Participant Experiences of a Quit Smoking Attempt Through Either Nicotine Replacement Therapy (NRT) Methods or the Use of an E-cigarette.

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Abstract

Objectives: There is a lack of evidence exploring experiences of using e-cigarettes for smoking cessation. The study's main aim was to explore participant experiences of e-cigarettes compared to nicotine replacement therapy (NRT) delivered through stop smoking services.

Methods: Semi-structured, face-to-face and telephone interviews at three-month post-quit follow-up in a randomised controlled trial comparing nicotine-containing e-cigarettes, nicotine-free e-cigarettes and NRT for smoking cessation. N=17 participants, 9 were male, mean age 44 years, 5 using nicotine-containing e-cigarettes, 7 nicotine-free e-cigarette and 5 NRT. Interviews were transcribed and analysed using thematic analysis.

Results: Two global themes and five organising themes were identified. Global themes included: (1) experiences of e-cigarette and NRT quit aids (e-cigarette positive impact and dilemmas, NRT perceptions and experiences), and (2) key mechanisms to support quit attempt (physical aids, advice and support, feedback and structure). E-cigarettes were viewed with caution, however, generally evaluated positively alongside NRT methods, finding e-cigarettes useful during a quit attempt due to their versatility in application. Nicotine-containing e-cigarettes were favoured due to their support with nicotine cravings. Participants were, however, wary of replacing smoking addiction with vaping habit.

Conclusions: Participant e-cigarette experience were generally positive, however, concerns over long-term application were noted. There was a noticeable preference for nicotine-containing e-cigarettes, but further research is required to better understand how nicotine is used in conjunction with e-cigarettes long-term as a quit aid alongside other NRT.

Keywords

E-cigarette, smoking cessation, nicotine replacement therapy (NRT), Randomised Control Trial (RCT).

1. Introduction

It was estimated that in 2019 15.4% of the UK adult population smoked[1]. This is significantly higher in lower socio-economic groups, finding 35% of people living in social-housing smoke[2]. Smoking is linked with noncommunicable diseases (e.g., cancer, coronary heart disease and cardiovascular disease)[3,4], and poor quality of life[5]. Traditional stop smoking methods, such as nicotine replacement therapy (NRT; gum, inhaler, lozenge, nasal spray) have demonstrated good utility[6] to support smoking cessation (e.g., 50-60% more likely to be successful in a quit attempt when compared to those receiving no support[7]). Nevertheless, research reports a high relapse rate (e.g., 75%) within the first six months for those making a quit smoking attempt[8]. Smokers attempting to quit sometimes have concerns over NRT use, including a lack of confidence in NRT, often derived from high relapse rates, adverse physiological side-effects, failure to support behavioural aspects of smoking, and fear of not dealing with nicotine dependence[9,10].

People attempting smoking cessation have sought alternative methods, such as electronic cigarettes (e-cigarettes). E-cigarette popularity has increased since their inception in 2006[11-13]. Evidence suggests e-cigarettes can support a quit smoking attempt over a sustained period of time (e.g., up to six months)[12,14,15]. A recent U.K. randomised controlled trial found e-cigarette use, compared to traditional NRT, was almost twice as successful for smoking cessation at one-year follow-up[16]. In line with previous studies[17,18], e-cigarettes were found more effective in reducing nicotine withdrawal symptoms[16], potentially linking to reduced relapse rates[19,20]. Heavy smokers in the e-cigarette group[16] who were unable to quit smoking were more likely than NRT participants to reduce their smoke intake, supporting previous literature[14]. A qualitative[9] investigation of perceived e-cigarette efficacy and NRT supports the utility of e-cigarettes in offering behavioural and social benefits when compared to traditional NRT. There

is, however, little known about the participant experience comparing nicotine-containing and nicotine-free e-cigarette use for smoking cessation.

