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A qualitative study exploring experiences of the safetxt digital health intervention to reduce sexually transmitted infections in young people in the UK

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ABSTRACT

Objectives People aged 16–24 are more likely than other age groups to acquire sexually transmitted infections (STI). Safetxt was a randomised controlled trial of a theory-based digital health intervention to reduce STIs among 16–24 year-old people in the UK. We report results of qualitative research regarding participants' perceptions and experiences of the intervention and trial participation.

Design Qualitative thematic analysis following a critical realist paradigm of written open feedback comments provided in the 12-month follow-up questionnaire and semistructured interviews.

Setting Safetxt trial participants were recruited from UK sexual health clinics.

Participants Trial inclusion criteria: people aged 16–24 diagnosed with or treated for chlamydia, gonorrhoea or non-specific urethritis. Optional open feedback provided by 3526 of 6248 safetxt participants at 12 months and interviews with a purposive sample of 18 participants after the trial.

Results We summarise and report results in seven broad themes. According to recipients, the safetxt intervention increased awareness of the importance of avoiding STIs and ways to prevent them. Participants reported improved confidence, agency, sexual well-being and communication about sexual health with partners, friends and family. Recipients attributed increased condom use, increased STI testing after (rather than before) sex with new partners, and more confident partner notification to the intervention. Recipients described a reduced sense of isolation and stigma in having an STI. Control group participants reported that having had an STI and receiving control texts asking them to report any changes in contact details acted as reminders to use condoms and get tested. We also summarise participant recommendations for future interventions and studies.

Conclusions While control group participants reported precautionary behaviours were 'triggered' by trial participation, intervention recipients reported additional benefits of the intervention in increasing precautionary behaviours and in broader aspects of sexual health such as confidence, communication, emotional well-being and agency.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Qualitative research has an important role in gaining greater in-depth insight and complementing data of randomised controlled trials, especially if there are unanticipated results, as in the case of the safetxt trial.
⇒ Two sexual and reproductive health researchers not involved in the design and implementation of the safetxt trial, independently analysed 3526 open feedback comments from trial participants and conducted 18 semistructured interviews.
⇒ Obtaining results from different sources, including qualitative data from the open feedback comments and interviews reported here, in addition to the quantitative trial data allowed for triangulation of results.
⇒ Limitations are that many of these optional open feedback comments were only brief, and that we had to end the interview study slightly earlier due to the COVID-19 pandemic.

Trial registration ISRCTN registry ISRCTN64390461.

INTRODUCTION

Sexual and reproductive health is defined by WHO as 'a state of physical, emotional, mental and social well-being in relation to all aspects of sexuality and reproduction, not merely absence of disease, dysfunction or infirmity'.[1] In terms of sexually transmitted infections (STIs), younger people aged 16–24 bear the heaviest burden of chlamydia and gonorrhoea with long-term adverse health effects including ectopic pregnancy and subfertility.[2–4] Inequalities in sexual health persist; STIs are positively associated with lower educational levels and living in more deprived areas.[2 5–7] High STI rates among young people also reflect broader aspects of poor sexual health, such as lack of

knowledge, skills or confidence in how to carry out safer sex behaviours and how to communicate with partners about sex and desired precautions.[8]

We developed the safetxt intervention delivered by text message to reduce STI infection by increasing condom use, partner notification and STI testing before sex with new partners.[9] The intervention development was informed by behaviour change theory,[9] including the 'capability, opportunity and motivation model of behaviour' (COM).[10] This model is incorporated into the comprehensive 'behaviour change wheel' model, which aims to capture the full range of intervention functions involved in behaviour change; these include education, persuasion, environmental restructuring (encouraging people to change their environment to support the behaviour), training and enablement. Each intervention function can be implemented by a wide range of evidence-based behaviour change techniques.[11] In the case of sexual behaviour, knowledge, skills, beliefs, self-efficacy, and social and interpersonal influences have important effects on COM.[8 12] Our intervention aimed to influence these factors to reduce sexual risk behaviour and encourage STI preventive behaviour.

The intervention text messages were developed based on the content of effective face-to-face safer sex interventions targeting condom use,[13–15] the factors known to influence safer sex behaviours[16] and the views of over 200 people aged 16–24 collected in focus groups, a questionnaire and qualitative interviews.[9] The latter included telephone interviews conducted with 16 young people 2–3 weeks after enrolling in a feasibility trial in 2013.[17] The findings were used to adapt the intervention.

Intervention text messages were sent with decreasing frequency over the period of 12 months (online supplemental file 1).[18] Our randomised controlled trial to establish the effects of the intervention on STI, condom use, partner notification and STI testing before sex with new partners was conducted among 6250 people aged 16–24 diagnosed at UK sexual health clinics with chlamydia, gonorrhoea or non-specific urethritis.[19 20] Control group participants received a monthly untailored text message asking for information about changes in postal or email addresses. The safetxt intervention did not reduce STIs, there were slightly more infections in the intervention group with 22.2% (693/3123) versus 20.3% (633/3125) in the control group (OR 1.13, 95% CI 0.98 to 1.31).[19 20] There were some increases in self-reported precautionary behaviours such as condom use at last sex, OR 1.14, 95% CI 1.01 to 1.28.[19 20] Although our intervention did not target sexual partnerships, we assessed at 1-year follow-up the proportion of people who had two or more partners since joining the trial and found that it was slightly higher in the intervention vs control group (56.9% vs 54.8%, OR 1.11, 95% CI 1.00 to 1.24). This result, however, was not statistically significant (p=0.06) but could have contributed to the unexpected trial outcome. Other quantitative results, including on intermediate outcomes, did not clarify either, why a statistically significant effect was shown for the condom use outcome, but not for the biologic trial outcome.[19 20]

To shed further light on this, we analysed and triangulated qualitative data from two sources, including open feedback from the last follow-up questionnaires at the end of the trial (at 12 months)[20] and semistructured interviews conducted after 12 months. In this paper, we present and discuss qualitative data on participant perceptions of the safetxt intervention and of 12 months trial participation with a view to exploring for whom, how and why the intervention worked or not and what improvements could be made in the future.

METHODS

We conducted qualitative research (as part of a mixed-methods approach integrated through an advanced intervention framework with embedded methods and narrative staged reporting[21]) including the analysis of open feedback comments collected in the 12-month questionnaire[20] of the safetxt trial and semistructured qualitative interviews with participants after completing their involvement in the trial. The research team members are mixed-methods researchers within the areas of sexual and reproductive health. During the research, we followed a 'critical realist' (CR) paradigm,[22 23] as in terms of ontology, epistemology and methodology we position ourselves in the middle of a continuum between positivism, naïve realism and objectivism[23–25] on the one hand and interpretivism, relativism and constructionism[23 24] on the other. According to CR, there is a reality that exists independent of our thoughts about it, and while we can become more confident about what exists by observing, existence itself is not dependent on observation. CR also sees the social world as layered, complex and an open system and characterised by change. CRs often try to answer the question 'what works for whom, when and why?' and are typically pragmatic in their approach to methodology and methods.[23 26]

Below, we provide details on the two data sources used for our qualitative analysis.

