

**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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1 Participant experiences of a quit smoking attempt through either Nicotine
2 Replacement Therapy (NRT) methods or the use of an e-cigarette.

3

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25

26

Abstract

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

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

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

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

47 *Keywords*

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

50 **1. Introduction**

51 It was estimated that in 2019 15.4% of the UK adult population smoked¹. This is significantly
52 higher in lower socio-economic groups, finding 35% of people living in social-housing smoke².
53 Smoking is linked with noncommunicable diseases (e.g., cancer, coronary heart disease and
54 cardiovascular disease)^{3,4}, and poor quality of life⁵. Traditional stop smoking methods, such as
55 nicotine replacement therapy (NRT; gum, inhaler, lozenge, nasal spray) have demonstrated
56 good utility⁶ to support smoking cessation (e.g., 50-60% more likely to be successful in a quit
57 attempt when compared to those receiving no support⁷). Nevertheless, research reports a high
58 relapse rate (e.g., 75%) within the first six months for those making a quit smoking attempt⁸.
59 Smokers attempting to quit sometimes have concerns over NRT use, including a lack of
60 confidence in NRT, often derived from high relapse rates, adverse physiological side-effects,
61 failure to support behavioural aspects of smoking, and fear of not dealing with nicotine
62 dependence^{9,10}.

63
64 People attempting smoking cessation have sought alternative methods, such as electronic
65 cigarettes (e-cigarettes). E-cigarette popularity has increased since their inception in 2006¹¹⁻¹³.
66 Evidence suggests e-cigarettes can support a quit smoking attempt over a sustained period of
67 time (e.g., up to six months)^{12,14,15}. A recent U.K. randomised controlled trial found e-cigarette
68 use, compared to traditional NRT, was almost twice as successful for smoking cessation at one-
69 year follow-up¹⁶. In line with previous studies^{17,18}, e-cigarettes were found more effective in
70 reducing nicotine withdrawal symptoms¹⁶, potentially linking to reduced relapse rates^{19,20}.
71 Heavy smokers in the e-cigarette group¹⁶ who were unable to quit smoking were more likely
72 than NRT participants to reduce their smoke intake, supporting previous literature¹⁴. A
73 qualitative⁹ investigation of perceived e-cigarette efficacy and NRT supports the utility of e-
74 cigarettes in offering behavioural and social benefits when compared to traditional NRT. There

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

77

78 E-cigarette use is a divisive subject^{9,25}. Stop smoking service (SSS) users have reported both
79 concerns over the physical, unknown implications associated with e-cigarettes (e.g., device and
80 delivery method safety²⁵), whilst also highlighting their preference and perceived utility in a
81 quit attempt and their positive consequences (e.g., reduced cough, improved sense of smell²⁶).
82 Other studies^{9,27} found e-cigarette use as a favoured quit smoking method due to the perceived
83 positive community associations with e-cigarettes use (e.g., other people who use e-cigarettes,
84 local e-cigarette shops).

85

86 To date, few studies have investigated how experiences of using e-cigarettes for smoking
87 cessation differ with nicotine content and compared with NRT use. People using e-cigarettes
88 for smoking cessation typically choose nicotine-containing e-cigarettes²¹⁻²³. Behaviourally,
89 there is also evidence that low nicotine-containing or nicotine-free e-cigarette consumption
90 increased e-cigarette use when compared to nicotine-containing e-cigarettes²⁴ due to lack of
91 perceived impact from e-cigarette use.

92

93 Firstly, our work aimed to explore and compare experiences of participants in a randomised
94 controlled trial who were making a quit attempt supported by behavioural support and 1)
95 nicotine-containing e-cigarette, 2) nicotine-free e-cigarette, or 3) NRT²⁸. Secondly, we aimed
96 to gain greater knowledge of how the wider context and key mechanisms of a quit attempt,
97 beyond the quit aid, impact the quit experience.

98

99 **2. Methods**

100 **2.1 Design**

101 A qualitative methodology was adopted to explore participant experiences whilst participating
102 in the ISME-NRT randomised controlled trial (see protocol²⁸). The ISME-NRT primary aim
103 was to assess cardio-vascular function of smokers making a stop-smoking attempt using NRT
104 or nicotine-containing or nicotine-free e-cigarettes. Secondary aims included understanding the
105 participant experience from each group and six-month between-group quit rates. The present
106 study utilised one-to-one semi-structured interviews, either face-to-face on university premises
107 or via telephone depending upon participant preference (Topic Guide attached). Qualitative
108 data allowed for exploration of participants lived experiences across the three groups,
109 providing the medical community with the knowledge of specific factors unique to any one
110 quit method. The university's Ethics Committee granted study ethical approval (HWB-2016-
111 17-S&E-10). The consolidated criteria for reporting qualitative research (COREQ)²⁹ 32-item
112 checklist was utilised to improve reporting.