E-cigarette use is a divisive subject[9,25]. Stop smoking service (SSS) users have reported both concerns over the physical, unknown implications associated with e-cigarettes (e.g., device and delivery method safety[25]), whilst also highlighting their preference and perceived utility in a quit attempt and their positive consequences (e.g., reduced cough, improved sense of smell[26]). Other studies[9,27] found e-cigarette use as a favoured quit smoking method due to the perceived positive community associations with e-cigarettes use (e.g., other people who use e-cigarettes, local e-cigarette shops).

To date, few studies have investigated how experiences of using e-cigarettes for smoking cessation differ with nicotine content and compared with NRT use. People using e-cigarettes for smoking cessation typically choose nicotine-containing e-cigarettes[21-23]. Behaviourally, there is also evidence that low nicotine-containing or nicotine-free e-cigarette consumption increased e-cigarette use when compared to nicotine-containing e-cigarettes[24] due to lack of perceived impact from e-cigarette use.

Firstly, our work aimed to explore and compare experiences of participants in a randomised controlled trial who were making a quit attempt supported by behavioural support and 1) nicotine-containing e-cigarette, 2) nicotine-free e-cigarette, or 3) NRT[28]. Secondly, we aimed to gain greater knowledge of how the wider context and key mechanisms of a quit attempt, beyond the quit aid, impact the quit experience.

2. Methods

2.1 Design

A qualitative methodology was adopted to explore participant experiences whilst participating in the ISME-NRT randomised controlled trial (see protocol[28]). The ISME-NRT primary aim was to assess cardio-vascular function of smokers making a stop-smoking attempt using NRT or nicotine-containing or nicotine-free e-cigarettes. Secondary aims included understanding the participant experience from each group and six-month between-group quit rates. The present study utilised one-to-one semi-structured interviews, either face-to-face on university premises or via telephone depending upon participant preference (Topic Guide attached). Qualitative data allowed for exploration of participants lived experiences across the three groups, providing the medical community with the knowledge of specific factors unique to any one quit method. The university's Ethics Committee granted study ethical approval (HWB-2016-17-S&E-10). The consolidated criteria for reporting qualitative research (COREQ)[29] 32-item checklist was utilised to improve reporting.

2.2 Sample

Qualitative sub-study inclusion criteria required that participants:

1. Were part of the main ISME-NRT trial
2. Had completed their three-month post-quit date assessment

2.3 Recruitment

Seventeen participants from the ISME-NRT trial (*N*=249) were recruited using purposive sampling to ensure a mixture of ages and genders and representation from each of the smoking cessation treatment groups. A purposive sampling strategy was adopted to ensure participants from each group were interviewed and to gain a variety of participant experiences and perspectives.

All participants provided informed consent to be interviewed, initially written consent was obtained at the start of the ISME-NRT study and verbal confirmation was given before the interview began. Participants were provided with either an e-cigarette or the reimbursement of the NHS SSS cost.

2.4 Data collection

A semi-structured interview guide was formulated based on previous literature and the authors' previous experience in qualitative research and was reviewed by co-investigators taking a phenomenological approach to understand the participant experience of each quit method. The guide focussed discussion on previous smoking history (e.g. Describe how long you have been smoking for and what influenced you to start smoking), study experience and procedures (e.g. Describe your thoughts around the study structure and support you received), and views of allocated smoking cessation quit method (e.g. Describe your feelings towards using [support tool] as an alternative to traditional cigarettes).

The interviews were conducted by an experienced [EM] qualitative researcher. Each interview was audio recorded and lasted up to 30 minutes. All interviews were conducted at the three-month post-quit data collection point. Interviews were transcribed verbatim and identifiers removed. Interviewing continued until data saturation was reached and no new themes emerged. Transcripts were returned to participants and they were given the opportunity to add or edit any information and confirm accuracy.

