**Mobile phone text messages to support people to stop smoking by switching to vaping: co-development, co-production, and initial testing.**

**Abstract**

***Background:****Text messages are affordable, scalable, and effective smoking cessation interventions. However, there is little research on text message interventions specifically designed to support people who smoke to quit by switching to vaping.*

***Objective:****Over three phases, with vapers and smokers, we co-developed and co-produced a mobile phone text message programme. The co-production paradigm allowed us to collaborate with researchers and the community to develop a more relevant, acceptable, and equitable text message programme.*

***Methods:****In Phase 1, we engaged people who vape via Twitter and received 167 responses to our request to write text messages for people who wish to quit smoking by switching to vaping. We screened, adjusted, refined, and themed the messages, resulting in a set of 95 that were mapped against COM-B (Capability, Opportunity, Motivation) behaviour change constructs. In Phase 2, we evaluated the 95 messages from Phase 1 via an online survey, where participants (n= 202, 66 female) rated up to 20 messages on 7-point Likert Scales on 9 constructs: understandability, clarity, believability, helpfulness, interesting; inoffensive; positive; enthusiastic, and how happy they would be to receive the message. In Phase 3, we implemented the final set of text messages as part of a larger randomised optimisation trial where 603 (Mage = 38.33; 369 female) participants received text message support and then rated their usefulness, frequency and provided free-text comments at a 12-week follow up.*

***Results:****For Phase 2, means and SDs were calculated for each message across the 9 constructs. Those with means below the neutral anchor of 4 or with unfavourable comments were discussed with co-vapers and further refined or removed. This resulted in a final set of 78 that were mapped against early, mid, or late stage of quitting to create an order for the messages. For Phase 3, 202 (38%) of participants provided ratings at the 12 week follow up. 70% reported that the text messages had been useful and a significant association between quit rates and usefulness ratings was found (χ2 = 9.64, df = 1, p < 0.01). A content analysis of free-text comments revealed the two most common positive themes were: helpful (28%) and encouraging (13%) and the two most common negative themes were: too frequent (19%) and annoying (9%).*

***Conclusions****: Here we have described the initial co-production and co-development of a set of text messages to help smokers stop smoking by transitioning to vaping. We encourage researchers to use, further develop and evaluate the set of text messages, and adapt it to target populations and relevant contexts.*

*Keywords: Co-production; Text-messages; E-cigarette; Smoking; eHealth*

**INTRODUCTION**

E-cigarettes (EC), also known as vapes, have become a popular choice among individuals attempting to quit smoking, particularly in England 1. There is a growing body of evidence that supports the efficacy of vapes in helping individuals to quit smoking 2,3 also demonstrating the reduced exposure to toxins and improved health outcomes for those who fully switch to vaping 4,5. However, despite popularity, it has been observed that around half of people who vape continue to smoke tobacco (dual use). Many others have attempted to use vapes but have not continued to use them 6. Lack of satisfaction is cited as a major reason for tobacco relapse or discontinuing vape use 6. Perceptions of harm/safety concerns 6,7, concern around continued addiction 6, practical/technical difficulties 6, difficulties finding the right device (8, 9) and inadequate craving relief 6,8 are other commonly cited reasons. This suggests that more could be done to improve confidence in the products and support people who smoke to use vapes optimally for quitting smoking. While nicotine isn't devoid of risk, smoking stands as a primary contributor to premature mortality. Thus, shifting individuals away from smoking is a core objective. Aligning with UK NICE guidelines9, our text messages highlight the use of nicotine vapes for relapse prevention. The NICE guide advocates the extended use of licensed nicotine-containing products to avert relapse, in line with our text programme's approach.

Whilst there is interpersonal advice and support for those interested in switching from smoking to vaping (i.e., in vape shops and Stop Smoking Services 10), there is a paucity of concurrent support for those who purchase vapes online. Consumers may be transitioning from smoking to vaping without knowing the technicalities around device, flavour, and nicotine strengths. Mobile phone text messaging may be one way to improve outcomes and is cheap and easy to implement but co-production with people who vape is essential to ensure the relevance of the messages. The impact of co-production paradigms in research are vast: a) they enable targeting of embedded community needs and engage community stakeholders in meaningful and authentic rigorous research which incorporates diverse perspectives, experiences, and knowledge; b) promote an equitable practice (e.g., people who are affected by services and outcomes of research) and c) have a patient-centred focus in the design of interventions 11,12. Overall, the ethos of co-production fosters an inclusive research paradigm by promoting equality in shared decision-making and mutual respect between researchers and community stakeholders, which builds trust and addresses power imbalances that exist in traditional research approaches.

In the general smoking cessation field, text messages have been found to be an effective tool for smoking cessation and can increase abstinence rates 13,14. In a recent systematic review, text message interventions were more effective than minimal smoking cessation support across 13 studies (OR = 1.4) and there was also evidence that adding text messaging to other smoking cessation interventions improves abstinence rates compared to smoking cessation interventions alone (RR=1.6) 13. However, there are currently no text message interventions that have been specifically designed to assist people who smoke to stop smoking by switching to vaping.

Intervention design should draw on behavioural theory to identify the mechanisms of action that lead to behaviour change 15,16. The current project utilised the Behaviour Change Wheel (BCW) 17 to provide a comprehensive framework for this purpose, offering tools that can be used to specify both the characterisation of intervention content, as well as the theoretical mechanisms of action. At the core of the BCW is the COM-B model 17, which postulates that three essential conditions are necessary for behaviour change. According to the theory, behaviours only occur when the individual has the psychological and physiological ‘capability’, as well as the social and physical opportunity to engage in them and has more reflective or automatic motivation to enact them than other competing behaviours at any given moment. To be successful, behaviour change requires sustained change in one or more of these conditions. Therefore, the intervention content is designed to address these conditions.

The Behaviour Change Technique Taxonomy version 1 18 identifies 93 behaviour change techniques (BCTs) to enable the characterisation of behaviour change content of interventions. BCTs are the smallest components of an intervention that have the potential to change behaviour (i.e., the ‘active ingredients’) by targeting the different elements of the COM-B model, aiding in the selection and implementation of effective behaviour change strategies.

In this paper, we describe how we worked with people who vape and smoke (or who previously vaped and/or smoked) to develop, evaluate, and test a set of text messages that could be used by other researchers across a range of smoking cessation studies using vapes. This process was divided into three distinct phases:

In Phase 1, the focus was on generating text messages through the input and perspectives of current and former people who vape and smoke. This phase aimed to capture the unique experiences of those individuals to create text messages that were tailored to their specific needs and challenges. Finally, the application of theoretical frameworks and clinical expertise of the research team was applied to the text messages.

In Phase 2, the recommendations from Phase 1 were evaluated against several concepts for suitability from users. This phase aimed to ensure that the text messages were evidence-based and aligned with the current practices in smoking cessation.

Finally, in Phase 3, the text messaging programme was used as part of a larger online randomised optimisation study 19. The larger study aimed to identify the most effective ways (including text messaging) of supporting smokers to quit smoking by switching to an EC.

 **METHODS**

The selection of the text messages for the programme was informed by a co-produced examination of COM-B and BCTs used in smoking cessation interventions followed by an application of the final set of text messages in a randomised optimisation trial 19,20. Phase 1 and Phase 2 took place before the COVID-19 pandemic. However, Phase 3 coincided with the COVID-19 pandemic.

**PHASE 1 – TEXT GENERATION AND DEVELOPMENT**

**TEXT GENERATION**

Between January and March 2019, the following tweet was posted on Twitter: *“Vapers please help! We are developing new text messages to help ‘would be’ vapers make the switch. What advice would you give in a text message?”*. One hundred and fifty-one message recommendations were received. An additional 16 suggestions were made in a thread posted on ‘Planet of the Vapes’ [a popular vaping online information forum].