113 **2.2 Sample**

114 Qualitative sub-study inclusion criteria required that participants:

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

117 **2.3 Recruitment**

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

123

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

128 **2.4 Data collection**

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

137

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

144 **2.5 Data Analysis**

145 The data analysis followed the principles of thematic analysis, allowing for a rich and complex
146 data description³⁰. Transcripts were initially read and re-read by two research team members

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

158 **3. Results**

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

167

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

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

180

181

182

Insert figure 1 here

183 **3.1 Experience of e-cigarettes and NRT quit aids**

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

187

188 **3.1.1 E-cigarette positive impact and dilemmas**

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

193 *“I’m not sure about the risks of e-cigarettes because they are not*
194 *proven yet”* (ID: 057, nicotine-free e-cigarette group)

195

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

198 *“I used it for a few days and was like you know what I’m not going to*
199 *use the e-cig because it just didn’t provide me with what smoking does.”*

200 (ID: 055, nicotine-free e-cigarette group).

201

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

206 *“yea I just feel a lot better, generally I feel a lot healthier.”* (ID: 051,
207 nicotine-free e-cigarette group)

208

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

210 *“I found it very useful when I was drunk that’s when it tends to come*
211 *out. Like I say if I was in the pub.”* (ID: 051, nicotine-free e-cigarette
212 group).

213

214 **3.1.2 NRT perceptions and experience**

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

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

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

222

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

226 *“I was alright with the tablets because with the patches I had trouble*
227 *with my skin.”* (ID: 063, NRT group).

228 *“It is good because it’s a steppingstone and it is more effective than going cold*
229 *turkey.”* (ID: 006, NRT group).

230

231 **3.2 Key mechanisms to support quit attempt**

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

234 **3.2.1 Physical aids**

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

239 *“Yea, I don’t think I’m puffing it as much as in the beginning. So I*
240 *think I can leave it do you know, I don’t need it all the time.”* (ID: 016,
241 nicotine-containing e-cigarette group).

242

243 3.2.2 Advice and support

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

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

250

251 3.2.3 Feedback and structure

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

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

258

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

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

267

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

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

275 **4. Discussion**

276 **4.1 Overview of Main Findings**

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

289 **4.2 Key interpretations**

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

292

293 **4.2.1 Quit method experience**

294 Concerns of long-term e-cigarette safety and fear of replacing smoking addiction with a vaping
295 habit were emphasised, reinforcing previous e-cigarette research^{9,26,31-33}, where successful
296 quitters went from identifying as a 'smoker' to a 'vaper'⁹. Both in the present study and Sherratt
297 *et al.*²⁵, this feeling of uncertainty impacted e-cigarette uptake as a stop smoking aid.
298 Interestingly, NRT group participants reported high efficacy in NRT quit aids, perceiving these
299 methods to have a strong evidence base, and were thus, safe. Sufficient evidence regarding e-
300 cigarette use to satisfy public concerns, strengthening public motivation and confidence, has
301 either, (a) not been gathered, or, (b) not been sufficiently communicated to the public,
302 something future research should seek to address. Nicotine-containing e-cigarettes were
303 reported in the current study as a favoured choice for smoking cessation due to their reported
304 support with nicotine cravings. Participants were, however, ambivalent, due to concerns that
305 nicotine-containing e-cigarettes not directly dealing with nicotine dependence, especially if
306 used long-term as found previously⁹. Further investigation is needed to explore long-term e-
307 cigarette behaviours as a quit aid, focusing fundamentally, on how to support participants to be
308 smoke and e-cigarette free. There is, however, good evidence to suggest long-term (i.e. longer
309 than three months) e-cigarette use reduces the likelihood of relapse^{19,20}, thus there is a balance
310 to strike. This is especially important when considering a high relapse rate for NRT^{8,9}.