2.5 Data Analysis

The data analysis followed the principles of thematic analysis, allowing for a rich and complex data description[30]. Transcripts were initially read and re-read by two research team members

[GJ, EM], and a coding frame devised that included deductive codes based on the interview guide and inductive codes that had emerged from the participants' accounts. Both reviewers met after independently coding the transcripts and identifying themes and concepts from coded text segments. The researchers compared, refined and reached a consensus on identified themes. A third research team member cross-checked final themes against the transcripts, the study objectives and interview guide to confirm validity. The lead author then applied thematic networks to facilitate the structuring and depiction of interrelationships between themes. In the Results section, participants are identified by ID number and allocated treatment group. Participant experiences were catalogued, allowing exploration of the acceptability and utility of e-cigarette use (nicotine-free, nicotine-containing) for smoking cessation to complement current NHS SSS tools.

3. Results

Participants (N=17, male = 9 (53%), mean age = 44 years) were from the nicotine-containing e-cigarette group (*n* = 5), nicotine-free e-cigarette group (*n* = 7), and NRT group (*n* = 5). At three-month follow-up, five (100%) nicotine-containing e-cigarette participants, four (57%) nicotine-free e-cigarette group participants, and three (60%) NRT group participants were still using their quit aid (e.g. e-cigarette or NRT) regularly. Almost all (*n* = 15) participants were abstinent from smoking (verified via carbon monoxide (CO) levels <10ppm[28]), with one participant from each e-cigarette group reporting significantly reduced, but occasional, cigarette use (confirmed by CO levels).

Analysis of the data identified two global themes and five organising themes (Figure 1), with smoking abstainers and occasional smokers reporting similar experiences. Global themes included: (1) experiences of e-cigarette and NRT quit aids and (2) key mechanisms to support a quit attempt. Global theme one included two organising themes; e-cigarettes positive impact

and dilemmas, and NRT perceptions and experiences. Theme two included three organising themes; physical aids, advice and support, and feedback and structure. In addition to these main themes, participants often referred to the motivation behind their quit attempt, highlighting experiences of physical (e.g. shortness of breath, chest infections) and psychological symptoms (e.g. fear of future adverse health implications) of smoking and their quit attempt, as well as the financial impact (e.g. quit attempt positive financial impact). Participants reported these functions aided motivation to either want to quit smoking (prior to the study) or maintain smoking cessation.

Insert figure 1 here

3.1 Experience of e-cigarettes and NRT quit aids

Participants were generally positive of both methods, although e-cigarettes were discussed more favourably due to their versatility in application across contexts and situations found in the current study.

3.1.1 E-cigarette positive impact and dilemmas

Almost all participants reported mixed e-cigarettes perceptions. E-cigarette dilemmas included: little knowledge of bodily impact, perceived to not deal with the smoking habit (especially marked in nicotine-containing e-cigarette group), and uncertainty of e-cigarette manufacturing quality and integrity:

> *"I'm not sure about the risks of e-cigarettes because they are not proven yet"* (ID: 057, nicotine-free e-cigarette group)

Some nicotine-free e-cigarette participants felt that e-cigarettes did not sufficiently remove their cigarette cravings, leaving them feeling dissatisfied and stressed.

> *"I used it for a few days and was like you know what I'm not going to use the e-cig because it just didn't provide me with what smoking does."* (ID: 055, nicotine-free e-cigarette group).

Most e-cigarette participants overarching evaluation of e-cigarettes was however, positive, emphasising them as a constructive alternative to smoking tobacco cigarettes. Participants frequently discussed the benefits such as "helpful quit tool", 'improved health', and 'improved psychological wellbeing through no-longer feeling guilty for smoking'.

> *"yea I just feel a lot better, generally I feel a lot healthier."* (ID: 051, nicotine-free e-cigarette group)

Another participant added e-cigarettes were helpful at trigger points, such as social occasions.

> *"I found it very useful when I was drunk that's when it tends to come out. Like I say if I was in the pub."* (ID: 051, nicotine-free e-cigarette group).

3.1.2 NRT perceptions and experience

Some participants reported higher confidence in NRT due to a perceived stronger evidence base, whilst others were cynical of NRT due to them being very different from habitual components of smoking.

> *"The benefits of the NRT is not using a device that we know very little about in my opinion."* (ID: 006, NRT group).

"I didn't think the NHS gums and lozenges would work just because it's so very different to smoking." (ID: 059, nicotine-free e-cigarette group).

