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Electronic cigarette use and risk perception in a Stop Smoking Service in England

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Abstract

Introduction: Electronic cigarette (e-cigarette) use rose substantially within the UK in recent years but currently, Stop Smoking Services in England do not prescribe them due to a lack of regulation. Previous research has examined e-cigarette use and attitudes within English Stop Smoking Services using samples of practitioners and managers; the current study recruited a sample of service users. *Methods*: Participants ($N = 319$) aged 18–60 years old were recruited from Roy Castle FagEnds, Liverpool, England (Stop Smoking Service). A cross-sectional questionnaire was completed, which recorded demographic variables, e-cigarette use alongside risk perception, and lastly, smoking behaviour i.e. smoking duration, cigarettes per day, and nicotine dependence. *Results*: Most participants were female (57.1%), current smokers (53.0%), and current or former e-cigarette users (51.7%). Participants who perceived e-cigarettes as less harmful than smoked tobacco were more likely to have smoked fewer cigarettes per day ($p = 0.008$). Furthermore, those who felt uncertain whether e-cigarettes were safer than smoked tobacco, were less likely to have tried them ($p < 0.001$). *Conclusion*: This study suggests that e-cigarette use is becoming common among users of Stop Smoking Services (despite e-cigarettes being unavailable from such services) and that e-cigarette risk perception is related to e-cigarette status. The results highlight the importance of providing smokers intending to quit smoking with current and accurate e-cigarette information. Findings may inform future Stop Smoking Services provision and the results demonstrate that further research is warranted.

Keywords

E-cigarettes, electronic cigarettes, health services, risk perception, smoking, smoking cessation

History

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Introduction

Electronic cigarettes (e-cigarettes) are battery-powered devices that deliver nicotine to the user and tend to be marketed as a less harmful alternative to smoked tobacco (Bauld, Angus, & De Andrade, 2014). The popularity of e-cigarettes in Great Britain has grown substantially within recent years (Action on Smoking and Health, 2014; Dockrell, Morrison, Bauld, & McNeill, 2013) but despite this, there is ongoing debate within the research community regarding the safety and efficacy of e-cigarettes as smoking cessation tools (Ashton, 2014; Watson & Forshaw, 2014).

E-cigarettes have been linked to reduced cigarette consumption and increased smoking cessation rates, although the majority of results have been based upon survey data and prospective trials, rather than randomised controlled trials (Bullen et al., 2013; Caponnetto, Auditore, Russo, Cappello, & Polosa, 2013; Caponnetto, et al., 2013; Caponnetto, Polosa, Russo, Leotta, & Campagna, 2011; Etter & Bullen, 2011, 2014; Pokhrel, Fagan, Little, Kawamoto, & Herzog, 2013; Polosa et al., 2011, 2014; Siegel, Tanwar, & Wood, 2011).

Toxic chemicals have been identified in e-cigarette vapour (Hadwiger et al., 2010; Kim & Shin, 2013; Ohta, Uchiyama, Inaba, Nakagome, & Kunugita, 2011), but one review concluded that e-cigarette vapour is substantially lower in toxic content, cytotoxicity, associated adverse effects and passive toxicity exposure, when compared to tobacco smoke (Harrell, Simmons, Correa, Padhya, & Brandon, 2014). Further to this, Nutt et al. (2014) developed a multi-criteria decision analysis model, which ordered nicotine containing products by harm to users. Their calculations suggested that harm associated with e-cigarette use was extensively lower than smoked tobacco and similar to other nicotine replacement therapies. Current results are promising but further research is warranted to establish any potential long-term health implications associated with e-cigarette use (Ashton, 2014; Grana, Benowitz, & Glantz, 2014). The National Institute for Health and Care Excellence (NICE) (2013) provides guidance for practitioners, managers and commissioners working in public health, in which it recommends the use of licensed nicotine replacement products (e.g. nicotine patches) for smoking cessation and relapse prevention. The recently approved European Tobacco Product Directive

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(TPD) subjects e-cigarettes that make medicinal claims regarding smoking cessation or harm reduction and/or products containing above 20 mg/ml nicotine to a medicinal regulatory regime (European Commission, 2014). Products classified as medicinal will be licensed by the Medicines and Healthcare products Regulatory Agency (MHRA) by 2016 (MHRA, 2013).