**TEXT DEVELOPMENT**

All authors reviewed the suggestions received. Sixty suggestions were removed, mainly because they were descriptive accounts of participants’ own experiences rather than advice per se. Other duplicate messages and those with inappropriate content were also removed. Remaining messages (n=42) were refined, or re-worded and character count was reduced where necessary to ensure messages were short and adhered to the 160-character limit for a single SMS text. Fifty-three additional messages were also added by the authors at this stage based on their own research or clinical work and professional experience resulting in a set of 95 messages. The authors then grouped the messages into key themes through an iterative process of discussion, categorisation, and consensus. Seven themes were identified: Smoking Cessation Support; Social and Practical Support; Identity; Preventing Lapse and Relapse; Vaping vs. Smoking; Practical Vaping Tips (equipment); Health and Safety.

To support the use of theory and mechanisms of action in intervention design, the 95 text messages were mapped against the COM-B behaviour change constructs and BCTs. Some of the texts contained a link to videos but as the intervention content was external to the message and engagement was optional, these were not coded. Two authors (LD and EV) identified the behaviour(s) and condition(s) targeted in each text message and these were then independently examined by FN, CN, and VS. Coders met to discuss discrepancies and refine the mapping strategy. For example, coding behavioural substitution only where the text explicitly refers to replacing smoking (the unwanted behaviour) with vaping (the desired behaviour) and applying the blanket application of BCT pharmacological support to all texts where vape use is the behaviour (as vaping is pharmacological support itself). The revised coding was applied following a similar process to the original coding, any remaining discrepancies were further discussed and resolved.

**PHASE 2 – ASSESSMENT AND REFINEMENT OF TEXT MESSAGES**

**ASSESSMENT OF TEXT MESSAGES**

The 95 text messages from Phase 1, alongside 49 generic smoking cessation text messages from the iQuit in Practice Study (21; for a separate project; data not included here) were presented in a Qualtrics survey to people who smoke and/or vape. Each participant rated up to 20 text messages, randomly generated from each of the 7 themes, on 7-point Likert scales for the following constructs: how clear, understandable, believable, and helpful for smokers they considered the text messages to be, as well as whether they would be happy to receive them (with a higher score indicating a more favourable response). They also rated how the text made them feel: positive (1) vs negative (7); offended (1) vs unoffended (7); enthusiastic (1) vs unenthusiastic (7); and interested (1) vs uninterested (7). In addition to these 9 constructs, free text box for optional comments was also available; we received 61 comments with recommendations, feedback and suggestions for new text messages or re-wording. Full dataset and syntax are available online 22.

**DATA ANALYSIS PLAN**

Descriptive statistics were planned to generate a total score across the 9 different constructs followed by a computation of the mean across participants. Any text message that received a mean score of 4 and above was included in the final set of text messages.

**REFINEMENT OF TEXT MESSAGES**

 A working group (LD, SC and two people with extensive vaping experience) reviewed and discussed the survey results including messages with low ratings and comments/suggestions from survey participants. Further amendments were made to wording following advice around the use of consistent and understandable wording/terminology.

Finally, a second working group (LD and SC with two further individuals with vaping experience) matched the messages to early, mid, or late stages of quitting/vaping and created a suggested schedule, ensuring adequate temporal representation from each theme and COM-B construct. Two messages were added at this stage to introduce and conclude the set of messages producing a final set of 78 messages (Table 1) which are available for other researchers to use in e-cigarette smoking cessation studies.

**ETHICS**

The study was approved by the School of Applied Sciences Ethics Committee at LSBU (ETH1819-0143). Informed consent was obtained from all participants. Privacy and confidentiality were achieved by anonymising all data. No compensation was received for their participation to the project at this stage.

**PHASE 3 – APPLICATION OF THE FINAL TEXT MESSAGES SET IN A RANDOMISED OPTIMISATION TRIAL.**

The third phase required the application and evaluation of the selected intervention text messages through a planned randomised optimisation trial.

**OVERVIEW OF PARTICIPANTS AND PROCEDURE OF THE RANDOMISED OPTIMISATION TRIAL**

Six hundred and three participants (*M age =* 38.33 years, 369 females; 239 males; 1 non-binary) were randomised to receive text message support as part of an online randomised optimisation study, described elsewhere 20. All participants received a voucher to purchase an e-cigarette starter kit online and participants were sent a link to complete a follow up survey after 12 weeks. Those who were allocated to the text message condition were sent 72 messages, twice daily for the first two weeks, one a day for the following four weeks, then every other day for four weeks, finally one a week for 2 weeks. Full dataset and syntax are available online 23.

**DATA ANALYSIS PLAN**

For Phase 3, the aim was to evaluate the application of the final text messages in the randomised optimisation trial. A set of questions were asked at the 12 week follow up on the usefulness, frequency, and perception of the text messages. In terms of the quantitative data, we were interested in the responses from people who answered the questions about their experiences of receiving texting support. To do that, we computed the percentages for usefulness, frequency and whether they had blocked the messages. This was followed by an association test (a chi-square), that explored perceptions of usefulness of the text messages and self-reported abstinence status (not a single puff in the last 4-weeks at the 12-week follow up point).

Participants also had the opportunity to provide feedback on the text message programme. To understand the feedback provided, a content analysis approach was employed.

**ETHICS**

The study was approved by the School of Applied Sciences Ethics Committee at LSBU (ETH1920-0043). Informed consent was obtained from all participants. Privacy and confidentiality were achieved by anonymising all data. Participants were reimbursed with a £10 Amazon voucher for their participation in this phase.

 **RESULTS**

The co-development resulted in a text message programme that was focused on supporting people to quit smoking using an EC over a 12-weeks period.

 **PHASE 1 – EXAMINATION OF THE GENERATED TEXT MESSAGES AND DEVELOPMENT OF AN INITIAL SET**

Table 1 shows the 95 text messages mapped according to COM-B constructs. Three behaviours are targeted by the text-messages. Practical advice on how to use the vape was the most common behavioural target, followed by smoking cessation and purchasing of vape equipment.