Data source 1: free-text comments

The final page of the 12-month questionnaire given to all trial participants (who had provided written informed consent on enrolment) included an open-ended question: 'Did anything good or bad happen as a result of being involved in the study or receiving the text messages? Please describe'. This question was followed by a blank space that participants had the option of completing themselves.

Two researchers (AG and SB), who had not been involved in the design, implementation and quantitative evaluation of the intervention, independently coded the free-text comments and categorised data by theme, using Excel 2019 and NVivo v.12 respectively. AG and SB initially took a purposive sample of 12% (n=390) of free-text comments. They ensured that participants from

different gender and sexuality groups were represented (by adding random samples of comments from each group) and included all comments from participants reporting that someone else had read their messages or reporting partner violence. This was to ensure that the feedback from participants who might have experienced unforeseen intervention side effects was coded in detail. AG and SB then independently coded these comments inductively line-by-line, considering all content (almost all of it was relevant to our research question). They then collated codes into potential themes and compared these to check for consistency of analysis and to reduce the risk of imposing own assumptions and predefined theories onto participants' narratives. Subsequently, AG and SB independently analysed all remaining free-text comments, thereby adding newly generated themes, reviewing and naming themes. AG and SB then compared their findings again (which were consistent) and discussed them within the team. The findings were compared with data from the semi-structured interviews (data source 2).

Data source 2: semistructured interviews

We purposively recruited from safetxt participants based on trial allocation and sociodemographic characteristics (age, sexuality, ethnicity, index of multiple deprivation) to encompass a variety of experiences. Eligible were participants who indicated during trial follow-up that they agreed to be contacted for further research. We sent text messages about the interview study to those who had recently (<6 months) completed trial follow-up. AG and SB then approached and provided verbal and written information to those who were interested in the study.

After receiving written informed consent, SB and AG conducted interviews by video conferencing (including Teams, Zoom or WhatsApp) or telephone. We initially focused on the recruitment of intervention participants and found that after 14 interviews data saturation for key themes relevant to our research question regarding the intervention had been reached (based on reflective notes, concurrent data analysis, triangulation with results of open feedback analysis and team discussions). After completing four interviews with control group participants, we had to stop study activities due to the COVID-19 pandemic and related personal circumstances and were unable to resume the work at a later stage as funding could not be extended.

Interviews lasted between 30 and 90 min (average about 60 min). The interviewers (AG and SB, both female) introduced themselves as public health researchers who had not been involved in the design of the safetxt trial. Both kept reflective journals throughout the research process and engaged in self-reflexivity not only during interviews, but also during analysis to recognise and avoid imposing own assumptions and predefined theories onto participants' narratives.

The interviews followed a semistructured topic guide, which aimed to explore participants' experiences regarding trial participation, whether or not they had been able to carry out the behaviours targeted by the intervention, and (for those from the intervention group) the intervention and how and why the messages did or did not help. We first explored which intervention messages participants recalled without being prompted. We then showed, sent or read to participants some of the messages and asked which, if any, they found particularly helpful or not. We also asked participants to make suggestions for improvements of the interventions. (Topic guides and example intervention messages in online supplemental file 2). New topics not included in the guide were further explored during subsequent interviews. These topics and summaries of reflective field notes were also discussed with RF and/or CF during team meetings.

After completing the interviews, participants were offered a £20 voucher as a thank you for their time.

Analysis

Interviews were audiorecorded, transcribed verbatim by a professional transcription service (bound to a confidentiality agreement), and reviewed for anonymity and accuracy of transcription by SB and AG, while listening to the audiorecordings. This was also part of the first step of the thematic analysis approach that we used, including (1) familiarising ourselves with the data, (2) generating initial codes, (3) searching for themes, (4) defining and naming themes and (5) producing the report.[27] This process was iterative as analyses were conducted alongside data collection. During the early stages, SB and AG first independently developed thematic codes from the same four interview transcripts, two of which were also coded by RF, to ensure consistency of coding. Thereafter, SB and AG independently coded their interview transcripts and categorised data by theme using NVivo v.12 and Microsoft Word 2019, respectively. At the later stages of thematic analysis, Microsoft Word 2019 was used to integrate and triangulate themes developed by both researchers from both data sources, based on comparisons and team discussions. During analysis meetings with the research team, results from open feedback comments (source 1) and interviews (source 2) were triangulated with quantitative trial data (including primary, secondary and intermediate outcomes)[19 20] and data from telephone interviews conducted as part of the 2013 feasibility trial 2–3 weeks after starting messages[17] looking for consistencies and inconsistencies across the different data sources and searching for deviant cases.

Patient and public involvement

Patients and members of the public were involved in all phases of the safetxt intervention development and trial, including part of the qualitative components of the safetxt evaluation reported here. Prior to development of the safetxt intervention, possible safer sex interventions were discussed with young people in five discussion groups (25 participants). Subsequently, patients who participated in formal focus group discussions, helped to design the content of the intervention,[9] and a

patient representative was included in the trial steering committee. In addition, 14 patient representatives from the King's College Hospital Sexual and Reproductive Health user group helped design the patient information, consent and follow-up procedures and all trial questionnaires, including the open feedback question. Due to time restrictions, we did not seek help from patients for the design and pilot-testing of the interview topic guides, but instead gained input from four young colleagues. After the interviews, most participants indicated that they would be happy to help with the dissemination of results once published.

RESULTS

Fifty-six per cent (n=3526/6248, intervention: n=1745, control: n=1781) of participants provided comments in the open feedback section of the 12-month questionnaire, 72% of those who completed a 12-month questionnaire (table 1). Participants across all sociodemographic backgrounds provided open feedback comments, and the characteristics of respondents were similar to the characteristics of safetxt trial participants.[19]

About 27% (intervention: 24%, control: 29%) of those who provided open feedback on whether anything good or bad had happened (see the Methods section for exact question) merely stated 'no', 'n/a', 'don't know', 'nothing', 'neutral', 'no difference' or a brief statement saying either they were unsure or did not notice any change as a result of participating in the study, for example, 'I carried on as usual, nothing good or bad happened'. A further 3% of comments from control group participants merely stated that they were in the control group or did not receive any intervention messages or similar. The remaining free text comments (intervention: 76%, control: 70%) provided another free text response (beyond the aforementioned statements) that was generally mostly only a few sentences long, with some participants providing longer feedback (8% of intervention and 5% of control group comments were >50 words long).