Considering smoking cessation support, there has been a gradual increase in the number of Stop Smoking Services (SSS) offered globally across various countries and although these services vary in regard to structure, all offer some form of support for smokers who wish to stop smoking (Pine-Abata et al., 2013). SSSs in the UK have possibly one of the most comprehensive approaches. Such services implement evidence-based behavioural and pharmaceutical interventions to help smokers to quit smoking and they have proven to be a highly effective approach to reducing smoking prevalence (Ferguson, Bauld, Chesterman, & Judge, 2005; Judge, Bauld, Chesterman, & Ferguson, 2005). Currently, e-cigarettes are not provided by SSSs as they are unlicensed, but if some e-cigarettes gain a medicinal licence in the future, guidance and supply of e-cigarettes within SSSs may change (National Centre for Smoking Cessation and Training [NCSCT], 2014b). The NCSCT (2014a) identified that SSSs were struggling to decide what role they should play in regard to e-cigarettes and how practitioners should respond to queries regarding them. The guidance recommended that practitioners be open to clients interested in trying e-cigarettes.

To our knowledge, only two published studies have examined e-cigarette use within SSSs but both rely upon the reports of SSSs practitioners or managers. The earliest study highlighted an increase in e-cigarette use amongst clients, with 90% of SSS practitioners reporting e-cigarettes being used (Beard, Brose, Brown, West, & McEwen, 2014). The most recent study compared the results of a SSSs practitioner survey undertaken in 2011 with a repeated survey completed in 2013 (Hiscock et al., 2014). The findings suggested that e-cigarette use in SSSs has increased and that practitioners often felt uncertain about providing advice on e-cigarette use and safety. The annual Statistics on NHS Stop Smoking Services report will be available later in 2015 and will include data on the use of unlicensed nicotine containing products in services for the first time. However, preliminary results suggest that only 2% of service users have reported using unlicensed nicotine containing products for their quit attempt (Health and Social Care Information Centre, 2014b).

A number of studies have also explored e-cigarette risk perception among current and former smokers from the general populations in Britain. A smokers' survey conducted across Great Britain in 2010 suggested that 71% of smokers perceived e-cigarettes to be safer than smoked tobacco (Dockrell et al., 2013). More recently, Brown et al. (2014) found that 67% of a sample combining current and former smokers, perceived e-cigarettes to be less harmful than smoked tobacco, whilst 24% felt unsure whether e-cigarettes were safer. Tan and Bigman (2014) suggested that behaviour change theories, such as The Theory of Planned Behaviour (Norman, Conner, & Bell, 1999) and The Transtheoretical Model of Change (DiClemente et al., 1991) might provide explanations regarding the role of e-cigarette risk perception in influencing psychosocial variables linked with smoking cessation (e.g. subjective norms in relation to perceived e-cigarette harm, or self-efficacy towards using an e-cigarette for cessation) which subsequently impacts upon smoking cessation. This highlights the importance of exploring the role of e-cigarette risk perception for individuals making smoking cessation treatment decisions.

Recording e-cigarette use and behaviours will enable planning for future provision and delivery of SSSs, whilst establishing e-cigarette risk perception among clients, will enable us to determine their knowledge regarding e-cigarettes. Ensuring the e-cigarette information clients receive is unbiased, up-to-date and accurate, will enhance understanding and enabling clients to make educated smoking cessation treatment choices. The current survey study recruited clients engaging in SSSs and examined their e-cigarette use and risk perception.