Table 1: Original list of 95 text messages evaluated by smokers, ex-smokers, and vapers with the Mean score across the 9 construct ratings (ordered from highest to lowest mean rating within each theme) and the COM B construct.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Primary theme** | **SMS example** | **COM-B construct** | **N** | **Mean[[1]](#footnote-2)** | **Std. Deviation** |
| Smoking cessation support | Vaping saves money | Capability – psychological | 38 | 5.77 | 1.24 |
| Smoking cessation support | You can save around £1,260 per year if you switch from smoking to vaping | Capability – psychological | 35 | 5.77 | 1.32 |
| Smoking cessation support | Need more support to stop smoking? Try visiting a Stop Smoking Service. Many now offer ‘vape friendly’ services | Opportunity – physical & social | 41 | 5.37 | 1.14 |
| Social and practical support | Quitting smoking is hard! You are doing really well. Don’t give up! | Motivation – reflective | 23 | 6.14 | 1.07 |
| Social and practical support | Need more help and support? Talk to experienced vapers | Opportunity – social | 13 | 5.62 | 1.63 |
| Social and practical support | Need more advice and support? Try visiting a vape shop or an online forum for advice and support | Opportunity – physical & social | 16 | 5.41 | 1.45 |
| Social and practical support | If you can, seek out tips and advice from current vapers. There are lots of others who have switched to vaping and understand how it works | Opportunity – physicalMotivation – reflective | 13 | 5.33 | 1.37 |
| Social and practical support | Want to talk to others who are quitting smoking? Try online forums where you will find lots of advice and support | Opportunity – social | 19 | 5.18 | 1.29 |
| Social and practical support | Reward yourself for quitting smoking. Treat yourself to a new vaporiser or something else | Motivation – reflective | 13 | 5.00 | 1.12 |
| Identity | Don’t think you are too old and have smoked too many years to try vaping. Vaping can help adults of all ages quit smoking | Motivation – reflective | 19 | 6.15 | 1.05 |
| Identity | Vaping is helping you to free yourself of smoking | Motivation – reflective | 18 | 6.12 | 1.14 |
| Identity | It’s never too late to quit smoking! Even lifelong smokers have successfully switched to vaping | Motivation – reflective | 27 | 6.07 | 1.22 |
| Identity | You have joined 1.7 million vapers in Great Britain who have moved away from smoking | Motivation – reflective | 20 | 5.92 | 1.19 |
| Identity | Evidence suggests that vaping is the most popular form of quitting smoking | Motivation – reflective | 17 | 5.82 | 1.17 |
| Identity | Try watching this short film for inspiration from vapers who made The Switch <https://www>.youtube.com/watch?v=GPxxBvf6hJU | N/A | 20 | 5.63 | 1.36 |
| Identity | Most people prefer the smell of vape to tobacco smoke, so it is more acceptable to vape in public than to smoke | Opportunity – social | 28 | 5.47 | 1.26 |
| Identity | Worried about gaining weight? If you vape and continue to use nicotine, you shouldn’t put on weight when you quit smoking | Capability – psychological | 24 | 5.36 | 1.26 |
| Identity | Well done! You have joined 1.7m vapers in Great Britain who have switched to a lower risk nicotine product | Motivation – automatic | 24 | 5.34 | 1.40 |
| Identity | Vaping doesn’t need to be a drama. Vapes come in different shapes, sizes and even cloud factor. Find the one(s) that fits with you Understandable | Capability – psychological | 24 | 5.25 | 1.40 |
| Identity | Experiment by trying friends’ devices before you commit to buying your own | Opportunity – physical & social | 23 | 5.31 | 1.13 |
| Identity  | Love smoking? You can learn to love vaping instead! | Motivation – reflective | 16 | 5.16 | 1.41 |
| Identity | Don’t listen to naysayers, this is your journey | Motivation – reflective | 30 | 4.84 | 1.34 |
| Identity | Don’t want to be known as a ‘vaper’? Find a device that is small and discreet to avoid others making judgements | Motivation – reflective | 18 | 4.80 | 1.34 |
| Identity | It is hard when you stop smoking as you might feel lonely or cut off from friends who continue to smoke. Try visiting a vape shop and making new friends who vape | Opportunity – social | 25 | 4.38 | 1.47 |
| Identity | Some vapers like being part of a ‘vaping’ group. You can find a tribe that suits you! | Motivation – reflective | 17 | 3.89 | 1.74 |
| Preventing lapse and relapse | Don’t give up if you don’t like vaping straight away. There are plenty of other devices, nicotine strengths and flavours to try | Motivation – reflectiveCapability – psychological | 16 | 6.13 | 0.97 |
| Preventing lapse and relapse | Every time you crave a cigarette go for your vape first and keep using it until the craving has passed | Motivation – automatic | 12 | 6.07 | 1.28 |
| Preventing lapse and relapse | Whenever you have an urge to smoke, vape instead | Motivation – automatic | 21 | 6.05 | 1.47 |
| Preventing lapse and relapse | The first flavour you try may not be your favourite – try another | Capability – physical | 17 | 5.95 | 1.42 |
| Preventing lapse and relapse | Research suggests you are more likely to relapse to smoking if you have been drinking, so be prepared and don’t forget your vaporiser on nights out | Motivation – reflective | 22 | 5.90 | 1.24 |
| Preventing lapse and relapse | Did you know almost 3 million people now use e-cigarettes in the UK? Over half of these have given up smoking.” | Opportunity – social | 20 | 5.89 | 1.03 |
| Preventing lapse and relapse | Craving a cigarette? Try vaping first | Motivation – reflective | 19 | 5.87 | 1.26 |
| Preventing lapse and relapse | Don’t be afraid to use higher nicotine if you’re still craving a smoke. You can wean yourself off easier later | Capability – psychological | 15 | 5.81 | 1.57 |
| Preventing lapse and relapse | If you’re craving a cigarette and vaping doesn’t fix it, try increasing your nicotine level | Capability – physical | 17 | 5.76 | 1.18 |
| Preventing lapse and relapse | Social event coming up? Be prepared a higher strength e liquid so you are not tempted to smoke if you have a craving | Motivation – reflective | 17 | 5.66 | 1.34 |
| Preventing lapse and relapse | Try carrying a vape bag with extra coils, e-liquid and a charger with you. This could save you from smoking | Motivation – reflectiveCapability – psychological | 20 | 5.64 | 1.06 |
| Preventing lapse and relapse | If you stop tasting one flavour of e-liquid, try switching to another, like mint | Opportunity – physical | 13 | 5.62 | 1.26 |
| Preventing lapse and relapse | If you’re craving nicotine, don’t be worried, try using your device more often or go up a strength. | Capability – physical | 15 | 5.58 | 1.62 |
| Preventing lapse and relapse | Don’t give up if you have a cigarette. Many people have gone on to quit successfully with vaping after a smoking lapse | Motivation – reflective | 17 | 5.52 | 1.17 |
| Preventing lapse and relapse | If your partner smokes it is very hard to quit. Why not try switching to vaping together? | Motivation – reflective | 24 | 5.47 | 1.11 |
| Preventing lapse and relapse | E-cigarettes need charging regularly. Try putting it on charge when you charge your mobile phone | Capability – physical | 17 | 5.46 | 1.32 |
| Preventing lapse and relapse | E-cigarette not holding it’s charge? Contact your local vape shop or the research study investigator | Opportunity – physical | 24 | 5.43 | 1.18 |
| Preventing lapse and relapse | Most cigarettes are associated with certain ‘triggers’ (people, places, events). Try to recognise these and have your e-cigarette to hand instead | Motivation – automatic | 18 | 5.39 | 0.85 |
| Preventing lapse and relapse | Still craving a cigarette? Just vape through it | Motivation – automatic | 14 | 5.13 | 1.90 |
| Preventing lapse and relapse | Start with an all-in-one starter kit that won’t break the bank if you end up not liking it | Capability – physical | 17 | 5.26 | 1.14 |
| Preventing lapse and relapse | Remember to charge your e-cigarette using the charger provided | Capability – physical | 12 | 5.26 | 1.00 |
| Preventing lapse and relapse | Start with the highest nicotine level you can tolerate with the device you’re using | Capability – physical | 17 | 5.18 | 1.28 |
| Preventing lapse and relapse | Drinking alcohol can be a weak link when trying to stop smoking. Try increasing your nicotine e-liquid content if you think alcohol could tempt you to smoke | Opportunity – physicalCapability – psychological | 20 | 5.02 | 1.15 |