NRT group participants were generally positive about the methods on offer to them, emphasising the range of quit method options and NRT gradual reduction in nicotine delivery method.

"I was alright with the tablets because with the patches I had trouble with my skin." (ID: 063, NRT group).

"It is good because it's a steppingstone and it is more effective than going cold turkey." (ID: 006, NRT group).

3.2 Key mechanisms to support quit attempt

Participants often discussed key quit smoking mechanisms, including (1) physical aids, (2), advice and support and (3) feedback and structure.

3.2.1 Physical aids

All participants reported physical aids (e.g. e-cigarettes, patches), as a key mechanism in their quit attempt. Physical aids were utilised in two ways; 1) replace smoking habits and 2) to distract from/replace nicotine cravings. In general, participants were more reliant on physical aids at the beginning of their quit attempt, becoming less attached with time.

"Yea, I don't think I'm puffing it as much as in the beginning. So I think I can leave it do you know, I don't need it all the time." (ID: 016, nicotine-containing e-cigarette group).

3.2.2 Advice and support

Advice and support from a stop smoking officer was another key mechanism for smoking cessation. Specifically, the positive impact advice and support had on participant motivation and confidence to quit smoking was discussed.

> *"I don't think if I'd just brought my own vape and not had the motivational backup from (the team) then I don't think I would have been as successful."* (ID: 047, nicotine-containing e-cigarette group).

3.2.3 Feedback and structure

Most participants highlighted data measurement feedback as a key mechanism for smoking cessation.

> *"You can also see what's happening like with all the checks on the body and everything else and you can see that things are improving you know there has been a change."* (ID: 074, nicotine-containing e-cigarette group).

The frequency and structure of the touch points between stop smoking officers and participants was highlighted by participants as helpful.

> *"I think because it had structure to it, umm and there were points where you were going to be monitored and because it was part of a study and for some reason I kinda thought it would be a good discipline to put myself into quite structured to put myself into and I thought that might be quite a good way of trying to quit."* (ID: 009, NRT group).

A few participants added that the structure aided feeling accountable so to not ‘let anyone down’.

> *“I just knew if I was going to see somebody it would make me more accountable for it so I didn’t feel like I could just quit and go back to smoking as and when because it was involving other people as well at the same time who I felt I would be letting down as well.”* (ID: 057, nicotine-free e-cigarette group).

4. Discussion

4.1 Overview of Main Findings

The current study investigated participant experiences of e-cigarette use as a stop smoking method, comparing these experiences to traditional NRT methods through NHS SSS. Participants were favourable of e-cigarette use as a stop smoking method due to its versatility in application across situations. Participants from the nicotine-free group perceived the nicotine-free e-cigarette as ‘less useful’ due to it not fulfilling participant nicotine cravings. Almost all participants raised concerns over e-cigarette safety and behavioural aspects of e-cigarette use (e.g. long-term e-cigarette use). These concerns, however, did not deter participants from e-cigarette use as a smoking cessation aid. NRT were a helpful quit aid, however, were reported to not support the habitual aspect of smoking, which the e-cigarette was reported to do. The study emphasises the importance of sufficient advice and support from a stop smoking officer alongside a quit aid, as well as adequate data measurement and feedback, supporting participant confidence, motivation and discipline during a quit attempt.

4.2 Key interpretations

The results confirm the complexity and individualistic experience of the participant quit attempt experience.