We completed 18 interviews between February and May 2020. Respondent characteristics are in table 2. Open feedback was overwhelmingly positive both about the intervention text messages and being in the trial. Many intervention and control group participants commented on the usefulness and convenience of having an STI test kit sent to their home for primary outcome assessment. Intervention group participants commented positively on the tone of the intervention text messages finding them friendly, reassuring, helpful and written in a non-judgmental manner. Participants also found that mobile phone delivery was a trusted, appropriate and convenient way to access information. Conversely, a few people in open feedback had concerns about keeping their messages private or reported that messages were annoying and many in both, the intervention and control arm, indicated that there was no change and nothing good or bad had happened as a result of being in the study.

Findings from open feedback and the interviews were consistent, but interviews allowed to gain greater insight into themes that had had been generated during analysis of open feedback comments. Results from both sources are summarised by major theme below with example quotes provided in box 1 (intervention group) and box 2 (control group).

Knowledge and awareness of safer sex

Intervention group participants reported the messages were 'clear', 'concise' and 'informative'. Participants reported impact on their general knowledge of practising safer sex including new ways to protect themselves, how STIs are contracted, the risks and consequences of unprotected sex and the need to go for regular testing. Some participants appreciated intervention messages as a 'proper' source of information with links to trustworthy internet sites that clarified which information from other less reliable sources was correct. A few participants in the open feedback reported messages only said things they already knew.

Many intervention participants, but also some control group participants, reported increased awareness of the importance of safer sex behaviours. Control group participants were 'indirectly' reminded of safer sex importance, because the regular texts reminded them their previous STI and/or because trial participation raised their awareness and motivation. This greater awareness reportedly influenced some intervention and control group participants in being more 'careful' in their choice of sexual partners and/or having less casual sex.

Confidence, agency, well-being and communication

Intervention group participants reported an increased confidence and agency in asserting their needs, for example, greater agency in only having sex when they wanted to. Some participants reported benefits in their sexual well-being such as, 'feeling positive' about their sex lives, respecting their body more or greater sexual pleasure through feeling more in control of their sex lives.

In both the intervention and control group, sexual health was reported to be a 'difficult' and a 'taboo' subject to talk about. Sharing intervention text messages with partners, friends, housemates and siblings was a catalyst for facilitating open and honest dialogues about sexual health and helped many participants feel less embarrassed raising the topic. Showing partners messages was also used to reinforce requests to use condoms. One person reported the intervention gave them the confidence to start a new relationship after their STI.

Changes in condom use

Many intervention, but also some control group respondents reported having been 'more cautious' after receiving messages and that texts were good reminders to use condoms. Several participants explicitly reported increased condom use especially with casual or new partners. Intervention group participants attributed this to increases in their

Table 1 Characteristics of open feedback respondents (N=3526)

	Intervention N=1745, n (%)	Control N=1781, n (%)	Total N=3526, n (%)
Age group			
16–19	649 (37.2)	635 (35.7)	1284 (36.4)
20–24	1096 (62.8)	1146 (64.4)	2242 (63.6)
Gender			
Female	1177 (67.5)	1176 (66.0)	2353 (66.7)
Male	561 (32.2)	600 (33.7)	1161 (32.9)
Non-binary gender	7 (0.4)	5 (0.3)	12 (0.3)
Ethnic group			
White British/other white background	1385 (79.4)	1398 (78.5)	2783 (78.9)
Black/black British—Caribbean/African/other	189 (10.8)	190 (10.7)	379 (10.8)
Asian/Asian British—Bangladeshi/Chinese/Indian/ Pakistani/other	53 (3.0)	56 (3.1)	109 (3.1)
Mixed background	93 (5.3)	116 (6.5)	209 (5.9)
Other background	25 (1.4)	21 (1.2)	46 (1.3)
Index of Multiple Deprivation (IMD) quintile*			
1 and 2—least deprived	577/1733 (33.3)	572/1772 (32.3)	1149/3505 (32.8)
3	333/1733 (19.2)	356/1772 (20.1)	689/3505 (19.7)
4 and 5—most deprived	823/1733 (47.5)	844/1772 (47.6)	1667/3505 (47.6)
Educational level†			
16 or under	230/1726 (13.3)	216/1755 (12.3)	446/3481 (12.8)
17 or over	741/1726 (42.9)	803/1755 (45.8)	1544/3481 (44.4)
I am still in full time education	755/1726 (43.7)	736/1755 (41.9)	1491/3481 (42.8)
Gender and orientation			
Women who have sex with men only	1089 (62.4)	1072 (60.2)	2161 (61.3)
Men who have sex with women only	396 (22.7)	403 (22.6)	799 (22.7)
Women who have sex with women only	13 (0.7)	11 (0.6)	24 (0.7)
Men who have sex with men only	137 (7.9)	156 (8.8)	293 (8.3)
Women who have sex with men and women	74 (4.2)	92 (5.2)	166 (4.7)
Men who have sex with women and men	28 (1.6)	41 (2.3)	69 (2.0)
Non-binary people who have sex with men only	5 (0.3)	1 (0.1)	6 (0.2)
Non-binary people who have sex with women only	0 (0)	2 (0.1)	2 (0.1)
Non-binary people who have sex with women and men	2 (0.1)	2 (0.1)	4 (0.1)
Not stated	1 (0.1)	1 (0.1)	2 (0.1)
Baseline diagnosis			
Chlamydia	1393 (79.8)	1394 (78.3)	2787 (79.0)
Gonorrhoea	160 (9.2)	185 (10.4)	345 (9.8)
Gonorrhoea and chlamydia	74 (4.2)	84 (4.7)	158 (4.5)
Gonorrhoea or NSU	14 (0.8)	20 (1.1)	34 (1.0)
NSU	63 (3.6)	61 (3.4)	124 (3.5)
Unknown	41 (2.4)	37 (2.1)	78 (2.2)

*Reduced denominator, as IMD quintile missing for some participants who provided an invalid postcode.
†Reduced denominator, as education information missing for some participants due to non-response.
NSU, non-specific urethritis.

Table 2 Characteristics of interviewees (N=18)

	Intervention N=14	Control N=4	Total N=18
Age group			
18–21	10	1	11
22–26	4	3	7
Gender			
Female	12	2	14
Male	2	2	4
Non-binary gender	0	0	0
Ethnic group			
White British	8	3	11
Other White background	0	1	1
Black/black British—African	2	0	2
Black/black British—Caribbean	2	0	2
Mixed background	2	0	2
Other background	0	0	0
Index of Multiple Deprivation (IMD) quintile			
1st—least deprived	2	0	2
2nd	0	0	0
3rd	3	1	4
4th	5	1	6
5th—most deprived	4	2	6
Gender and orientation			
Women who have sex with men only	9	2	11
Men who have sex with women only	1	1	2
Men who have sex with men only	1	1	2
Women who have sex with men and women*	3	0	3
Other	0	0	0

*One participant changed from WSM to WSMW during study period.

confidence and knowledge of how to stay protected from STIs as well as greater confidence in being able to bring up the topic of condom use. Practical tips, including to prevent condoms to break or slip off, had been particularly helpful. One participant, however, said it would be helpful to have more advice on what to do if a partner refuses to use a condom. Those who used condoms did not necessarily use them on every occasion. Reportedly, the messages also led some to encourage their peers to use protection.