| Preventing lapse and relapse | Struggling with cravings? More help and advice is available via the NHS stop smoking service | Opportunity – physical & social | 15 | 4.99 | 1.42 |
| Preventing lapse and relapse | Getting bored of vaping? Try a new flavour! | Capability – psychological | 17 | 4.90 | 1.32 |
| Vaping vs. Smoking | Don’t be worried if your e-cigarette never leaves your hand and you feel as if you’re constantly puffing. Vaping is not the same as smoking | Motivation – reflective | 19 | 6.38 | 0.79 |
| Vaping vs. Smoking | Some people switch quicky, others take longer. Take as long as you need | Motivation – reflective | 34 | 6.04 | 1.24 |
| Vaping vs. Smoking | Vaping is better for the environment. Second hand vape produces less carcinogens than second-hand smoke | Capability – psychological | 31 | 5.95 | 1.24 |
| Vaping vs. Smoking | You didn’t give up when you first started smoking so give vaping the same chance and be rewarded with better health | Motivation – reflective | 23 | 5.92 | 1.26 |
| Vaping vs. Smoking | Don’t worry if you find yourself vaping lots. Vaping is different to smoking and you need to find patterns of vaping that best suit your needs | Motivation – reflective | 18 | 5.91 | 1.21 |
| Vaping vs. Smoking | Vaping is better for the environment. Cigarette butts are messy and don’t biodegrade for hundreds of years. There is very little waste with vaping | Capability – psychological | 21 | 5.56 | 1.03 |
| Vaping vs. Smoking | Don’t be concerned about vaping too much. Nicotine delivery is slower with e-cigarettes so you will need to vape more than you smoked | Capability – psychologicalMotivation – reflective | 23 | 5.55 | 1.20 |
| Vaping vs. Smoking | Don’t be discouraged by subtle differences. Vaping isn’t exactly like smoking but in time you will adjust | Motivation – reflective | 26 | 5.50 | 1.25 |
| Vaping vs. Smoking  | Most people who switch from smoking to vaping are not successful the first time. Don’t give up trying | Motivation – reflective | 25 | 5.48 | 1.31 |
| Vaping vs. Smoking  | Don’t limit use of your e-cigarette, especially at first. It takes around 30 minutes of use to get the same nicotine as from one cigarette | Capability – psychological | 21 | 5.46 | 1.37 |
| Vaping vs. Smoking | Vaping is different to smoking. Don’t worry if you seem to be vaping more | Motivation – reflective | 32 | 5.31 | 1.09 |
| Vaping vs. Smoking | You may not get it right with your first vape but don’t give up. Just remember how awful it tasted and felt when you started smoking | Motivation – reflective | 33 | 5.30 | 1.54 |
| Vaping vs Smoking | Feeling stressed? Keep going with your vape. This feeling will pass and maybe try a different strength of nicotine | Motivation – reflectiveCapability – psychological | 18 | 4.86 | 1.26 |
| Practical vaping tips (equipment) | Finding the right combination of device, liquid and flavours can take time. Don’t dismiss vaping straight away | Motivation – reflective | 18 | 6.38 | 0.87 |
| Practical vaping tips (equipment) | Try before you buy: Many vape shops allow you to experiment with different products | Opportunity – physical | 22 | 6.20 | 0.88 |
| Practical vaping tips (equipment) | Do not be embarrassed about using your vape in public | Motivation – automatic | 19 | 5.91 | 1.41 |
| Practical vaping tips (equipment) | Don’t be afraid of trying lots of different flavours, and remember, your taste buds will change after you stop smoking and come back to life again | Motivation – reflective | 18 | 5.87 | 1.47 |
| Practical vaping tips (equipment) | Dropped your vaporiser and smashed the tank? This can be replaced, so ask a vape shop for help | Opportunity – physical | 18 | 5.87 | 1.00 |
| Practical vaping tips (equipment) | Some pubs and bars are vape friendly. Check with staff who might be happy to let you vape indoors | Opportunity – physical | 14 | 5.77 | 1.25 |
| Practical vaping tips (equipment) | Try watching this short film for a practical intro to vaping for smokers: <https://www>.youtube.com/watch?v=fb1PfwEIoHY | N/A | 15 | 5.75 | 1.03 |
| Practical vaping tips (equipment) | Experiencing a bad taste from your e-cigarette? Try changing the coil | Capability – psychological | 16 | 5.74 | 1.14 |
| Practical vaping tips (equipment) | Try using a small waterproof bag to hold your vaping gear. Perfect for containing leaky tanks or e-liquid bottles | Capability – physical | 22 | 5.61 | 1.14 |
| Practical vaping tips (equipment) | if your device isn’t working quite right, ask your local vape shop for technical support | Opportunity – physical | 16 | 5.60 | 0.98 |
| Practical vaping tips (equipment) | Always use the approved charger for your vaporiser. It can be dangerous to use the wrong charger | Capability – psychologicalOpportunity – physical | 19 | 5.60 | 0.67 |
| Practical vaping tips (equipment) | Not all e-cigarettes produce huge clouds. Try a different device or a different liquid if you want less vapour | Capability – psychological | 17 | 5.59 | 1.24 |
| Practical vaping tips (equipment) | Concerned that you’re vaping all the time? Try increasing your nicotine level. Research shows people vape less with higher nicotine concentrations | Motivation – reflectiveCapability – psychological | 17 | 5.56 | 1.38 |
| Practical vaping tips (equipment) | Device broken! Visit a vape shop and ask for help | Opportunity – physical | 21 | 5.41 | 1.36 |
| Practical vaping tips (equipment) | Look for places that allow vaping. Many places are happy for people to vape, so don’t be shy to ask | Opportunity – social | 20 | 5.41 | 1.07 |
| Practical vaping tips (equipment) | Coughing a lot? This is a common side effect of giving up smoking | Motivation – reflective | 29 | 5.38 | 1.55 |
| Practical vaping tips (equipment) | If you don’t like using your device in public, try a smaller one for when you are out | Opportunity – physical | 23 | 5.30 | 1.38 |
| Practical vaping tips (equipment) | Don’t keep your vaporiser in a pocket with loose change – this is a fire risk! | Capability – psychological | 22 | 5.22 | 1.32 |
| Practical vaping tips (equipment) | Feeling more thirsty with vaping? This is perfectly normal and the extra fluids can be beneficial too | Motivation – reflective | 24 | 5.19 | 1.56 |
| Practical vaping tips (equipment) | Remember to charge your e-cigarette using the charger provided | Capability – physical | 14 | 5.16 | 1.03 |
| Practical vaping tips (equipment) | When refilling e-liquid, be careful not to overfill your device so you avoid leaks | Capability – physical | 20 | 5.16 | 1.29 |
| Practical vaping tips (equipment) | If your e-cigarette ‘spits’ liquid, just turn off the device and clean out excess liquid in the mouthpiece with some rolled up tissue | Capability – physical | 17 | 5.03 | 1.18 |
| Practical vaping tips (equipment) | Try to keep your device away from water. You can wipe it clean with a cloth or tissue | Capability – physical | 20 | 5.02 | 1.39 |
| Practical vaping tips (equipment) | More support to help you stay stopped from smoking here: <https://www>.uea.ac.uk/documents/246046/28183329/vaping+leaflet.pdf/aa23000b-d9df-2d9e-b617-9ab15464f61 | N/A | 16 | 4.45 | 1.50 |
| Health & Safety | Vaping is a safer, cleaner and much cheaper way of delivering nicotine | Capability – psychological | 17 | 6.37 | 0.91 |
| Health & Safety | Ignore people who say vaping is just as dangerous as smoking. Evidence suggests vaping is around 95% safer than smoking | Capability – psychological | 15 | 6.05 | 1.26 |
| Health & Safety | Remember to take your liquid with you in case you run out | Capability – physical | 17 | 5.96 | 1.09 |
| Health & Safety | There are far fewer cancer-causing particles in vape than in smoke. It is safer to vape around friends and family than to smoke | Capability – psychological  | 17 | 5.70 | 1.18 |
| Health & Safety | People smoke for nicotine but it’s the harmful chemicals in smoke that damages health. Getting the nicotine without these chemicals will really help your health | Capability – psychological | 18 | 5.64 | 1.51 |
| Health & Safety | This short film by Public Health England shows how much safer e-cigarettes are than smoking: <https://www>.youtube.com/watch?v=RisBe5sLGPc | N/A | 19 | 5.61 | 1.37 |
| Health & Safety | Don’t panic if you read an article about the dangers of vaping. Research shows vaping is much less harmful than smoking | Capability – psychological | 16 | 5.32 | 1.17 |
| Health & Safety | Try watching this short film on top tips for vaping safety: <https://www>.youtube.com/watch?v=cuZRky79MMY | Ν/Α | 14 | 4.85 | 1.73 |