4.2.1 Quit method experience

Concerns of long-term e-cigarette safety and fear of replacing smoking addiction with a vaping habit were emphasised, reinforcing previous e-cigarette research[9,26,31-33], where successful quitters went from identifying as a 'smoker' to a 'vaper'[9]. Both in the present study and Sherratt *et al.*[25], this feeling of uncertainty impacted e-cigarette uptake as a stop smoking aid. Interestingly, NRT group participants reported high efficacy in NRT quit aids, perceiving these methods to have a strong evidence base, and were thus, safe. Sufficient evidence regarding e-cigarette use to satisfy public concerns, strengthening public motivation and confidence, has either, (a) not been gathered, or, (b) not been sufficiently communicated to the public, something future research should seek to address. Nicotine-containing e-cigarettes were reported in the current study as a favoured choice for smoking cessation due to their reported support with nicotine cravings. Participants were, however, ambivalent, due to concerns that nicotine-containing e-cigarettes not directly dealing with nicotine dependence, especially if used long-term as found previously[9]. Further investigation is needed to explore long-term e-cigarette behaviours as a quit aid, focusing fundamentally, on how to support participants to be smoke and e-cigarette free. There is, however, good evidence to suggest long-term (i.e. longer than three months) e-cigarette use reduces the likelihood of relapse[19,20], thus there is a balance to strike. This is especially important when considering a high relapse rate for NRT[8,9].

Nicotine-free e-cigarette participants often reported they struggled with the lack of impact e-cigarettes were having on their nicotine cravings, reflecting earlier literature[34]. This was expected, however, participants did report nicotine-free e-cigarette use was a positive distraction technique from traditional cigarettes. All participants but one in the nicotine-free e-cigarette group, were smoke free at follow-up, thus this could reflect nicotine-free e-cigarettes

use to be more suited for those with low nicotine dependence, with nicotine-containing e-cigarettes being utilised for those with a more significant nicotine dependence. This, however, requires further investigation.

4.2.2 Key mechanisms

Physical quit aids, advice and support, and feedback and structure were reported as key mechanisms during the participant quit attempt. E-cigarettes (physical aid) were reported to have a dual purpose (e.g. distraction from nicotine cravings (more marked for nicotine-containing e-cigarette group) and/or replacing smoking habits/behaviours), something NRT failed to do (i.e. support behavioural aspect of smoking cessation). Nicotine-containing e-cigarette participants in particular, emphasised the confidence this gave them in their quit attempt, with participants stating feeling more confident in a wider variety of contexts (e.g. social situations), reflecting some previous research[33,35]. This finding potentially demonstrates a greater versatility and application utility for e-cigarette use as a quit aid, when compared to NRT[9,20,27]. This could be especially important for specific situations where external or internal pressure to smoke may be high (e.g. in social situations) and reducing smoking relapse.

All participants highlighted the importance of being in receipt of advice and support from a trained stop smoking officer, stating it aided motivation, confidence and discipline. This was reported to be achieved by educating participants with smoking cessation techniques, encouragement and belief in participant quit ability, and aiding in a feeling of accountability. This, coupled with physiological feedback and structure of the programme (e.g. six-month follow-up), were often mentioned as key mechanisms in sustained motivation during participant quit attempts. Sustained motivation across a significant period of time is difficult and complex to achieve[37], thus, mechanisms to support prolonged motivation should be

encouraged. Based on the current study, it is recommended that SSS continue to encourage regular contact during a quit attempt, incorporating both physiological tests and one-to-one support, perhaps extending this follow-up period to six months, in line with the present study. NHS SSS has demonstrated to have a positive impact on smoking behaviours[36], thus, any positive impact of the service may be bolstered with an extended follow-up period (e.g. six-months) and include the physiological tests and one-to-one support implemented in the present study.

4.2.3 Perceived impact of quitting smoking

Irrespective of group, participants reported three benefits of smoking cessation; a) positive physical health impact, b) improved psychological wellbeing, and c) positive finance impact, supporting previous findings[26,38]. Participants reported these benefits to positively impact motivation to continue their quit attempt, maintaining previous literature[39-40]. For participants in both e-cigarette groups, these observed benefits also positively impacted their evaluation of e-cigarette use as a quit aid.

4.3 Study limitations

Some key limitations to the current study should be considered when interpreting the findings. Firstly, selection bias, as participants had first self-selected to participate in the larger randomised controlled trial, and then had further agreed to participate in interviews, and this appears to have been linked to successful smoking cessation, reflected by 15 of 17 participants being smoke-free. Secondly, data collection took place in person via face-to-face and telephone interviews, thus, there is the potential the presence of the interviewer impacted the data. Interviews are, however, a valid method of data collection, being successfully used in similar areas of research[25,33]. Lastly, the generalisability of the results regarding e-cigarette experiences may be limited to UK participants.