Methods

Participants and procedures

Participants ($N = 319$) between the ages of 18–60 years old consented to take part in the study via community support groups, provided by the SSS, Roy Castle FagEnds (Liverpool, England). Host locations across Liverpool varied, some of which included: GP surgeries, hospital clinics, children's centres, and libraries. Liverpool remains the most deprived local authority in England (Liverpool City Council, 2011); furthermore, the smoking rate among adults in Liverpool is 24.5% compared to the national average of 19.5% (Public Health England, 2014). Between November 2013 and June 2014 participants completed a questionnaire with a researcher which examined demographic characteristics, smoking behaviour, and e-cigarette use and risk perception. The sample consisted of both current (53.0%) and recent former smokers (47.0%); Roy Castle FagEnds provided a rolling stop-smoking support programme, and therefore participants were at varying stages throughout their smoking cessation experience. Liverpool Central, National Research Ethics Service Committee provided full ethical approval for the study; strict confidentiality guidelines were adhered to, participants were made aware that they could withdraw from the study at any time and data were anonymised. Participants were informed that results may be published in a scientific journal, but only anonymised data would be referred.

Measures

The questionnaire took approximately 5–10 minutes to complete. Questions were divided into three sections: (1) demographic characteristics, (2) smoking behaviour, and (3) electronic cigarettes.

Demographic characteristics

Demographic characteristics included: age, sex, education, and ethnicity. Education was dichotomised into: (1) basic or no qualifications (i.e. General Certificate of Secondary Education [GCSE] or below), or (2) higher qualifications (i.e. achieving qualifications beyond GCSE level). Participants were offered 18 response options for the ethnicity

variable, including: White British ($n = 282$), White Irish ($n = 7$), White Other ($n = 4$), Black African ($n = 1$), Black Other ($n = 9$), Asian Pakistani ($n = 1$), Ethnic Other ($n = 1$), Mixed Asian ($n = 2$), Mixed Caribbean ($n = 2$), Mixed Other ($n = 2$), and Other ($n = 6$). As the majority of participants were classified as White British, White Irish or White Other (92.4%) and the remaining participants ($n = 24$) were divided between 8 further ethnicities, for statistical purposes, it was necessary to recode ethnicity values into two categories: (1) White (White British, White Irish, and White Other), and (2) Other, mixed, and unknown (Black African, Black Other, Asian Pakistani, Ethnic Other, Mixed Asian, Mixed Caribbean, Mixed Other, Other).

Smoking behaviour

A number of variables were examined regarding client smoking behaviour. Smoking status was measured using 7-day period prevalence: ''Have you smoked one or more cigarettes within the past week?'' Response options included: ''Yes'' or ''No''; participants who responded ''Yes'' were considered current smokers, whilst participants who answered ''No'', were considered recent former smokers. Cigarettes per day (i.e. smoked tobacco) were measured: ''How many cigarettes per day do you smoke?'' Smoking duration was calculated by asking: ''How old were you when you started smoking?'' and this figure was deducted from age to calculate smoking duration (having considered any gaps in smoking duration with the participant). Participants recorded the number of cigarettes per day they smoked. Nicotine dependence was measured using the Fagerstrom Test for Nicotine Dependence (FTND) (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). FTND scores were calculated based on six items and scores ranged from 0 to 10; low to high dependency. FTND scores were recoded into nicotine dependence levels (Fagerstrom, Heatherton, & Kozlowski, 1990): ''Very low'' (0-2), ''Low'' (3–4), ''Medium'' (5), ''High'' (6–7), and ''Very High'' (8–10). For individuals who identified themselves as recent former smokers, cigarettes per day and the FTND were adapted to reflect habits prior to quitting.

Electronic cigarettes

The measures used to assess e-cigarette use and attitudes were divided into two sub-sections. The first sub-section included two questions which all participants completed. Firstly, e-cigarette ever used was measured with the question: ''Have you ever used an electronic cigarette?'' Participants who responded ''Yes'' were considered ever users, whilst participants who responded ''No'' were considered never users. Secondly, the measure for e-cigarette perceived harm from a recent study (Sutfin, McCoy, Morrell, Hoeppner, & Wolfson, 2013) was asked: ''Compared with regular cigarettes, how harmful do you think electronic cigarettes are?'' Participants responded: ''Less harmful than cigarettes'', ''As harmful as cigarettes'', ''More harmful than cigarettes'', or ''Don't know''.