**PHASE 2 – ASSESSMENT AND REFINEMENT OF THE INITIAL SET OF TEXT MESSAGES**

**PARTICIPANTS**

Two hundred and two(*M age =* 48.31 years, 55% female) participants completed an online survey. Most of the participants vaped daily, 78.51%, and were ex-smokers, 74.38%. Table 2 presents a detailed demographic overview of our sample size.

Table 2. A detailed overview of participants’ demographics.

|  |  |  |
| --- | --- | --- |
|  | N / Mean | Percentage / SD |
| **Age** | 48.31 | 12.63 |
| **Gender** |  |  |
| Female | 66 | 55% |
| Male | 54 | 45% |
| Missing | 82 | - |
| **Ethnicity** |  |  |
| White | 115 | 96.04% |
| Mixed Race | 1 | .82% |
| Multiple Ethnic Groups | 2 | 1.65% |
| Asian/Asian British | 1 | .82% |
| Other | 2 | 1.65% |
| Missing | 81 | - |
| **Smoking Status** |  |  |
| Yes, Daily | 21 | 17.35% |
| Yes, Non-daily | 10 | 8.26% |
| No | 90 | 74.38% |
| Missing | 81 | - |
| **Vaping Status** |  |  |
| Yes, Daily | 95 | 78.51% |
| Yes, Non-daily | 10 | 8.26% |
| No | 16 | 13.22% |
| Missing | 81 | - |

The participants were recruited through social networks (Twitter; Planet of the Vapes) and word of mouth. Anyone above the age of 18 who vaped, smoked, or used both and were fluent in English was eligible for the study.

**ASSESSMENT OUTCOMES OF THE INITIAL SET OF TEXT MESSAGES**

Mean scores were computed for each message across all 9 construct ratings. Table 1 presents all 9 construct ratings combined alongside the message primary theme and COM-B construct. For this analysis, we only included participants who provided one complete set of construct ratings to at least one text.

The highest rated text message for each theme against each rating is shown in Table 1. In relation to the individual dimensions rated, all text messages received a mean score higher than the neutral anchor of 4 (our specified threshold for inclusion) on how clear, understandable, and believable they were perceived to be. Nine text messages received construct ratings outside of the pre-specified threshold for inclusion on some of the other constructs: Two of these had unfavourable scores (i.e., above/below the neutral anchor of 4) across multiple constructs, so they were removed (see Table 1). The other seven were discussed with two people who vape and 6/7 of these were retained. Based on the feedback we received from the survey, 24 text messages were also removed (e.g., due to lack of appeal to specific groups such as older people, confusion, or ostensible repetition of the same theme) and seven new messages (based on suggestions from participants/vapers in our working group) were added resulting in 76 messages.

Table 3 shows the final set of messages, in the suggested order, with the target behaviour, COM-B construct and BCTs. Across the final set of messages, a total of 15 BCTs were identified and 96 uses of these BCTs. Most BCT uses were from the shaping knowledge (26 messages), regulation (22 messages), natural consequences (19 messages), self-belief (10 messages) and social support (8 messages) groups.  There was coverage across all COM-B constructs in the programme. The most frequent COM-B constructs, representing potential mechanisms of action, were reflective motivation (30 messages), psychological capability (23 messages), physical capability (12 messages), physical opportunity (7 messages), social opportunity (5 messages) and automatic motivation (4 messages).