311

312 Nicotine-free e-cigarette participants often reported they struggled with the lack of impact e-
313 cigarettes were having on their nicotine cravings, reflecting earlier literature³⁴. This was
314 expected, however, participants did report nicotine-free e-cigarette use was a positive
315 distraction technique from traditional cigarettes. All participants but one in the nicotine-free e-
316 cigarette group, were smoke free at follow-up, thus this could reflect nicotine-free e-cigarettes

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

320

321 **4.2.2 Key mechanisms**

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

333

334 All participants highlighted the importance of being in receipt of advice and support from a
335 trained stop smoking officer, stating it aided motivation, confidence and discipline. This was
336 reported to be achieved by educating participants with smoking cessation techniques,
337 encouragement and belief in participant quit ability, and aiding in a feeling of accountability.
338 This, coupled with physiological feedback and structure of the programme (e.g. six-month
339 follow-up), were often mentioned as key mechanisms in sustained motivation during
340 participant quit attempts. Sustained motivation across a significant period of time is difficult
341 and complex to achieve³⁷, thus, mechanisms to support prolonged motivation should be

342 encouraged. Based on the current study, it is recommended that SSS continue to encourage
343 regular contact during a quit attempt, incorporating both physiological tests and one-to-one
344 support, perhaps extending this follow-up period to six months, in line with the present study.
345 NHS SSS has demonstrated to have a positive impact on smoking behaviours³⁶, thus, any
346 positive impact of the service may be bolstered with an extended follow-up period (e.g. six-
347 months) and include the physiological tests and one-to-one support implemented in the present
348 study.

349

350 **4.2.3 Perceived impact of quitting smoking**

351 Irrespective of group, participants reported three benefits of smoking cessation; a) positive
352 physical health impact, b) improved psychological wellbeing, and c) positive finance impact,
353 supporting previous findings^{26,38}. Participants reported these benefits to positively impact
354 motivation to continue their quit attempt, maintaining previous literature³⁹⁻⁴⁰. For participants
355 in both e-cigarette groups, these observed benefits also positively impacted their evaluation of
356 e-cigarette use as a quit aid.

357 **4.3 Study limitations**

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

367 **4.4 Future research and implications**

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

381 **4.5 Conclusion**

382 Results highlight e-cigarette versatility and utility as a quit aid for participants who were mostly
383 successful in their quit attempt and UK residents, finding that despite some e-cigarette safety
384 and behavioural concerns, e-cigarettes were generally evaluated positively due to associated
385 physical and psychological benefits. Nicotine-containing e-cigarettes were perceived a more
386 helpful quit aid, however, concerns with maintaining nicotine dependence was highlighted.
387 NRT was also evaluated positively, thus, the e-cigarettes would complement existing quit
388 methods available. Nicotine-containing e-cigarette participants in particular, evaluated their
389 quit experience more positively than both other groups. Adequate advice and support, in-depth
390 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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402

403

404

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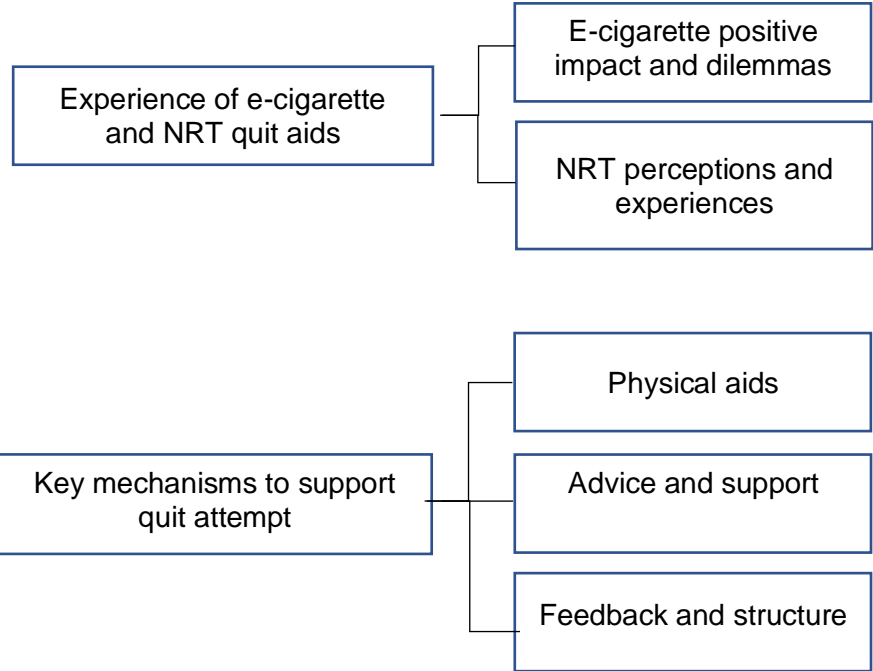


Figure 1. Global and organising themes derived from participant interviews