Effects on partner notification

Participants in the intervention group commonly reported that the text messages enabled them to speak

Box 1 Intervention group extracts illustrating themes

Taking part in the study and general comments

'Sexual health is something we need to be talking to each other about…, I think this study needs to be a regular thing and be sent to everyone thank you so much for all your help :)' (23, WSM, OF)

Knowledge and awareness of safer sex

'I learnt a lot more about STI's etc which I didn't know beforehand.' (18, MSM, OF)

'It educated me on other things I wasn't aware of and it was very nice to know I had support on my phone.' (24, WSM, OF)

'All of the texts were really useful, most of it was stuff I didn't know already(…)I think having the STI has made me a bit paranoid and the study's made me a bit more aware of what I can do to avoid getting them again.' (21, WSM, I)

Confidence, agency, well-being and communication

'It was helpful, made me rethink how important safe sex is. How much risk we put ourselves in, as well as difficult situations. I put my health first rather than pleasing others or being irresponsible. You enjoy it more when you control the controllable and prevent any problems for the future.' (23, WSM, OF)

'In regards to new partners, I felt more confident in asking them about their sexual health, which in turn helped me.' (19, MSW, OF)

'Making sure you know your rights and like. making sure that you agreed to it, not like where like it's fun and games and that and then they come onto you, like you have to say yes.' (21, WSM, I)

'Spoken about it when I was at uni whenever I got a text with my housemates. It has also made me speak more openly about it with my current partner - as like an ice-breaker.' (20, WSM, OF)

'I feel positive about my life and my sex life.' (17, WSM, OF)

'My attitude towards sexual health changed to the better… I respect my body more.' (21, WSM, OF)

'Since the study I've been more aware of being safe especially with new partners and being fully open with them about the topic instead of being shy/embarrassed. It's normalised the idea of being open with talking about safe sex.' (20, WSM, OF)

'The study has made more aware of being safe when having sex. The texts were friendly and comforting. The study gave me the confidence to engage in a new sexual relationship with a new partner without worrying about unwanted consequences.' (17, WSM, OF)

Change in condom use

'I think the main thing I do now differently is I definitely check them a lot more before I use them… my boyfriend… he just wants to get it done but I just say, 'No, I want to check them,' so I will, I'll check the tip, I'll check the packaging to make sure there's no holes in it, there's no tears…' (18, WSM, I).

'My partner asked if we can ditch the condom, but I didn't know how to say to him I don't want to. So I just nonchalantly showed him the message, pretending I just got a message and the message happened to be about condoms.' (22, WSM, OF)

'The texts were a reminder to take better care of myself, something to refer to if I felt reckless. Whilst having sexual contact with someone they slipped their penis inside me for a few seconds without a condom+I made him stop due to the risks whereas previously I wouldn't have objected.' (23, WSM, OF)

'Although I, myself did not use protection due to only being with my long term partner. This study has helped me pass on vital info to my friends to make sure they stay safe when sleeping with multiple people.' (18, WSM, OF)

Continued

Box 1 Continued

'I now have regular texts and have only not had sexual intercourse without a condom once, which was as a result of me and my partner both having alcohol. (21, WSM, OF)
'No, not much has changed in regards to me because I like to, I consider myself quite a safe person so I do wear protection where I can.' (26, MSM, I)
'I have been better at using a condom—but this may be just because of getting chlamydia last year, not because of the texts.' (18, WSM, intervention, OF)
'I look back now and I realise that it definitely was a form of definitely like some sort of self-harming, of like I was just, the only way, you know, I'd have (unprotected) sex with so many people, to make myself feel bad about myself almost.(…)I just didn't really care, I had no self-respect, I didn't really care about myself, my body really, … so I think the study definitely made me realise that' (23, WSM, I)

Effects on partner notification

'I think I would have gone a very different way about doing it (notifying partner), I think I would have sort of hid it away and taken, it would have taken me a lot longer to do it because I would have been embarrassed, but the text messages, like I said, they really do make you realise that you're not the only one in this situation, so…' (18, WSM, I)
'I think there was one ….that made me realise that actually it's normal to not want to tell someone, and it's normal to feel really uncomfortable about it, but actually I need to tell them, and(…)the texts inspired me to reach out to my friends, and then my friends help me create a message that I then sent to people, so yeah.' (23, WSM, I)
'The text study was really helpful and insightful it helped me to be able to tell my sexual partner that I had been given a positive result for chlamydia and it helped me understand how to speak to him and tell him.' (23, WSM, intervention, OF)
'I think where it gives examples of how to tell, I think that helps, because … you don't really know how to put it, or how to start it, … a lot of people are actually quite embarrassed or they're scared of what the other person might say or they just don't know what to say so some people actually leave it, which is how other people get infected' (20, WSM, I)
'I remember thinking like 'oh this is so annoying that I got it now and not like on the day when I actually had to like tell them'.(…)Because I was thinking 'oh I've really like gone through all that like internal stress of being like how do I tell him?' and all that stuff like before and like telling him and then getting the text after.'(25, WSM, I)

Increased STI testing

'I'd say the text messages made me get checked more often but I would have got checked anyway, but probably not as much as I did without the text messages. (21, WSMW, I)
'I got tested sooner after having had unprotected sex than I probably would have done had I not received a safer sex message text.' (21, WSM, OF)

'…the texts definitely were probably part of it, but I think just sort of the maturity side of it, and sort of getting in a better frame of mind where I could ask somebody, after I had sex with them, when were you last tested, because I really didn't want to get it again.' (21, WSM, I)

Reduction of isolation and stigma

'…very helpful to feel less like you were the only one.' (21, MSW, OF)
'it was just reassuring to know that it wasn't just me getting them…' (21, WSM, I)