Table 3: Final set of 78 text messages[[2]](#footnote-3) with suggested order.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number** | **Primary theme** | **SMS example** | **Target behaviour** | **COM-B Construct** | **BCT** |
| 1 | Smoking Cessation Support | Your decision to buy an e-cig is brilliant, so feel proud of yourself. Remember, if there are tough times, you have what it takes – stay strong and stay confident.\* | E-cigarette use | Motivation – reflective | Social support (unspecified); Verbal persuasion about capability (3.1; 15.1) |
| 2 | Smoking Cessation Support | In 2019, 2 million ex-smokers were vaping in Great Britain. You can join them.**\*** | Smoking cessation | Motivation – reflective | Verbal persuasion about capability (15.1) |
| 3 | Practical Vaping Tips (Equipment) | When you add liquid to your e-cig for the first time, it’s important to let it sit for a few minutes before taking a puff in order to avoid a nasty taste**\*** | E-cigarette use | Capability - physical | Instructions on how to perform the behaviour (4.1) |
| 4 | Practical Vaping Tips (Equipment) | Coughing after taking an e-cig puff? Remember, inhaling vapour is different to inhaling smoke – you will learn how to do it.**\*** | Smoking cessation | Motivation – reflective; Capability – psychological | Information about health consequences (5.1) |
| 5 | Practical Vaping Tips (Equipment) | Remember to charge your e-cigarette using the charger provided | E-cigarette use | Capability – physical | Instructions on how to perform the behaviour (4.1) |
| 6 | Vaping vs. Smoking | Vaping is different to smoking. Don’t worry if you seem to be vaping more | E-cigarette use / Smoking cessation | Motivation – reflective | None identified\*\* |
| 7 | Preventing lapse & relapse | Every time you crave a cigarette go for your e-cig first and keep using it until the craving has passed | E-cigarette use | Motivation – automatic | behaviour substitution |
| 8 | Identity | Don’t worry about how long you’ve been smoking to try vaping. Vaping can help adults of all ages quit smoking | E-cigarette use | Motivation – reflective | Verbal persuasion about capability (15.1) |
| 9 | Practical Vaping Tips (Equipment) | Do not be embarrassed about using your vape in public | E-cigarette use | Motivation – automatic | Framing/reframing (13.2) |
| 10 | Smoking Cessation Support | Vaping saves money | E-cigarette use | Capability – psychological | Information about Social and environmental consequences (5.3) |
| 11 | Practical Vaping Tips (Equipment) | Try watching this short film for a practical intro to vaping for smokers: <https://www>.youtube.com/watch?v=fb1PfwEIoHY | E-cigarette use | Uncoded | Uncoded |
| 12 | Preventing lapse & relapse | Research suggests you are more likely to relapse to smoking if you have been drinking, so be prepared and don’t forget your vaporiser on nights out | E-cigarette use / Smoking Cessation | Motivation – reflective | Problem solving; Information about antecedents (1.2;4.2) |
| 13 | Social & Practical Support | Quitting smoking is hard! You are doing really well. Don’t give up! | Smoking cessation | Motivation – reflective | Verbal persuasion about capability (15.1) |
| 14 | Vaping vs Smoking | Feeling stressed? Keep going with your vape. This feeling will pass and maybe try a different strength of nicotine | E-cigarette use | Motivation – reflective; Capability – Psychological | None identified |
| 15 | Smoking Cessation Support | You can save around £1,260 per year if you switch from smoking to vaping | E-cigarette use / Smoking cessation | Capability – psychological | Information about social and environmental consequences (5.3) |
| 16 | Practical Vaping Tips (Equipment) | Try to keep your device away from water. You can wipe it clean with a cloth or tissue | E-cigarette use | Capability – physical | None identified |
| 17 | Identity | Evidence suggests that vaping is the most popular form of quitting smoking | E-cigarette use | Motivation – reflective | None identified |
| 18 | Practical Vaping Tips (Equipment) | Don’t keep your vaporiser in a pocket with loose change – this is a fire risk! | E-cigarette use | Capability – psychological | Information about social and environmental consequences (5.3) |
| 19 | Health & Safety | Ignore people or organisations who say vaping is just as dangerous as smoking. Evidence suggests vaping is around 95% safer than smoking | Smoking cessation | Capability – psychological | Information about health consequences (5.1) |
| 20 | Preventing lapse & relapse | If you’re craving nicotine, don’t be worried, try using your device more often or go up a strength. | E-cigarette use | Capability – Physical | Instruction on how to perform the behaviour (4.1) |
| 21 | Identity | Love smoking? You can learn to love vaping instead! | E-cigarette use | Motivation – reflective | None identified |
| 22 | Practical Vaping Tips (Equipment) | When refilling e-liquid, be careful not to overfill your device so you avoid leaks | E-cigarette use | Capability – physical | Instructions on how to perform the behaviour (4.1) |
| 23 | Vaping vs. Smoking | Don’t worry if you find yourself vaping lots. Vaping is different to smoking and you need to finds patterns of vaping that best suit your needs | E-cigarette use | Motivation – reflective | Instructions on how to perform the behaviour (11.1) |
| 24 | Practical Vaping Tips (Equipment) | Experiencing a bad taste from your e-cigarette? Try changing the coil | E-cigarette use | Capability – psychological | Instructions on how to perform the behaviour (4.1) |
| 25 | Identity | It’s never too late to quit smoking! Even lifelong smokers have successfully switched to vaping | Smoking cessation | Motivation – reflective | Verbal persuasion about capability (15.1) |
| 26 | Practical Vaping Tips (Equipment) | Coughing a lot? This is a common side effect of giving up smoking | Smoking cessation | Motivation – reflective | Information about health consequences (5.1) |
| 27 | Practical Vaping Tips | Make sure your tank is always at least half full otherwise you’ll get a horrible taste **\*** | E-cigarette use | Capability – physical | Instructions on how to perform the behaviour (4.1) |
| 28 | Preventing lapse & relapse | Craving a cigarette? Try vaping first | Smoking cessation | Motivation – reflective | Behaviour substitution (8.2) |
| 29 | Preventing lapse & relapse | Try carrying a small bag with extra coils, e-liquid and a charger with you. This could save you from smoking | E-cigarette use / Smoking cessation | Motivation – reflective; Capability – Psychological | None identified |
| 30 | Preventing lapse & relapse | If you’re craving a cigarette and vaping doesn’t fix it, try increasing your nicotine level | E-cigarette use / Smoking cessation | Capability – physical | Problem solving (1.2) |
| 31 | Practical Vaping Tips (Equipment) | Try watching this short film on top tips for vaping safety: <https://www>.youtube.com/watch?v=cuZRky79MMY | E-cigarette use | Uncoded | Uncoded |
| 32 | Health & Safety | People smoke for nicotine but it’s the harmful chemicals in smoke that damages health. Getting the nicotine without these chemicals will really help your health | E-cigarette use / Smoking cessation | Capability – psychological | Information about health consequences (5.1) |
| 33 | Practical Vaping Tips | Remember to change your coil. If in doubt, put a new one in **\*** | E-cigarette use | Capability – physical | Instructions on how to perform the behaviour (4.1) |
| 34 | Vaping vs. Smoking | Don’t be discouraged by subtle differences. Vaping isn’t exactly like smoking but in time you will adjust | E-cigarette use | Motivation – reflective | verbal persuasion about capability (15.1) |
| 35 | Health & Safety | Remember to take your liquid with you in case you run out | E-cigarette use | Capability – physical | Instructions on how to perform the behaviour (4.1) |
| 36 | Preventing lapse & relapse | Don’t give up if you don’t like vaping straight away. There are plenty of other devices, nicotine strengths and flavours to try | E-cigarette use | Motivation – reflective; Capability – Psychological | Instructions on how to perform the behaviour (4.1) |
| 37 | Preventing lapse & relapse | E-cigarettes need charging regularly. Try putting it on charge when you charge your mobile phone – though never overnight | E-cigarette use | Capability – physical | Instructions on how to perform the behaviour (4.1) |
| 38 | Identity | Don’t listen to naysayers, this is your journey | E-cigarette use | Motivation – reflective | None identified |
| 39 | Practical Vaping Tips (Equipment) | Finding the right combination of device, liquid and flavours can take time. Don’t dismiss vaping straight away | E-cigarette use | Motivation – reflective | Instructions on how to perform the behaviour (4.1) |
| 40 | Practical Vaping Tips (Equipment) | Feeling more thirsty with vaping? This is perfectly normal and the extra fluids can be beneficial too | E-cigarette use | Motivation – reflective | information about health consequences (5.1) |
| 41 | Health & Safety | This short film by Public Health England shows how much safer e-cigarettes are than smoking: <https://www>.youtube.com/watch?v=RisBe5sLGPc | E-cigarette use | Uncoded | Uncoded |
| 42 | Vaping vs. Smoking | Don’t limit use of your e-cigarette, especially at first. It takes around 30 minutes of use to get the same nicotine as from one cigarette | E-cigarette use | Capability – psychological | Instruction on how to perform the behaviour (4.1) |
| 43 | Preventing lapse & relapse | Drinking alcohol can be a weak link when trying to stop smoking. Try increasing your nicotine e-liquid content if you think alcohol could tempt you to smoke | E-cigarette use | Opportunity- physical; Capability – Psychological | Problem solving (1.1) |
| 44 | Practical Vaping Tips (Equipment) | If your e-cigarette ‘spits’ liquid, just turn off the device and clean out excess liquid in the mouthpiece with some rolled up tissue | E-cigarette use | Capability – physical | Instructions on how to perform the behaviour (4.1) |
| 45 | Health & Safety | There is only a fraction of cancer causing particles in vape than in smoke. It is safer to vape around friends and family than to smoke | E-cigarette use / Smoking cessation | Capability – psychological | Information about health consequences (5.1) |
| 46 | Preventing lapse & relapse | Don’t be afraid of trying lots of different flavours, and remember, your taste buds will change after you stop smoking and come back to life again | E-cigarette use / Smoking cessation | Motivation – reflective | Instruction on how to perform the behaviour; information about health consequences (4.1;5.1) |
| 47 | Health & Safety | Don’t panic if you read an article about the dangers of vaping. Research shows vaping is much less harmful than smoking | E-cigarette use | Capability – psychological | Information about health consequences (5.1) |
| 48 | Vaping vs. Smoking | Don’t be worried if your e-cigarette never leaves your hand and you feel as if you’re constantly puffing. Vaping is not the same as smoking | E-cigarette use | Motivation – reflective | Instructions on how to perform the behaviour (4.1) |
| 49 | Practical Vaping Tips (Equipment) | Always use the approved charger for your vaporiser. It can be dangerous to use the wrong charger | Purchasing e-cigarette equipment | Capability – psychological; Opportunity – physical | Instructions on how to perform the behaviour (4.1) |
| 50 | Preventing lapse & relapse | Getting low on e-liquid? Remember to buy some more **\*** | E-cigarette use | Opportunity – physical | Instruction on how to perform the behaviour (4.1) |
| 51 | Vaping vs. Smoking | Most people who switch from smoking to vaping are not successful the first time. Don’t give up trying | Smoking cessation | Motivation – reflective | Verbal persuasion about capability (15.1) |
| 52 | Preventing lapse & relapse | Don’t be afraid to use higher nicotine if you’re still craving a smoke. You can wean yourself off easier later | E-cigarette use | Capability – psychological | Instruction on how to perform the behaviour; verbal persuasion about capability (4.1;15.1) |
| 53 | Identity | Try watching this short film for inspiration from vapers who made The Switch <https://www>.youtube.com/watch?v=GPxxBvf6hJU | E-cigarette use | Uncoded | Uncoded |
| 54 | Practical Vaping Tips (Equipment) | if your device isn’t working quite right, ask your local vape shop for technical support | E-cigarette use | Opportunity – physical | Social support practical (3.2) |
| 55 | Vaping vs. Smoking | You may not get it right with your first vape but don’t give up. Just remember how awful it tasted and felt when you started smoking | E-cigarette use / Smoking cessation | Motivation – reflective | Verbal persuasion about capabilities(15.1) |
| 56 | Preventing lapse & relapse | Whenever you have an urge to smoke, vape instead | E-cigarette use / Smoking cessation | Motivation – automatic | Behaviour substitution (8.2) |
| 57 | Practical Vaping Tips (Equipment) | Look for places that allow vaping. Many places are happy for people to vape, so don’t be shy to ask | E-cigarette use | Opportunity – social | Information about social and environmental consequences (5.3) |
| 58 | Preventing lapse & relapse | Don’t give up if you have a cigarette. Many people have gone on to quit successfully with vaping after a smoking lapse | E-cigarette use | Motivation – reflective | Social comparison (6.2) |
| 59 | Health & Safety | Vaping is a safer, cleaner and much cheaper way of delivering nicotine | E-cigarette use | Capability – psychological | Information about health consequences (5.1) |
| 60 | Vaping vs. Smoking | You didn’t give up when you first started smoking so give vaping the same chance and be rewarded with better health | E-cigarette use / Smoking cessation | Motivation – reflective | Verbal persuasion about capabilities (15.1) |
| 61 | Social & Practical Support | Want to talk to others who are quitting smoking? Try online forums where you will find lots of advice and support | Smoking cessation | Opportunity – social | Social support (unspecified) (3.1) |
| 62 | Preventing lapse & relapse | If you stop tasting one flavour of e-liquid, try switching to another, like mint | Purchasing e-cigarette equipment | Opportunity – physical | Instruction on how to perform the behaviour (4.1) |
| 63 | Vaping vs. Smoking | Don’t be concerned about vaping too much. Nicotine delivery is slower with e-cigarettes so you will need to vape more than you smoked | E-cigarette use | Capability – psychological; Motivation – reflective | Instruction on how to perform the behaviour (4.1) |
| 64 | Preventing lapse & relapse | Most cigarettes are associated with certain ‘triggers’ (people, places, events). Try to recognise these and have your e-cigarette to hand instead | E-cigarette use | Motivation – automatic | Problem solving (1.2) |
| 65 | Smoking Cessation Support | Need more support to stop smoking? Try visiting a Stop Smoking Service. Many now offer ‘vape friendly’ services | Smoking cessation | Opportunity – physical and social | Social support (unspecified) (3.1) |
| 66 | Identity | Most people prefer the smell of vape to tobacco smoke, so it is more acceptable to vape in public than to smoke | E-cigarette use | Opportunity – social | Information about social and environmental consequences (5.3) |
| 67 | Health & Safety | Remember to buy your e-liquid from a reputable source. **\*** | Purchasing e-cigarette equipment | Capability – physical | Instructions on how to perform the behaviour (4.1) |
| 68 | Practical Vaping Tips (Equipment) | Not all e-cigarettes produce huge clouds. Try a different device or a different liquid if you want less vapour | Purchasing e-cigarette equipment | Capability – psychological | Information on how to perform the behaviour; pharmacological support (4.1; 11.1) |
| 69 | Identity | Don’t want to be known as a ‘vaper’? Find a device that is small and discreet to avoid others making judgements | E-cigarette use | Motivation – reflective | None identified |
| 70 | Practical Vaping Tips | The first flavour you try may not be your favourite – try another | E-cigarette use | Capability – physical | None identified |
| 71 | Practical Vaping Tips | Dropped your vaporiser and smashed the tank? This can be replaced, so ask a vape shop for help | Purchasing e-cigarette equipment | Opportunity – physical | Information on how to perform behaviour (4.1) |
| 72 | Social & Practical Support | Need more help and support? Talk to experienced vapers | E-cigarette use | Opportunity – social | Social support (unspecified) (3.1) |
| 73 | Social & Practical Support | Reward yourself for quitting smoking. Treat yourself to a new vaporiser or something else | Smoking cessation | Motivation – reflective | Self-reward (10.9) |
| 74 | Identity | Worried about gaining weight? If you vape and continue to use nicotine, you shouldn’t put on weight when you quit smoking | E-cigarette use / Smoking cessation | Capability – psychological | Information about health consequences (5.1) |
| 75 | Vaping vs. Smoking | Vaping is better for the environment. Second hand vape won’t harm people around you but remember, it’s not to everybody’s taste | E-cigarette use | Capability – psychological | Information about social and environmental consequences; Information about health consequences; (5.3;5.1) |
| 76 | Preventing lapse & relapse | Getting bored of vaping? Try a new flavour! | E-cigarette use | Capability – psychological | Instructions how to perform the behaviour (4.1) |
| 77 | Identity | Vaping doesn’t need to be a drama. Vapes come in different shapes, sizes and even cloud factor. Find the one(s) that fits with you | E-cigarette use | Capability – psychological | None identified |
| 78 | Smoking Cessation Support | We hope you are still using your e-cig. Don’t give up if you smoke. Many people have still gone on to quit with vaping even if it takes a few attempts**\*** | E-cigarette use | Motivation – reflective | Social comparison (6.2) |

