapses, but others reported gradually quitting tobacco using an e-cigarette.

- **Limitations**

This study recruited participants who self-reported as having quit smoking using an e-cigarette. Individuals who failed to quit smoking using an e-cigarette may have been excluded so findings may only be relevant for a specific subset of e-cigarette users.

This was a small sample which were all White British and not representative of lower SES groups. Therefore, the themes and beliefs may not be generalisable to the wider vaping population.

There was a wide range of vaping experience, from two weeks to seven years. This study did not consider how lapse behaviour differed depending on length of time vaping.

This survey relied on self-reported data on product use and abstinence which could be subject to bias. Although this data can be used to generate hypotheses, it cannot be tested to determine significance.

Notley, C., Ward, E., Dawkins, L., Holland, R., and Jakes, S. (2018) Vaping as an alternative to smoking relapse following brief lapse. *Drug and Alcohol Review* doi.org/10.1111/dar.12876

2. [Messages matter: The Tobacco Products Directive nicotine addiction health warning versus an alternative relative risk message on smokers' willingness to use and purchase an electronic cigarette](#)

- **Study aims**

This English study randomised 81 smokers to one of three messages accompanying images of e-cigarettes; no message, the tobacco products directive (TPD) message ('this product contains nicotine which is a highly addictive substance') or a reduced-risk message ('The Royal College of Physicians (2016) report concluded that e-cigarettes are 95% less harmful than cigarettes'). Intention and willingness to use and purchase an e-cigarette was examined and compared across messages. Analyses were adjusted for willingness and intentions prior to exposure to the message and additionally for variables which had not been successfully randomly distributed between groups in the randomisation process

- **Key findings**

There was a significant effect of message type on willingness to use an e-cigarette ($p=0.012$) and likelihood to purchase an e-cigarette ($p=0.014$).

No effect of message type was seen on likelihood of use of an e-cigarette in the next month or use in a serious quit attempt ($p=0.17$ and $p=0.12$, respectively).

Pairwise comparisons found that participants exposed to the TPD message were significantly less willing to use an e-cigarette compared to those seeing no message, and also compared to those seeing a reduced risk message.

Participants exposed to the TPD message were significantly less likely to purchase an e-cigarette compared to those seeing no message, but there was no difference in purchase intentions compared to those seeing a reduced risk message.

- **Limitations**

The study didn't look at individuals' behaviours regarding e-cigarettes, only their intentions and attitudes, which may differ.

Participants were presented with the messages in a controlled situation rather than shown adverts in a real-life environment and the effect of the message in these scenarios may differ.

This was a small study which would need to be replicated in larger groups. Randomisation failed for some characteristics and it was not clear how many participants were exposed to each message.

The majority of participants were students and average nicotine dependence was low – therefore the results may not be generalisable to the wider smoking population.

Comprehension and belief of the reduced-risk message was not tested prior to the experiment. The effect of the TPD message may differ if compared to alternative reduced risk messages.

Cox, S., Frings, D., Ahmed, R. and Dawkins, L. (2018) Messages matter: The Tobacco Products Directive nicotine addiction health warning versus an alternative relative risk message on smokers' willingness to use and purchase an electronic cigarette. *Addictive Behaviors Reports* 8:136-139 doi.org/10.1016/j.abrep.2018.09.006

3. Differences in perceptions of e-cigarettes across daily and non-daily users

- **Study aims**

This was a US based online survey that examined the perceptions of benefits, risks and innovative characteristics of e-cigarettes and differences between 372 daily e-cigarette users and 192 non-daily e-cigarette users.

- **Key findings**

Participants reported using their e-cigarette 8 times a day on average. 436 individuals (77.3%) were dual users and a low level of e-cigarette dependence was observed in the sample.

There was a moderate positive correlation ($r=0.57$) between individuals' perception of benefits of e-cigarettes and perception of risks of e-cigarettes – those who perceive more benefits of e-cigarettes may also perceive higher risks.

After adjusting for sex, age, education, income, dual use and frequency of use, daily users reported significantly more perceived risks of e-cigarette use than non-daily users ($p=0.002$), but the estimated effect size of type of e-cigarette use was small.

Adjusted analyses also found that daily users reported more benefits of e-cigarette use and higher perception of the innovation of e-cigarettes compared to non-daily users ($p<0.001$ and $p=0.01$), respectively. The estimated effect size of daily e-cigarettes use was small for both benefits and innovation.