Continued

Box 1 Continued

'I think having regular texts written in the way that they were, it's really sort of like reassuring that you're not alone.(…)I'm not ashamed of my sexual health anymore, I don't think, I think before I was, I sort of thought that STIs were something to be ashamed of, but now definitely I know that they are more common than I thought they were, and they can be treated, easier than I thought they could be as well.' (18, WSM, I)
'Good for reminding you to keep getting tested and removes the stigma.' (24, WSM, OF)
'Thanks to studies like these, there is less shame relating to STI testing so I received the help I needed to get right away.' (23 years, WSM, OF)
'…when you have that sort of thought at the back of your mind that it could go wrong, what if it does go wrong, I'm scared, it's, you feel sort of alone, but then with the text messages it really did help me sort of come out of that corner… I think it's … the way they were worded, it wasn't sort of, they weren't ordering me to do anything, they weren't demanding us to do anything, they were just suggesting, they were just informing, and I think that's a lot better than being sort of too firm with things.' (18, WSM, I).
'…the stigma is still very much there so it's so easy to feel like 'oh I'm the only one, I can't tell anyone, I don't want people to think… because it could be one time but people assume just you're very promiscuous to get an STI… So I think it's really good… it's not just the physical treatment of it in regards to your body but like the mental treatment of it. It's like it's a common bacterial infection, just saying the word common makes people feel less alone so it could help their emotional wellbeing as well.' (26, MSM, I)
Information in parenthesis: Age at interview or, in case of open feedback, age at enrolment, gender and sexual orientation, data source; I, interview; OF, open feedback.

more confidently (calmly and sooner) to their partners about their infection, impacting on how they told partners. Intervention content that chlamydia was common and easy to treat helped facilitate conversations with partners about infection. This content also reduced concerns about getting chlamydia. There were reports that the messages motivated some participants to tell partners. Some stated that the text message examples they received arrived after they had notified partners, and regretted that they had not received them earlier. Some reported only learning from the messages that the clinic could have informed their partner. Two comments referred to unknown partner contact details.

Increased STI testing

Participants from both groups reported they sought further STI testing as a result of being in the study. Messages made some participants feel it was 'Ok to get tested' and directly or indirectly reminded intervention and control group participants to test or test more frequently than they normally would have. Participants reported going for testing *after* having sex with a new partner (none mentioned testing *before* first sex).

A few intervention participants reported frequent STI testing rather than condom use as a way of managing STI risk and to 'keep track of partners'.

Box 2 Control group extracts illustrating perceived impact of having a sexually transmitted infection and trial participation

'I'm very happy to have participated and hope that you get some conclusive results.' (24, MSM, OF)
'I have been a lot more insistent of using condoms during sex. This could have been due to contracting chlamydia last summer which was treated and not wanting to get it again. I was part of the placebo group in the study but still got a text every month or so to keep my details updated. This made me thought of the study so could have reminded me anyway.' (21, WSM, OF)
'I guess I've been more inclined to use condoms and have less unprotected sex as a screening was always in the back of my mind.' (24, MSM, OF)
'Made me more aware of my sexual health by receiving the texts, it was almost like a reminder as sometimes sexual health can be at the back of your mind whereas when receiving the texts it was like a reminder and kept it at the forefront of your mind' (18, WSM, OF)
'…receiving these texts made me feel good about taking steps towards being more aware and a part of something bigger that helped me be a better adult (18, MSM, OF)
'I didn't receive many messages. However, I became more conscious of my sexual health. I take precautions when I remember although, I haven't always used anything. I have been more conscious of sleeping with new people I don't know that well and have avoided this. (19, WSM, OF)
'I was sort of more wary about who I slept with, it's like I didn't sleep with as many people that I was before, I don't know if that was just because of my age or if… I don't know.(…) Like I went through a bit of a rough patch when I was younger and I feel like that sort of did include sleeping around a bit more and then I came out of it(…) and I was more like, I didn't want to just sleep with anyone, I was sort of more picky.(…) I feel like it did play a little role [*joining the study*), like agreeing to be part of the safetxt I think was like a turning point as well in its own right. (21, WSM, I)
'Through the whole process of being diagnosed with an STI has made me consider my life choices. … I am reluctant to have a 'one-night stand' as I have previously experienced the consequences of unprotected sex with unfamiliar people. Overall, I have thought more about my actions, not so much as a result of the texts I receive, but instead because of what has happened with my health.' (19, MSW, OF)
'I was made far more aware of how unsafe I was being, when in the past I would make more decisions in the moment which were unsafe and unthoughtful about the consequences. Having regular texts made me far more conscious about safe sex—it was a great reminder; as it is easy to forget.' (19, WSM, OF)
'… I was in the group that didn't receive texts about safe sex, however just being involved in the study and completing the questionnaires gave me a greater awareness of the benefits of practicing safe sex even after the shock from my initial diagnosis wore off… (18, WSM, OF)
'Made me more cautious of who to sleep with. Due to constant reminders.' (19, MSW, OF)
'The only kind of messages I was receiving were the ones about confirming my address and contact information. In spite of that, I was still more aware to be cautious and ask people if they were getting tested etc.' (19, MSM, OF)
'Has made me think to not have unprotected sex with a new person. I also feel happier…not having to feel embarrassed if I did have an STI.' (18, MSW, OF)
'If I hadn't been part of the study I would not think to get tested as often…. or think to ask about whether my partner has been tested recently.' (22, WSM, OF)
'I felt that having the message helped in reminding me to continue having tests at the clinic when & if needed.' (19, MSWM, OF)
'It made me feel like I was not alone with getting an STI.' (19, WSMW, OF)
'Receiving the text messages could be upsetting as they would remind me of the shame and stigma of contracting an STI.… Being part of the study made me feel less alone but it didn't make me feel less ashamed. It would have been good to have received texts with support or info…' (24, WSM, OF)
Information in parenthesis: Age at interview or, in case of open feedback, age at enrolment, gender and sexual orientation, data source; I, interview; OF, open feedback.

For some participants, the STI home testing kit was perceived as a central positive aspect of the study, and knowing that another 'screening' test would be done made one control group participant 'more inclined to use condoms'.

Reduction of isolation and stigma

Many intervention participants said that taking part in the study reassured them and reduced their feeling of being 'the only one', a common feeling after being diagnosed with an STI. Participants frequently commented on the reduction of 'stigma', 'shame' and feeling 'less embarrassed' about having had an STI which was perceived to be reassuring and to have benefits for emotional and mental well-being. In addition, learning that STIs could be easily treated reportedly reassured participants. Some control group participants also noted feeling 'less alone' as they 'belonged to a group of people that have had chlamydia or gonorrhoea', and one reported that being in the study reduced their embarrassment about having an STI. Another control group participant, however, emphasised that the study made her 'feel less alone', but not 'feel less ashamed' and she would have liked to be in the group that received texts with support and information.

STI diagnosis and trial participation effects

Some participants from both groups reported that changes in their behaviour were a consequence of having an STI rather than receiving intervention messages. Additionally, in open feedback many in the control group commented that participating in the study enabled them to make a commitment to changing their behaviour, and a few said that it prompted them to seek help, for example, about abusive relationships. As mentioned in the relevant sections above, the control group texts simply about trial participation had reminded many to adopt precautions such as using condoms, STI testing and asking partners about their last test for STIs.