**PHASE 3 – OUTCOMES OF THE APPLICATION OF THE FINAL SET OF TEXT MESSAGES**

For Phase 3, our participants were recruited through social networks (Twitter and Reddit) and word of mouth. Anyone above the age of 18 who was interested in switching to vaping to quit smoking and were fluent in English was eligible for the study. For more information, see the RCT study19.

Two hundred and two out of six hundred and three (38%) responded to at least one of the text message questions at the 12-week follow-up. 70% reported that they found the messages useful, 8% reported that they were not useful and 7% stated that they hadn’t received the texts. 66% stated that the message frequency was about right, 32% stated that they were too frequent, and 1.4% reported that they were not frequent enough. 6.5% reported blocking the messages because they were either too frequent, too annoying, or too repetitive (based on 8 comments).

Forty-seven participants provided further comments which we analysed using content analysis. A coding frame was first agreed for the classification of comments as positive, negative, mixed (containing both positive and negative points) or ambiguous (used where a comment was unclear, for example due to a typographical error). LD and CN then independently applied the coding framework deductively. Forty-five percent of the comments were coded as positive, 34% were negative, 15% mixed and 3% ambiguous. Next, LD and CN independently inductively coded the content of the comments to identify categories. The most common positive categories were helpful (28%), encouraging (13%), informative (9%) and motivating (9%) and the most common negative categories were too frequent (19%), annoying (9%), could not block (9%) and useless (6%). Finally, those who rated the text messages as useful were more likely to have quit than those who rated them as not useful (x2= 9.64, df =1, p =. 002).

The list of codes, frequencies and Cohen’s kappa are shown in Table 4. There was 100% agreement between the two coders for the classification of comments as either positive, negative, mixed, or ambiguous (all weighted kappas = 1). In relation to the categories, weighted kappa coefficients for all categories in the initial coding were substantial to perfect (range .66 – 1) apart from three disagreements (where kappas could not be computed due to single instance of the categories, by one coder). These inconsistencies were reviewed and discussed, and the coding frame was revised to reduce the categories and allow for more interpretation around the concepts.

Table 4. Ratings of constructs against the text messages.

|  |  |  |  |
| --- | --- | --- | --- |
| **Classification** | **N (%)** | **Cohen’s Weighted Kappa** | **95% CI** |
| Positive | 21 (45%) | 1 | 1-1 |
| Negative | 16 (34%) | 1 | 1-1 |
| Mixed | 7 (15%) | 1 | 1-1 |
| Ambiguous | 3 (6%) | 1 | 1-1 |
|  |  |  |  |
| **Positive Categories** |  |  |  |
| Helpful | 13 (28%) | .88 | .74-1.04 |
| Encouraging | 6 (13%) | 1 | 1-1 |
| Informative | 4 (9%) | 1 | 1-1 |
| Motivating  | 4 (9%) | .87 | .64-1.11 |
| Supportive |  3 (6%) | 1 | 1-1 |
| Great/Excellent/Good | 3 (6%) | .79 | .39-1.19 |
| Enjoyable | 3 (6%)  | 1 | 1-1 |
| Missed when stopped | 1 (2%) | 1 | 1-1 |
| Stay on track | 1 (2%)  | 1 | 1-1 |
| Relevant | 1 (2%) | 1 | 1-1 |
| Factual | 1 (2%) | 1 | 1-1 |
| Well-timed | 1 (2%) | 1 | 1-1 |
| Positive impact | 1 (2%) | 1 | 1-1 |
| Unbiased | 1 (2%) | 1 | 1-1 |
|  |  |  |  |
| **Negative Categories** |  |  |  |
| Too frequent | 9 (19%) | .76 | .51-1.02 |
| Annoying | 4 (9%) | 1 | 1-1 |
| Could not block | 4 (9%) | .73 | .37-1.09 |
| Useless | 3 (6%) | 1 | 1-1 |
| Patronising | 2 (4%) | 1 | 1-1 |
| Ignored | 2 (4%) | .66 | .03-1.23 |
| Repetitive | 2 (4%) | 1 | 1-1 |
| Triggering | 2 (4%) | 1 | 1-1 |
| Badly timed | 2 (4%) | 1 | 1-1 |
| Bored | 1 (2%) | 1 | 1-1 |
| Deleted | 1 (2%) | 1 | 1-1 |
| Wrong context | 1 (2%) | 1 | 1-1 |
| Not required | 1 (2%) | 1 | 1-1 |
| Blocked | 1 (2%) | 1 | 1-1 |

**DISCUSSION**

Co-production in health research is increasingly becoming a valued approach as it has potential to improve the relevance, quality, and impact of research outcomes 24. Through this approach, the expertise and knowledge of researchers, health providers and the community are recognised 12,24. In the present work, we employed a co-production paradigm to co-develop and co-produce a mobile phone text message programme with ex-smokers and people who vape which aimed to support people to quit smoking by switching to vaping. The significance of the present works lies on the representation of the voices of those who quit smoking using a vape. In addition, our work ensures that our text message programme is driven by the community who have direct experiences of attempts to quit and is not solely relying on scientific evidence which often does not encapsulate the diverse voices of people.