- **Limitations**

This was a cross-sectional study so is unable to draw conclusions about causality. It's not possible to determine how perceptions about the benefits, risk and innovation of e-cigarettes influence whether someone is a daily e-cigarette user or not.

There was no distinction drawn out of differences in absolute perceived risk and benefits and perceived risk and benefits relative to smoking between daily users and non-daily users.

The majority of participants were white and average e-cigarette dependence was low – therefore the results may not be generalisable to the wider vaping population.

This study didn't control for all possible confounders that could affect results, such as reasons for e-cigarette use.

Inclusion criteria specified that individuals had to have used an e-cigarette in the last month which could include users who initiated e-cigarette use recently or only tried it once. There was no analysis of how perceptions of e-cigarettes varied according to length of time of e-cigarette use.

Mayorga, NA., Garey, L. and Zvolensky MJ (2018) Differences in perceptions of e-cigarettes across daily and non-daily users. *Addictive Behaviors* 90;415-420 doi.org/ 10.1016/j.addbeh.2018.12.004

4. [Comparing cigarette and e-cigarette dependence and predicting frequency of smoking and e-cigarette use in dual-users of cigarettes and e-cigarettes](#)

- **Study aims**

This study was a US based online survey of 326 dual users in 2017. Dual use was defined as at least weekly use of both cigarettes and e-cigarettes. Participants answered two four-item questionnaires on both cigarettes and e-cigarettes to measure dependence on a Likert scale of 0-4. The study aimed to examine differences in dependence on cigarettes and e-cigarettes, and further determine whether dependence predicted smoking or vaping frequency.

- **Key findings**

Participants reported greater dependence on cigarettes compared to e-cigarettes (score of 2.30 vs 1.86, $p<0.01$). There was a moderate positive correlation between cigarette dependence score and e-cigarette dependence score ($r=0.35$).

E-cigarette dependence was significantly associated with more frequent vaping ($p<0.001$) and less frequent smoking ($p<0.01$) in the past-month, after adjusting for age, sex, race, nicotine e-liquid use and cigarette dependence.

Cigarette dependence was significantly associated with less frequent vaping ($p<0.01$) and more frequent smoking ($p<0.001$) in the past-month, after adjusting for age, sex, race, nicotine e-liquid use and e-cigarette dependence.

Multivariate analyses indicated that older age was a significant predictor of past-month smoking frequency ($p<0.001$), but not past-month vaping frequency.

- **Limitations**

It is not clear how 'dependence' was defined for the analysis looking at the relationship with smoking/vaping frequency. The categorisation of both cigarette and e-cigarette dependence based on a particular PROMIS/PROMIS-E score would affect the interpretation of the results.

The researchers did not compare dependence scores in these dual-users to those in exclusive smokers or exclusive vapers, or how dependence might differ in daily e-cigarette users compared to non-daily users.

The majority of participants were white and average e-cigarette dependence was low – therefore the results may not be generalisable to the wider vaping population.

This study didn't control for all possible confounders that could affect results, such as reasons for e-cigarette use.

This survey relied on self-reported data and this could be subject to bias.

Morean, M., Krishnan-Sarin, S. and O'Malley, M. (2018) comparing cigarette and e-cigarette dependence and predicting frequency of smoking and e-cigarette use in dual-users of cigarettes and e-cigarettes. Addictive Behaviors 87:92-96 doi.org/10.1016/j.addbeh.2018.06.027

Overview

For this the last bulletin in 2018 we include two articles from the UK and two from the USA.

Our first paper reports results from qualitative research conducted as part of a [larger study](#) funded by CRUK. Amongst participants in the larger study, forty adult vapers living in England were recruited and matched by gender and age with a representative sample of ex-smokers who had quit in the past year. They took part in a semi-structured interview covering a range of issues, and for the current article the focus was on how any relapse to smoking was experienced by these adult vapers. The authors' rationale for exploring this was the existing literature on the strong relationship between brief or occasional lapses and full relapse to smoking.