A few participants mentioned that they joined safetxt when they had been at a 'turning point', and would have

changed their behaviour anyway, but appreciated the safetxt support during this time of change. One control group participant, who had reportedly meanwhile changed due to the STI and becoming more mature, thought that safetxt support if targeted at younger people could help them avoid having to go through the same 'quite big stressful event' of having an STI.

Recommendations for future interventions

Recipients felt the intervention was especially helpful for younger people such as late secondary school/first year post school (online supplemental file 3). Many interview participants and free-text comments reported that not enough was taught in schools and the texts were much more useful than what they were taught at school. Participants mentioned additional topics that would be helpful to include, such as peer pressure to have sex, further content on dealing with people who do not want to use protection, and pleasurable aspects of condom use; a few women who have sex with men and women requested more information on safer sex between women and two men who have sex with men (MSM) wanted the intervention to cover 'chem sex' (stimulant enhanced and prolonged 'no-strings' sexual sessions between MSM connecting through apps[28]).

A few participants suggested further personalisation of safetxt messages and an option to choose from a wider range of topics from the outset (in addition to the 'text 2 to hear more' option). Some requested better mental health support to explore why people have unprotected sex. Suggestions from participants for changes in the timing and frequency of messages often focused on having some form of control of message frequency, with some wanting less messages (especially at the beginning) and others more (especially towards the end).

Although many participants said that certain intervention message content would 'stick' with them, some would have liked to continue receiving texts, as they served as reminders.

DISCUSSION

According to recipients, the safetxt intervention increased awareness of the importance of avoiding STIs and related knowledge about ways to prevent them. Participants reported improved confidence, agency, sexual well-being and communication about sexual health with partners, friends and family members. They attributed to these improvements, increases in condom use, STI testing, more confident partner notification and (for a few) disclosure of diagnoses. There was a reduced sense of isolation, stigma, shame and embarrassment about having an STI which reportedly reassured some participants and improved their emotional well-being.

Participants from both the intervention and control group reported that having an STI influenced their safer sex behaviours. Control group participants reported that taking part in the study had influenced their commitment to safer sex behaviours. The control group text message about trial participation reminded many about the importance of safer sex and acted as a trigger for STI testing and condom use.

Our qualitative analyses of interviews and open feedback are mainly consistent with the trial results. However, recipients' reports suggest larger differences in behaviour than were demonstrated in the trials results. Possible reasons include social desirability bias, an incorrect attribution of changes in behaviour to the intervention rather than the experience of STI and a strong Hawthorne effect[29], including the trial participation messages sent to the control group reportedly acting as a prompt for safer sex behaviours.

Our findings suggest that young people felt positive impacts of the safetxt intervention on their sexual and reproductive well-being. These benefits include increase in confidence, agency, communication and precautionary behaviours.[1] The perceived value of safetxt from recipients' accounts accords with the trial results showing higher condom use at 12 months. The 'spill-over' effect resulting from participants reportedly encouraging their peers to use condoms, was not quantitatively assessed during the trial. Recipients accounts that the main perceived benefit of the intervention was in 'how' to tell partners rather than 'whether' to tell them about their STI accords with the only slightly higher levels of partner notification in the intervention group. The results are not in line with the public health impact of safetxt as the trial results found STIs were not reduced, with slightly more infections in the intervention group. The trial results suggested (although not statistically significant) that there were slightly more participants with two or more partners and a new partner in the intervention group compared with the control group during the course of the trial (altering partnerships was not an intervention aim). The findings from this study involving interviews and feedback obtained after the 12-month intervention of the safetxt trial were in keeping with the findings from telephone interviews conducted in 2013 during the intervention development 2–3 weeks after receiving the first messages, but included longer-term impacts.[17]

A strength of the interviews and the open feedback analysis was that it was conducted by two researchers not previously involved in the intervention development or trial.

We analysed all of the open feedback comments left by over 3500 trial participants (56% of participants who enrolled into the trial and 72% of those who completed the 12-month questionnaire). The experience of those not leaving a free-text comment may be different from those who did. However, the characteristics of respondents were similar to the characteristics of trial participants including those from diverse sociodemographic and ethnic groups. It is not possible to blind participants receiving a behavioural intervention, which could introduce bias when obtaining feedback. All open feedback comments were brief, optional and completed at the end

of their involvement in the trial, so it was not possible to explore participant views in depth or follow-up on feedback. During interviews, however, (and despite having to stop the interview study slightly earlier due to the COVID-19 pandemic), we were able to gain greater insight into themes that had been generated during analysis of open feedback comments.

Our qualitative analyses provide little direct evidence to explain the unanticipated quantitative trial findings, but raise some plausible explanations. Both qualitative analyses and quantitative analyses of intermediate and secondary trial outcomes showed increased correct condom use self-efficacy and increased condom use. This effect did not seem big enough to translate into reduced reinfection rates in the intervention group, given that those who reported increasingly using condoms did not necessarily use them on every occasion. In addition, a few intervention participants seemed to prefer a secondary prevention approach with frequent STI testing over a primary prevention approach with consistent condom use.

In both intervention and control groups, there were large reductions between baseline and follow-up in the number of partners in the preceding year, as would be expected if high-risk people were reverting to the norm. However, there was a marginally smaller reduction in the intervention group. Previous trials of group interventions targeting those at high risk for STI, have had unanticipated effects in normalising risk behaviours and increasing STI.[30]

The 'shock' of having had an STI and receiving control group messages reminding them of their STI might have deterred control group participants for a longer period from engaging in new relationships than intervention group participants. Some intervention recipients reported feeling less ashamed about their STI, generally more confident in discussing sexual health and/or reassured that their infection could be easily treated. Lower stigma about having an STI carried benefits in emotional well-being and reportedly gave a few the confidence to start a new relationship following their STI. While this was a positive outcome from recipient's perspectives, starting a new relationship confers some additional STI risk. Whether that risk is worth taking depends on what people are getting out of new relationships. Our analysis suggest intervention recipients were better equipped to get the sex they want (and to avoid the sex they do not want). The trial suggests that sex was no less a risk for STIs, but it may have had more value to them.

Our qualitative analysis also suggested that testing *after* sex with new partners was increased, but not *before* first sex. The safetxt trial indicator assessed STI testing 'prior' to first sex with new partners (showing no difference between groups), whereas the few previous mHealth trials we identified in a systematic review that showed an effect on STI/HIV-testing, only enquired about whether participants had an STI test within a specified time period.[31] Secondary analysis of the safetxt trial data looking at overall testing data in clinics (rather than self-reported tests 'prior' to first sex) is consistent with this with slightly higher clinic testing for STI in the intervention groups (1549/3123, 50%) vs the control group (1477/3125, 47%).