In the context of co-developing a mobile phone text message programme, we worked with community stakeholders in Phase 1 to identify text messages that could support people to quit smoking by switching to vaping. We received 151 text message recommendations which captured different perspectives and experiences from the community members. By combining the diverse perspectives of the community and our expertise in the field, we attempted to capture a more relevant, feasible and acceptable focus on topics that people who wish to quit smoking by switching to a vape would consider. Despite the high volume of recommendations and the different views from the community, the working group of researchers and people who vape invested significant amounts of time in sorting and reviewing the text messages for several reasons (e.g., difference in opinions; inaccurate medical information; shortening the messages to fit in a single 160 characters text message). This highlights the significant time and resource required to enable a full co-production paradigm, which can also be a barrier to its implementation 11. Similarly, in Phase 2 further reviewing was required by our working group for the refinement of the final mobile phone text message programme. Although the input from the community is invaluable, the limits of co-production must be considered.

Text message interventions for smoking cessation have been found to be efficient, convenient, and cost-effective 25 as well as improve smoking abstinence rates 26 due to the personalised support and reminders the smokers receive during a text message intervention 27,28. Although our text messages were not personalised to individuals, they were co-produced with people who had experienced the transition from smoking to vaping and were tailored to stage of that journey; thus, our study meets a gap in provision for text messages to specifically support smoking cessation using an EC device. In addition to providing a programme of text messages to use in intervention design, specification according to BCTs, with linking to mechanisms of action, offers opportunity for the development of interventions that can test hypotheses about the theoretical underpinning of these via conduct of mediational analyses.

The strength of our work lies in the co-production and co-development of the text messages. Through the implementation of the mobile phone text message programme in Phase 3, we had the opportunity to obtain further feedback on the reception of the programme. Only a small portion of the participants (6%) reported that the text messages were not useful, and 7% of the participants (7%) reported that they did not receive the texts. This could be due to erroneous input of their mobile telephone number or because they blocked them (more details are discussed in the main paper of the study19). Incorrect mobile phone entries (either erroneously or fraudulently) or texts being blocked and marked as spam could be the reasons participants didn’t receive the text messages.

In terms of frequency, most of the participants found the frequency of the mobile phone text message programme to be about right with around one third reporting that they were too frequent, especially in the first two weeks where they received two a day. This is a common issue in text message interventions 29,30 and may differ depending on individual preferences. Similarly, some participants reported blocking the messages due to their frequency. Previous research highlights that 20% of participants in practice trials requested to stop receiving text messages 21. Other reasons stated in the literature include not wanting/needing help or not having confidence on text messages 31. In phase 3, written feedback on the mobile phone text message program revealed that half of the recipients of the texts found them encouraging, supportive and helpful, however 32% had a negative outlook on the programme and 23% a more mixed perspective. Our findings indicate that the co-developed programme was generally perceived as effective by those participants who provided feedback. However, a limitation of phase 3 is that only 1/3 of those who received text messages completed the follow up survey. Thus, further research is needed to fully investigate the acceptability, usefulness, and utility of these text messages and to explore other combinations of messages that may be effective or in other formats e.g., app notifications. Finally, Phase 3 revealed that those who rated the text messages as useful were more likely to quit than those who did not. This could be because participants who found the mobile phone text message programme useful engaged more and recalled the information presented to them more often throughout the study. Alternatively, it could mean that participants rated the messages as more useful because they were able to quit. Therefore, further investigation is needed regarding the association between usefulness (one of the constructs) ratings and quit rates.

It is crucial though to consider the rapidly changing e-cigarette landscape; the arrival of the disposable vapes is changing the market and the traditional landscape of smoking cessation 32,33. These devices have gained significant popularity, because unlike to traditional vapes, they do not require recharging or refilling, hence minimising the effort from the user. While the current mobile phone text message programme was developed with traditional vape devices in mind, it’s important to consider the changes in the market and adapt the programme according to needs.

Our work comes with limitations. Findings from Phase 3 should be considered in the context of the data collection coinciding with the beginning of the COVID-19 pandemic, spanning the first and second lockdown in England (March 2020 - October 2020). During that period, there were several changes; campaigns ‘quit for COVID’ but also, on the contrary, erroneous news reports suggesting that smoking protects you from the COVID-19 virus. Whilst our findings cannot be explained by the pandemic, there are chances that the perceptions of people have been affected by the news in the media regarding smoking, either in a positive or negative way. Finally, there were instances where participants received text messages while they didn’t have their vape due to the several delays posed by the COVID-19 pandemic. This would render the texts unhelpful since they were designed to coincide with the arrival of the EC device. Other limitations include automation errors during Phase 3; there were cases where participants didn’t receive the text messages on time and cases where participants didn’t receive the text messages at all due to automation issues e.g., providing the wrong phone number. Further research is needed to examine the feasibility of the text message programme in helping smokers quitting smoking using vapes but also to test these text messages in other forms, such as notifications in mobile applications which could lead to more interactive engagement than a passive one. Finally, the cost of running a text message intervention should be considered by researchers as two-way communications (participants responding to text messages) will lead to more expensive interventions than one-way communication (participants only receive texts). The text messages are available for other researchers to use for further evaluation and testing either as a whole programme or by selecting which theme or BCT they wish to address.

**CONCLUSIONS**

This study underscores the potential benefits of co-production in health research, including the ability to target community needs, engage community stakeholders, and promote person-centred practices. The co-developed mobile phone text message programme has the potential to support smokers in quitting smoking using a vape. However, the rapidly changing e-cigarette landscape suggests that further research is needed to investigate the effectiveness of the co-developed text message programme by considering the disposable vapes. Despite the limitations mentioned above, the programme was perceived as effective by participants in Phase 3, highlighting the potential benefits of incorporating community perspectives and expertise in the development of smoking cessation interventions.

**Acknowledgements**

We would like to thank all the people who suggested content for our text messages; construct ratings of the messages; suggestions for improving and refining the messages; and help with ordering the messages.

**Declarations of Interest**

FN is a non-paid member of the scientific committee of the Smoke Free app and has undertaken paid consultancy for a medical device manufacturer (ResMed) designing a smoking cessation app which uses a wireless inhaled nicotine replacement therapy device.

JB has received unrestricted research funding to study smoking cessation from manufacturers of smoking cessation medications (Pfizer and Johnson & Johnson).

LD has provided consultancy for the pharmaceutical industry (Johnson & Johnson)

All other authors report no conflicts of interest.

**Funding**

This work was supported by a research grant from the Medical Research Council’s Public Health Intervention Development (PHIND) scheme (Grant ref: MR/T002352/1).

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1. The constructs of positive/negative, enthusiastic/unenthusiastic, and interested/uninterested reverse scored so a higher score is more favorable. [↑](#footnote-ref-2)
2. Text messages marked with an asterisk point out that these were newly added at stage 5; \*\*Pharmacological support BCT (11.1) applies to all texts where e-cigarette use is the behaviour and has therefore not been added for each one. EV, CN and FN who examined the text messages have completed BCT workshop/online training. [↑](#footnote-ref-3)