Participants had a variety of smoking and vaping histories. The vast majority were vaping ($n=37$) at the time of interview, following recruitment to the main study. The duration of vaping varied substantially from a few weeks to 7 years. The vast majority (31 out of 40) were ex-smokers and the remainder had relapsed to smoking ($n=6$) or were no longer smoking or vaping ($n=3$). Just under half of the sample ($n=19$) reported brief or regular lapses to tobacco smoking since they started vaping. When discussing when these lapses occurred, or how participants perceived these lapses, the authors identified different patterns from previous studies on relapse to smoking for adults who quit smoking using methods other than vaping. Lapses were common among the participants, particularly in the early stages of a quit attempt with vaping. They were sometimes tried on purpose to test resolve, or regarded as acceptable because the availability of vaping gave participants confidence that they would not return to regular smoking. Particular aspects of vaping that were

distinctive included: the experience of inhaling vapour; the scent or smell of vapour emissions; and the hand to mouth action of vaping, which participants felt made vaping different from other approaches to stopping smoking. Brief lapses were not perceived as inevitably leading back to smoking, because vaping was seen as a viable and (for most) as a preferable alternative to smoking. These perceptions merit further exploration in a larger sample. Research is also needed that examines differences in the relapse rate (both brief and full relapse) to smoking when vaping is compared with the use of other aids to smoking cessation.

The second article focuses on health warnings on vaping products. This study was also conducted in England, where the transposition into UK law of the EU Tobacco Products Directive (TPD) requires a nicotine warning on all vaping product packaging. 81 smokers aged between 18 and 55 were randomised to view images of e-cigarettes online. None were regular vapers - most (73%) had never tried vaping and some (27%) had tried it once or twice. There were three groups and each viewed ten images of different types of vaping devices. One group viewed these devices with the required TPD nicotine warning (nicotine is a highly addictive substance), the second with a reduced risk message (95% less harmful than cigarettes) and the third group the devices with no message. Ratings of willingness to use an e-cigarette and the likelihood of purchasing an e-cigarette were significantly lower in the group who viewed the TPD warning compared to the reduced harm message or no message. Differences in terms of likeliness of using in the next month or using in a quit attempt were not significant. The authors concluded, as [previous studies](#) have suggested, that the TPD message might increase perceptions of harms of vaping, may raise concerns about maintaining addiction or increase perceptions of the harms of nicotine (which is [often confused with the harms of smoking](#)). Questions remain about what warning messages should be shown in e-cigarette packaging and this is something other countries, [particularly Canada](#), are currently considering.

This month's third study aimed to examine differences between daily and non-daily users of e-cigarettes in a sample of 564 adults aged 18-65 recruited from an online panel in the USA. Participants needed to have vaped at least once in the past 30 days. They completed an online survey about their use of e-cigarettes, perceptions of use and questions on affective states (feelings or emotions). The rationale behind the study was that the authors suggest that "daily users are theorized to be at greater risk for experiencing e-cigarette negative health consequences" so understanding what affects daily use may be important.

The authors employed a number of new validated measures or scales that have been developed to assess different elements of vaping including the [Penn State Electronic Cigarette Dependence Index](#), the [Electronic Cigarette Smoking History Questionnaire](#), the [Risks and Benefits of E-cigarettes Questionnaire](#) and the [Innovation Characteristics of E-cigarettes Questionnaire](#). Overall they found that daily users compared with non-daily users reported: more perceived risks of e-cigarette use; more perceived benefits of e-cigarette use; and higher levels of perceived innovation (i.e that the innovative technology involved in vaping devices is viewed positively by users). Most of the study participants were dual users (77%) so findings are likely to be influenced by the fact that most of those answering the survey questions were still smoking and may have viewed their e-cigarette use in the context of (or compared to) their smoking behaviour. As the authors point out, the findings that daily users were more positive (reported more perceived benefits) about vaping and innovative vaping technology is not surprising and may affect vaping frequency. However, the fact that daily users were more concerned than non-daily users about any risks from vaping appears contradictory. The researchers suggest this may reflect concerns users had about the long-term safety of vaping, the relative risk of vaping compared with smoking, or increased concerns about their dependency on e-cigarettes.

Our final study this month, also from the USA, examined differences in dependency on (addiction to) tobacco cigarettes and e-cigarettes in a sample of 326 adult dual users. This study also used standard tools validated in previous studies; one developed to assess cigarette dependence ([PROMIS](#)) and then adapted to assess e-cigarette dependence ([PROMIS-E](#)). The authors were interested in whether participants reported different levels of dependence on each product, and whether dependence affected how frequently they smoked or vaped.

Overall, the dual users in the study were more dependent on smoking than vaping based on the self-report measures in PROMIS and PROMIS-E. This suggests that participants viewed the two behaviours differently and were able to describe urges to smoke or vape as distinctive from one another. Perhaps unsurprisingly, those that reported stronger dependence on cigarette smoking were heavier smokers (in the past month) and used e-cigarettes less frequently. In contrast, those who reported more dependence on vaping were smoking less and vaping more. A challenge for the study, as we note in the summary above, was that this group of dual users was not compared with smokers who don't vape, or ex-smokers who have quit while vaping. In addition, it's not clear from the results how dependence on vaping could prove a useful construct or measure in helping smokers reduce their urges to smoke or to assist with smoking cessation - a topic that could be explored in future research.