Participants who had identified themselves as e-cigarette ever users were required to complete additional questions on e-cigarette use. Within this section, ever users were asked further questions regarding patterns of use. The first two questions were adapted from a recent survey (Goniewicz, Lingas, & Hajek, 2013). Firstly, e-cigarette status was established with the question: ''When did you last use an electronic cigarette?'' Participants responded: ''Within the past month'', ''Within the past 1–6 months'', or ''More than 6 months ago''. Current users were defined as having used an e-cigarette within the past month, whilst others were categorised as former users. Secondly, frequency of e-cigarette use per day was explored: ''How many times a day do/did you use an e-cigarette?'' Response options included: ''5 times or less'', ''6–15 times a day'', ''16–25 times per day'', or ''Over 25 times per day''. To our knowledge, intended duration of e-cigarette use had not previously been measured, therefore, the following question was posed: ''Do/did you use an e-cigarette as...'' Potential responses included: ''A long-term or permanent replacement for regular cigarettes'', ''A short-term stop-smoking aid'', or ''Not sure''. Lastly, the study also aimed to explore whether participants had used an e-cigarette in a location where they would not normally have smoked tobacco. However, at the time the questionnaire was developed there was no previously validated measure available to our knowledge, therefore the following question was included: ''Do/did you find yourself using the e-cigarette anywhere that you wouldn't normally smoke a regular cigarette?'' Participants could respond: ''Yes'' or ''No'', with an open text box enabling them to state a location if applicable.

Analysis

Differences between electronic cigarette use and risk perception in socio-demographic and smoking characteristics were examined using χ^2 test or Fisher's exact test as appropriate for categorical variables. For continuous variables, Kruskal–Wallis tests were undertaken to identify significant differences between variable levels. All analyses were performed using STATA® version 13.1 (StataCorp, College Station, TX) and IBM-SPSS® statistical software version 21.0 (New York, NY), and a p value ≤ 0.05 wasconsidered statistically significant.

Results

Three-hundred and nineteen participants completed a questionnaire. Table 1 depicts the distribution of the key participant characteristics across the study population. The median age was 45.0 years old (interquartile range [IQR] = 36–52) and the majority of participants were female (57.1%) and Caucasian (94.2%). The median number of cigarettes per day and the median smoking duration were 20.0 cigarettes (IQR = 15–30) and 29.0 years (IQR = 20–38), respectively. Only over half of the participants reported having ever used an e-cigarette ($n = 165$, 51.7%). However, no significant relationships were identified between e-cigarette ever use and all participant characteristics recorded in Table 1 (i.e. age, sex, ethnicity, education, smoking status, cigarettes per day, smoking duration, or nicotine dependence).

Of e-cigarette ever users, 45.5% were current users (Table 2). The most common frequency of use was 5 times per day or less (41.1%). Current users were more likely to

Table 1. Differences in participant characteristics by e-cigarette ever use.

Participant characteristics	E-cigarette ever users *n* (%)	E-cigarette never users *n* (%)	Total *n* (%)
Age summary statistic			
Median (IQR)	44.0 (36–53)	47.0 (37–53)	45.0 (36–52)
18–30 years	26 (15.8)	19 (12.3)	45 (14.1)
31–40 years	35 (21.2)	31 (20.1)	66 (20.7)
41–50 years	53 (32.1)	50 (32.5)	103 (32.3)
51–60 years	51 (30.9)	54 (35.1)	105 (32.9)
Sex			
Female	101 (61.2)	81 (52.6)	182 (57.1)
Ethnicity[a]			
White (vs. Other, mixed, and unknown)	153 (95.6)	140 (90.9)	293 (94.2)
Education[a]			
Basic or no qualifications (vs. higher qualifications)	85 (56.7)	68 (44.2)	153 (52.8)
Smoking status			
Current	94 (57.0)	72 (46.8)	150 (47.0)
Cigarettes per day			
Median (IQR)	20.0 (15–30)	20.0 (15–30)	20.0 (15–30)
Smoking duration			
Median (IQR)	28.5 (20–38)	29.0 (21–37)	29.0 (20–38)
Nicotine dependence[a]			
Very low	15 (9.2)	19 (12.5)	34 (10.8)
Low	19 (11.7)	24 (15.8)	43 (13.7)
Medium	32 (19.6)	28 (18.4)	60 (19.0)
High	59 (36.2)	44 (28.9)	103 (32.7)
Very high	38 (23.3)	37 (24.3)	75 (23.8)

[a]Total participants for variable may not equal 319 due to some missing data.