4.4 Future research and implications

The current study has highlighted some key future areas of research. First, results suggest that investigation into a framework for e-cigarette nicotine dose delivery as a quit aid would be worthy, mimicking other current methods (e.g., patches), reassuring the public that they are not replacing one addiction with another potentially harmful habit. Second, to explore potential e-cigarette use long-term health implications, informing the public of any potential harmful side effects. Third, present results emphasise the importance of sufficient advice and support, health feedback, and, regular and sustained (six-months) contact with a practitioner. This finding is especially relevant for clinicians and practice. Investigating how services could further implement this, regardless of the quit aid used, would be of benefit. Fourth, results highlight the experiences of participants who were generally successful abstainers, thus investigating the experiences of those who were unsuccessful would be beneficial. Finally, investigating if the current results are replicable in other countries (e.g. America), representing different historical and medical cultures and views on e-cigarettes would be worthwhile.

4.5 Conclusion

Results highlight e-cigarette versatility and utility as a quit aid for participants who were mostly successful in their quit attempt and UK residents, finding that despite some e-cigarette safety and behavioural concerns, e-cigarettes were generally evaluated positively due to associated physical and psychological benefits. Nicotine-containing e-cigarettes were perceived a more helpful quit aid, however, concerns with maintaining nicotine dependence was highlighted. NRT was also evaluated positively, thus, the e-cigarettes would complement existing quit methods available. Nicotine-containing e-cigarette participants in particular, evaluated their quit experience more positively than both other groups. Adequate advice and support, in-depth health feedback and a sustained service support were significant mechanisms supporting

391 physical aid use during a quit attempt. Overall, e-cigarettes were viewed as a worthy quit
392 smoking aid, suggesting they would be a positive additional tool for traditional SSS.
393
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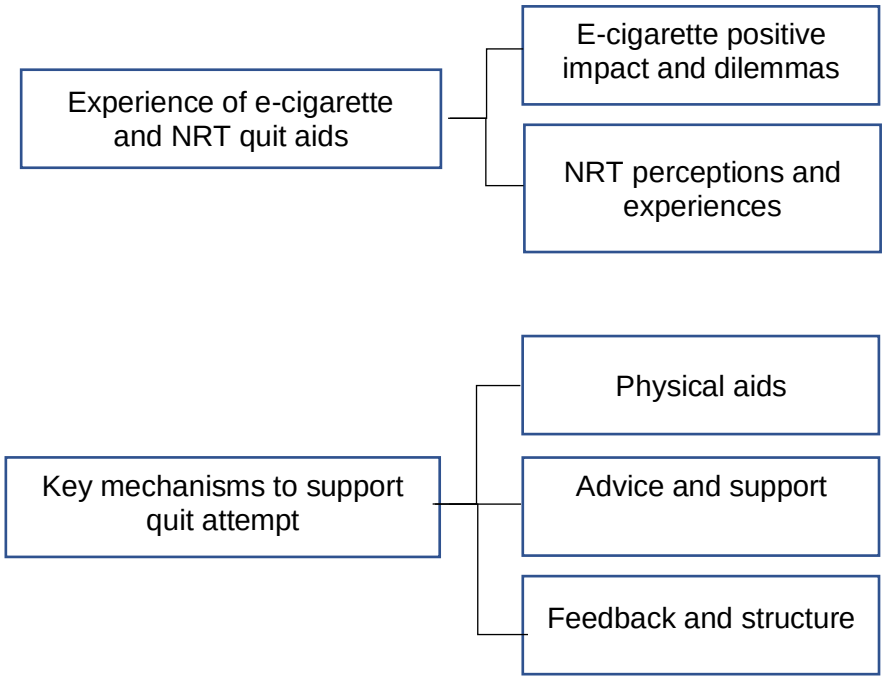

Figure 1. Global and organising themes derived from participant interviews