Conclusion

This research has described the perceived impacts of receiving the intervention and control group messages on participants. A randomised controlled trial was needed to identify slightly higher STI diagnoses in the intervention group. The qualitative findings and trial results both show that the components of the safetxt intervention promoting condom use were effective. Since this is a unique finding not seen in any previous similar mHealth interventions,[31] service providers could consider delivering this content. Further research could consider recipients recommendations for future interventions and explore how to achieve and measure positive impacts of reduced stigma about having an STI and increase sexual well-being as well as reduce subsequent STI.

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Patient consent for publication Not applicable.

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REFERENCES

1 WHO. Defining sexual health: report of a technical consultation on sexual health, 28–31 January 2002, Geneva. 2006. Available: https://www.who.int/reproductivehealth/publications/sexual_health/defining_sh/en
2 UK Health Security Agency. *Sexually transmitted infections and screening for chlamydia in England: 2022 report*. London, UK, 2023.
3 Cates W, Wasserheit JN. Genital Chlamydial infections: epidemiology and reproductive sequelae. *Am J Obstet Gynecol* 1991;164:1771–81.
4 Tanton C, Geary RS, Clifton S, *et al*. Sexual health clinic attendance and non-attendance in Britain: findings from the third national survey of sexual attitudes and lifestyles (Natsal-3). *Sex Transm Infect* 2018;94:268–76.
5 Hughes G, Nichols T, Peters L, *et al*. Repeat infection with Gonorrhoea in Sheffield, UK: predictable and preventable *Sex Transm Infect* 2013;89:38–44.
6 Sonnenberg P, Clifton S, Beddows S, *et al*. Prevalence, risk factors, and uptake of interventions for sexually transmitted infections in Britain: findings from the national surveys of sexual attitudes and lifestyles (Natsal). *The Lancet* 2013;382:1795–806.
7 Le POLAIN De WAROUX O, Harris RJ, Hughes G, *et al*. The epidemiology of Gonorrhoea in London: a Bayesian spatial Modelling approach. *Epidemiol Infect* 2014;142:211–20.
8 Marston C, King E. Factors that shape young people's sexual behaviour: a systematic review. *Lancet* 2006;368:1581–6.
9 Free C, McCarthy O, French RS, *et al*. Can text messages increase safer sex Behaviours in young people? intervention development and pilot randomised controlled trial. *Health Technol Assess* 2016;20:1–82.
10 Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for Characterising and designing behaviour change interventions. *Implement Sci* 2011;6:42.
11 Michie S, Richardson M, Johnston M, *et al*. The behavior change technique Taxonomy (V1) of 93 Hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Ann Behav Med* 2013;46:81–95.
12 Michie S, Johnston M, Abraham C, *et al*. Making psychological theory useful for implementing evidence based practice: a consensus approach. *Qual Saf Health Care* 2005;14:26–33.
13 DiClemente RJ, Wingood GM, Rose ES, *et al*. Efficacy of sexually transmitted disease/human immunodeficiency virus sexual risk-reduction intervention for African American adolescent females seeking sexual health services: a randomized controlled trial. *Arch Pediatr Adolesc Med* 2009;163:1112–21.
14 Jemmott JB, Jemmott LS, Braverman PK, *et al*. HIV/STD risk reduction interventions for African American and Latino adolescent girls at an adolescent medicine clinic: a randomized controlled trial. *Arch Pediatr Adolesc Med* 2005;159:440.
15 Shain RN, Piper JM, Newton ER, *et al*. A randomized, controlled trial of a behavioral intervention to prevent sexually transmitted disease among minority women. *N Engl J Med* 1999;340:93–100.
16 Free C, Roberts IG, Abramsky T, *et al*. A systematic review of randomised controlled trials of interventions promoting effective condom use. *J Epidemiol Community Health* 2011;65:100–10.
17 French RS, McCarthy O, Baraitser P, *et al*. Young people's views and experiences of a mobile phone Texting intervention to promote safer sex behavior. *JMIR Mhealth Uhealth* 2016;4:e26.
18 Free C, McCarthy OL, Palmer MJ, *et al*. Safetxt: a safer sex intervention delivered by mobile phone Messaging on sexually transmitted infections (STI) among young people in the UK - protocol for a randomised controlled trial. *BMJ Open* 2020;10:e031635.
19 Free C, Palmer MJ, McCarthy OL, *et al*. Effectiveness of a behavioural intervention delivered by text messages (Safetxt) on sexually transmitted Reinfections in people aged 16-24 years: randomised controlled trial. *BMJ* 2022;378:e070351.
20 Free C, Palmer MJ, Potter K, *et al*. Behavioural intervention to reduce sexually transmitted infections in people aged 16-24 years in the UK: the Safetxt RCT. *Public Health Res* 2023;11:1–96.
21 Fetters MD, Curry LA, Creswell JW. Achieving integration in mixed methods designs-principles and practices. *Health Serv Res* 2013;48:2134–56.
22 Bahaskar R. *A Realist Theory of Science*. London, UK: Routledge, Taylor & Francis e-Library, 2008.
23 Gilson L, Hanson K, Sheikh K, *et al*. Building the field of health policy and systems research: social science matters. *PLOS Med* 2011;8:e1001079.
24 Green J, Thorogood N. *Qualitative Methods for Health Research, 2nd edn*. London, UK: SAGE Publications Ltd, 2009.
25 Tashakkori A, Teddlie C. SAGE handbook of mixed methods in social & behavioral research. In: Tashakkori A, Teddlie C, eds. *Realism as a Stance for Mixed Methods Research in SAGE Handbook of Mixed Methods in Social & Behavioral Research*. 2455 Teller Road, Thousand Oaks California 91320 United States: SAGE Publications, 2010.
26 Sturgiss EA, Clark AM. Using critical realism in primary care research: an overview of methods. *Fam Pract* 2020;37:143–5.
27 Braun V, Clarke V. Using thematic analysis in psychology. *Qualit Res Psychol* 2006;3:77–101.
28 Bourne A, Reid D, Hickson F, *et al*. ""Chemsex" and harm reduction need among gay men in South London". *Int J Drug Policy* 2015;26:1171–6.
29 Parsons HM. What happened at Hawthorne?: new evidence suggests the Hawthorne effect resulted from operant reinforcement contingencies. *Science* 1974;183:922–32.
30 Imrie J, Stephenson JM, Cowan FM, *et al*. A cognitive behavioural intervention to reduce sexually transmitted infections among gay men: randomised trial. *BMJ* 2001;322:1451–6.
31 Berendes S, Gubijev A, McCarthy OL, *et al*. Sexual health interventions delivered to participants by mobile technology: a systematic review and meta-analysis of randomised controlled trials. *Sex Transm Infect* 2021;97:190–200.

Supplementary file 1 – Description of the Safetxt intervention and control group messages

The Safetxt intervention delivered in the Randomised Controlled Trial (RCT)

The intervention delivered in the RCT aimed to increase safer sex in three ways: i) encouraging participants to correctly follow STI treatment instructions including informing partner(s) about infection; ii) promoting condom use with new or casual partners; and iii) encouraging participants to obtain testing for STI prior to unprotected sex. Participants in the intervention group received regular messages delivered by text message in community settings according to a predetermined schedule[1].