Table 2. Patterns of use among e-cigarette ever users.

E-cigarette behaviour	*n*	%
Last used e-cigarette[a]		
Within the past month (current users)	71	45.5
Within the past 1–6 months (formers users)	44	28.2
More than 6 months ago (former users)	41	26.3
Frequency of use per day[a]		
≤5 times	62	41.1
6–15 times	40	26.5
16–25 times	20	13.2
≥25 times	29	19.2
Intended duration of e-cigarette use[a]		
Long-term	31	20.3
Short-term	113	73.9
Unsure	9	5.9
E-cigarette use in a location they wouldn't smoke tobacco[a]		
Yes	70	46.4
No	81	53.6

[a]Total participants for variable may not equal 165, i.e. total e-cigarette ever users. This is due to some missing data.

report lower frequencies of use per day compared to former users ($p = 0.015$). The majority of e-cigarette ever users had intended on using e-cigarettes for the short-term (73.9%). Many e-cigarette users reported having used their e-cigarette in a location they would not normally have smoked tobacco (Table 2). Reported locations varied but included: in their own home (28.2%), in pubs/bars (21.2%), on public transport (12.9%), at work (12.9%), in shops (7.1%), eating out (4.7%), in the car (4.7%), everywhere (4.7%), in a hotel (2.4%), and in hospital (1.2%).

Overall, nearly half of the participants viewed e-cigarettes as less harmful than smoked tobacco (48.2%, $n = 149$) and a large number of participants felt uncertain whether e-cigarettes were safer than smoked tobacco (38.8%, $n = 120$). There were no significant differences between e-cigarette risk perception and age, sex, ethnicity, education, smoking status, smoking duration, and nicotine dependence (Table 3). Table 3 displays the significant differences between e-cigarette risk perception and e-cigarette status ($p < 0.001$) and cigarettes smoked per day ($p = 0.008$). Current users were more likely to view e-cigarettes as less harmful than former or never users, whilst never users were most uncertain if e-cigarettes were safer than smoked tobacco. Furthermore, participants who viewed e-cigarettes as less harmful than smoked tobacco were more likely to smoke fewer cigarettes per day, whilst those who reported feeling uncertain whether e-cigarettes were safer tended to smoke a greater number of cigarettes per day.

Discussion

To our knowledge, this is the first study that has interviewed UK SSS clients regarding e-cigarette use and perceptions of risk. E-cigarette use was substantially higher (51.7%) than previously estimated; a recent survey (conducted in 2013) detailed only 12.2% of practitioners thought that a significant proportion (50–75%) of their clients were using or had used an e-cigarette (Hiscock et al., 2014); it is possible that practitioners underestimated e-cigarette use. The present study also found that current use of e-cigarettes in SSSs is substantially higher than the levels suggested by recent preliminary national data (Health and Social Care Information Centre, 2014b). Differences could be attributed to SSS clients feeling uncomfortable disclosing e-cigarette use with SSSs practitioners (perhaps due to them being unlicensed), variations in study recruitment dates or potentially, there are

Table 3. The relationship between perceived e-cigarette harm and participant characteristics.