We'll be back in 2019 with more regular updates on the latest studies! In the meantime if you are in the UK and planning to attend the next UKECRF face to face meeting in Cardiff on January 25th, please get in touch via tobaccocontrol@cancer.org.uk if you've not yet booked your place.

Other studies from the last months that you may find of interest:

[First comparative results about the direct effect of traditional cigarette and e-cigarette smoking on lung alveolocapillary membrane using dynamic ventilation scintigraphy.](#)

[Urinary concentrations of monohydroxylated polycyclic aromatic hydrocarbons in adults from the U.S. Population Assessment of Tobacco and Health \(PATH\) Study Wave 1 \(2013-2014\)](#)

[Emissions of free radicals, carbonyls, and nicotine from the NIDA Standardized Research Electronic Cigarette and comparison to similar commercial devices.](#)

[The impact of local regulation on reasons for electronic cigarette use among Southern California young adults.](#)

[U.S. adult perceptions of the harmfulness of tobacco products: descriptive findings from the 2013-14 baseline wave 1 of the path study.](#)

[Exclusive versus dual use of tobacco and electronic cigarettes among adolescents in Poland, 2010-2016.](#)

[Electronic cigarette marketing and smoking behaviour in adolescence: a cross-sectional study.](#)

[Electronic cigarette use after the adoption of a tobacco-free campus policy.](#)

[Impact of e-cigarette sampling on cigarette dependence and reinforcement value.](#)

[E-cigarette devices used by high-school youth.](#)

[Trends in Trust in the Sources of Health Information on E-Cigarettes Among US Adults, 2015-2017.](#)

[Current pain severity and electronic cigarettes: an initial empirical investigation.](#)

[Older Smokers' Beliefs About e-Cigarettes and Intent to Quit Conventional Cigarettes.](#)

[Psychological distress and responses to comparative risk messages about electronic and combusted cigarettes.](#)

[A videogame intervention for tobacco product use prevention in adolescents.](#)

[Validation of the electronic cigarette attitudes survey \(ECAS\) for youth.](#)

[Associations of risk factors of e-cigarette and cigarette use and susceptibility to use among baseline PATH study youth participants \(2013-2014\).](#)

[E-cigarette use in Serbia: Prevalence, reasons for trying and perceptions](#)

[A content analysis of JUUL discussions on social media: Using Reddit to understand patterns and perceptions of JUUL use.](#)

[E-cigarette palatability in smokers as a function of flavorings, nicotine content and propylthiouracil \(PROP\) taster phenotype.](#)

[Dental professionals' opinions and knowledge of smoking cessation and electronic cigarettes: a cross-sectional survey in the north of England.](#)

[U.S. Adult Attitudes About Electronic Vapor Product Use in Indoor Public Places](#)

[Examining the relationship of vaping to smoking initiation among US youth and young adults: a reality check.](#)

[E-Cigarette Use is Associated with Intentions to Lose Weight among High School Students.](#)

[Influence of machine-based puffing parameters on aerosol and smoke emissions from next generation nicotine inhalation products.](#)

[Regional Rural-Urban Differences in E-Cigarette Use and Reasons for Use in the United States.](#)

Search strategy

The Pubmed database is searched in the middle of each month, for the previous month using the following search terms: e-cigarette*[title/abstract] OR electronic cigarette*[title/abstract] OR e-cig*[title/abstract] OR (nicotine AND (vaporizer OR vaping OR vapourizer OR vaporiser OR vapouriser))

Based on the titles and abstracts new studies on e-cigarettes that may be relevant to health, the UK and the UKERCRF key questions are identified. Only peer-reviewed primary studies and systematic reviews are included – commentaries will not be included. Please note studies funded by the tobacco industry will be excluded.

This briefing is produced by Sophia Lowes from Cancer Research UK with assistance from Professor Linda Bauld at the University of Edinburgh and the UK Centre for Tobacco and Alcohol Studies, primarily for the benefit of attendees of the CRUK & PHE UK E-Cigarette Research Forum. If you wish to circulate to external parties, do not make any alterations to the contents and provide a full acknowledgement. Kindly note Cancer Research UK cannot be responsible for the contents once externally circulated.