Participant characteristics	Less harmful than cigarettes *n* (%)	As harmful as cigarettes *n* (%)	More harmful than cigarettes *n* (%)	Not sure *n* (%)	*p* Value
Age summary statistic					0.687
Median (IQR)	46.5 (36–52)	42.0 (34–51)	45.0 (36–55)	45.0 (37–53)	
Sex					0.556
Female	87 (56.5%)	23 (67.6%)	3 (42.9%)	68 (56.2%)	
Ethnicity[a]					0.073
White (vs. Other, mixed, and unknown)	146 (96.1%)	34 (100.0%)	5 (83.3%)	106 (91.4%)	
Education[a]					0.116
Basic or no qualifications (vs. higher qualifications)	73 (52.5%)	12 (35.3%)	3 (42.9%)	63 (58.3%)	
Smoking status					0.527
Current (vs. recent former smoker)	73 (47.4%)	20 (58.8%)	3 (42.9%)	54 (44.6%)	
Cigarettes per day[a]					0.008*
Median (IQR)	20.0 (15–20)	20.0 (15–30)	20.0 (15–25)	20.0 (20–30)	
Smoking duration					0.331
Median (IQR)	30.0 (21–38)	25.0 (18–34)	27.0 (20–43)	29.0 (20–37)	
Nicotine dependence[a]					0.139
Very low	21 (13.8%)	4 (11.8%)	2 (28.6%)	7 (5.8%)	
Low	21 (13.8%)	10 (29.4%)	1 (14.3%)	11 (9.2%)	
Medium	25 (16.4%)	4 (11.8%)	1 (14.3%)	30 (25.0%)	
High	50 (32.9%)	11 (32.4%)	1 (14.3%)	41 (34.2%)	
Very high	35 (23.0%)	5 (14.7%)	2 (28.6%)	31 (25.8%)	
E-cigarette status[a]					<0.001*
Current	50 (70.4%)	3 (4.2%)	1 (1.4%)	17 (23.9%)	
Former	39 (45.9%)	9 (10.6%)	3 (3.5%)	34 (40.0%)	
Never	60 (39.2%)	22 (14.4%)	2 (1.3%)	69 (45.1%)	

[a]Total participants for variable may not equal 309, i.e. total respondents to risk perception measure. This is due to some missing data.
*$p < 0.01$

higher levels of e-cigarette use within this particular sample or within Liverpool.

Patterns of use were also measured in the present study. Users mostly viewed e-cigarettes as a short-term smoking cessation tool (73.9%), whereby they presumably intended on weaning themselves off the product within a limited time. Short-term nicotine replacement therapy is established as an effective and safe approach to fostering smoking cessation (Shields, 2011). Contrary to this, a proportion of participants did view e-cigarettes as a product which they intended to use long-term (20.3%). NICE (2013) also advise nicotine-containing products ''for the long-term, if necessary, to prevent relapse'' (p. 16), but they have identified a number of gaps in research in relation to the safety of long-term nicotine exposure. In future, if some e-cigarettes are regulated as medicinal products and used long-term by many, this could challenge the shorter-term approach to smoking cessation treatment that is often adopted by SSSs.

Common use of e-cigarettes in public locations (Table 2) might suggest that many e-cigarette users do not perceive e-cigarette vapours as harmful to others. Ballbè et al. (2014) conducted an observational study in which they found that salivary cotinine (a metabolite of nicotine) was more than twice as high for non-smokers living in e-cigarette users' homes, compared to those living in control homes. However, cotinine levels amongst non-smokers living in smoking households were over five times higher compared to the control homes. There is currently a deficit of research regarding the impact of passive e-cigarette vapour exposure, so the health implications, if any, are uncertain. As discussed earlier, a number of studies have associated e-cigarettes with smoking cessation success but it would also be of interest to consider future smoking behaviour amongst e-cigarette users who relapse, especially among those who used e-cigarettes in locations which they would not normally have smoked tobacco in, as it is currently unclear which habits smokers return to.

Reported cigarettes per day were fewer among those who viewed e-cigarettes as less harmful than smoked tobacco and higher among participants who felt that they were unsure whether e-cigarettes were safer; further research is warranted to explore this relationship in greater detail. The results also suggest that individuals who feel uncertain regarding the safety of e-cigarettes may avoid trying them and those who view them as safer than smoked tobacco may be more likely to use them. Although causality cannot be inferred, the findings do imply that attitudes towards risk are related to use and this association fits well with previously discussed behaviour change theories, e.g. The Theory of Planned Behaviour (Norman et al., 1999); one possibility for future research might be to explore the application and use of such models in this context, using a longitudinal design. Additionally, the results suggest that SSS users (within this service at least) are substantially more likely to feel uncertain whether e-cigarettes are less harmful than smoked tobacco, compared with a more general sample of British current and recent former smokers (Brown et al., 2014).

The reported inflated perception of e-cigarette risk was unanticipated in light of the growing body of research that suggests e-cigarettes are substantially safer than smoked tobacco (e.g. Hajek, Etter, Benowitz, Eissenberg, & McRobbie, 2014; Nutt et al., 2014). This has relevance in relation to cognitive dissonance, which occurs when a person holds at least two opposing but related cognitions, which

can result in mental conflict (Festinger, 1957, 1962). Consequentially, individuals may deny or distort information perceived as threatening in an attempt to reduce dissonance and mental conflict (Kleinjan, van den Eijnden, Dijkstra, Brug, & Engels, 2006). This concept is relevant to the current study results, as some smokers may have distorted e-cigarette information, resulting in inflated e-cigarette risk perception, thus enabling continued smoking through reduced mental conflict. One should also consider the accuracy and balance of information current and recent former smokers are receiving. For example, Rooke and Amos (2013) suggested that ''risk and uncertainty'' was one of a number of recurrent themes adopted by UK newspaper coverage regarding e-cigarettes, but it is unclear how these stories are embodied by smokers. This warrants further investigation to ascertain understandings of safety and efficacy surrounding e-cigarettes amongst both SSSs clients and current and former smokers overall.

There are a few limitations to the study. Firstly, the results are based upon cross-sectional data and therefore, causality cannot be inferred in regard to the relationships between e-cigarette use and risk perception. Secondly, as the results rely on self-reports, there may have been some recall bias. For example, former e-cigarette users retrospectively reported increased frequent use per day compared to current users. This may have been due to former users accurately recalling greater use and the subsequent discontinuation of the product could have been born out of concerns around excessive use. Conversely, the differences could also be due to under-reporting amongst current users; perhaps some felt uncomfortable reporting frequent use of an unlicensed product. A longitudinal design may help to establish why differences in reported frequency of e-cigarette use occurred between current and former e-cigarette users.

The design of some of the measures should also be considered when interpreting the results. Seven day period prevalence was used to classify current and recent former smokers; for occasional smokers, this measure may be less reliable. Current e-cigarette use was defined as having used the product within the previous month. However, individuals who have experimented with e-cigarettes on one occasion several weeks prior would therefore be classified as a current user; future research should consider a more elaborate measure of status. Further research could also incorporate a more comprehensive list of response options in relation to the measures pertaining to long- or short-term e-cigarette use and locations of use; further options will enable the researcher to explore such behaviours more in-depth.

In comparison to the age distribution of SSS clients across England, SSS clients in Liverpool are of a slightly older age range (Health and Social Care Information Centre, 2014a), which was reflected in our sample. The older age range may additionally be reflected in the results regarding smoking duration and cigarettes per day; cigarettes per day were higher than the national average (Office for National Statistics, 2013). Liverpool is also the most deprived local authority in England (Liverpool City Council, 2011) and e-cigarette use has been associated with higher socio-economic status in Britain (Brown et al., 2014). Therefore, the results may not be representative of e-cigarette use across all SSSs in England, or indeed other countries. However, the study provides an in-depth snapshot of e-cigarette use within one support service and also, details the perceptions of e-cigarette harm among clients. It is essential that future research examines e-cigarette use among varying populations, including clients engaging in health services. Additionally, perceptions of e-cigarette harm among smokers should continue to be monitored to ensure that smokers are receiving and understanding balanced, accurate e-cigarette information.

Conclusion

The study findings, considered alongside the documented increases in e-cigarette use in Great Britain (ASH, 2014; Dockrell et al., 2013), suggest that e-cigarette use is prevalent within UK SSSs and that there is a strong relationship between e-cigarette status and risk perception. At a pivotal time in the development of e-cigarettes both nationally and internationally, these findings emphasise the importance of consistent e-cigarette measurement within SSSs to enable improvements in future planning and provision of services. Furthermore, the reported uncertainties around e-cigarette use highlight the important role practitioners may hold in providing clients with accurate, up-to-date, and unbiased e-cigarette information, which should result in the enablement of clients to make informed, educated decisions regarding smoking cessation treatments.

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Declaration of interest

The authors report no conflicts of interest.

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