Over the first ten days participants were sent messages targeting engagement with the intervention, taking treatment, avoiding sex for 7 days after treatment and telling partner(s) about an infection. These messages provided non-judgemental, non-stigmatising information about STIs. They provided suggestions about when, where, and how to tell partner(s) about an infection and examples of how others had told partners covering a range of different types of relationship (e.g. casual, long term).

Messages then targeted condom use and testing for STIs before having sex without a condom with a new partner. Topics covered risk assessment, instructions on how to use condoms, positive aspects of condom use, tips on preventing condom problems and examples of how others had resolved condom use problems. Participants were prompted to think about their own success in achieving safer sex strategies, risks they had taken and what they could do differently in the future. Messages included advice regarding testing before unprotected sex with a new partner. Participants were sent links to: support for those concerned about partner violence; and web-based information regarding contraception, alcohol and sexual risk, how to use a condom and general communication about sex. The messages provided social support for safer sex behaviours and acknowledge participants experiences.

The intervention employed educational, enabling and incentivising behaviour change functions and twelve behaviour change techniques: information about health consequences of behaviour; instruction on how to carry out the behaviour; demonstrations of risk reduction behaviour; social support; emotional support; social rewards; non-specific incentives; encouragement to add objects to the environment; anticipated regret; problem solving; action planning techniques; and reframing [2]. The information on safer sexual practices has been in accordance with existing guidelines[3].

The messages were tailored according to gender and sexual orientation. Women who have sex with men only (WSM), men who have sex with men only (MSM), men who have sex with men and women (MSMW), women who have sex with men and women (WSMW) were sent messages about how others had negotiated condom use. WSM, WSMW and men who have sex with women (MSW) were sent messages about emergency contraception. MSM and MSMW were sent messages about post exposure prophylaxis (PEP). Women who have sex with women only (WSW) were not sent messages about condom use. The information provided was specific to the STI diagnosed. This tailoring resulted in different numbers of messages being sent to those of different gender and sexual orientation.

The core message sets included: 42 messages for WSW and 74 messages for women who have sex with men or men and women; and; 69 messages for men who have sex with women, 76 for MSM

and 79 for men who have sex with men and women.). Recipients could request additional messages on specific topics. Participants were sent messages starting on the day of randomisation with: 4 messages per day for days 1-3, then 1-2 messages per day for days 4-28, then 2-3 messages per week for month 2, and 2-5 messages per month for months 3-12.

RCT control group messages

Participants in the control group received a monthly untailored text message asking for information about changes in postal or e-mail addresses, for example:

"Thank you for taking part in the texting study. Remember to let us know if your contact details have changed by replying to this text or emailing safetxt@lshtm.ac.uk."

References

1. Free C, McCarthy OL, Palmer MJ, et al. Safetxt: a safer sex intervention delivered by mobile phone messaging on sexually transmitted infections (STI) among young people in the UK - protocol for a randomised controlled trial. *BMJ Open* 2020;10(3):e031635. doi: 10.1136/bmjopen-2019-031635 [published Online First: 2020/03/11]
2. Michie S, Wood C, Johnston M, et al. Behaviour change techniques: the development and evaluation of a taxonomic method for reporting and describing behaviour change interventions. *Health Technology Assessment* 2015;19(99):1-188.
3. Clutterbuck DJ, Flowers P, Barber T, et al. UK National Guidelines on safer sex advice - The Clinical Effectiveness Group of the British Association for Sexual Health and HIV (BASHH) and the British HIV Association (BHIVA), July 2012. London: British Association for Sexual Health and HIV, 2012.

Supplementary file 2 – Topic guides and example Safetxt messages shown to interviewees who participated in the trial intervention group

Participant views evaluating the Safetxt intervention

Topic guide for interviews – intervention group

Introductions

Aim of today / What is this research for?

You were chosen to be interviewed as you took part in the Safetxt study and you kindly agreed to be contacted again by the research team. We are interested in your views of the text messages and whether you found them helpful or not.

Interview: Approximately 45 mins - 1 hour, £20 voucher as a thank you at end.

Confidentiality:

We will keep everything confidential unless you or someone else is in danger of harm (especially for under 18s).

We will not use your name in the report or in any other information that could identify you.

Other:

Ok to stop or take a break at any time. (If phone/Skype) If you have any privacy concerns you can end the phone call at any time and either call us back right away or another time.
You don't have to answer questions you don't want to answer. You can say you prefer not to answer to any question I ask.
There are no right or wrong answers, I am just interested in hearing about your experiences.
I have not been involved in designing this project in any way, so please feel free to be as critical and honest as you want to me.
Mobile on silent if possible.
Let us know if you want to speak about anything privately at the end.

CONSENT FORM + PIS – Sign, and keep information sheet

Any questions before starting?

Recording: Okay to tape record?

A. Participant views and experiences of the intervention

1. Understanding and overall experience of the intervention

Tell me about your overall experience of taking part in the Safetxt trial
Probe: Motivation/reasons to take part?

[If not already answered] Overall, what was it like taking part in this study?
-Probe: Positive, negative, useful, neutral etc. Can you tell me more about why you feel that?

What do you think the Safetxt study was for/ what was it trying to achieve (insight to participants' understanding of intervention)?
-Probe: What do you think the key messages are?

Who do you think the Safetxt study was for?
-Probe: Age, sexuality, relationship status, STI status.

Do you feel the messages applied to you?
-Probe: Check if messages apply to sexual orientation, relationship status, age.

-How did you feel when you received text messages?
-Probe: What was it like receiving the messages (positive/negative/neutral)? What did they make you think of?

Were there any good or bad things about taking part of the Safetxt study?
-Probe: Anything good/bad? Explain why?

Can you recall which text messages you found helpful/unhelpful and why?
-Probe: Can you give me examples? Can you tell me more about why you feel that? Any parts that are more essential than others? Any features you were unsure of?

Anything else to add?

B. Text messages about STI treatment, including 7-day abstinence

Did you get treated for an STI?

Do you remember what your treatment involved?
-Probe: Was this said at the clinic/pharmacy or did you remember from the text messages/did they help? Avoiding sex after treatment or not?

Did you take your treatment as you were instructed to?
-Probe: Why or why not?

People are often advised to not have sex for 7 days until the infection has cleared. How did you find that/ what did you think about that?

[if don't remember: check enrollment date _____– try to jog memory by reminding them their enrolment date and asking how they got their treatment (clinic/pharmacy etc)]

[if still don't remember: Don't worry, I understand it's been a long time, let's try a hypothetical scenario: Imagined you are diagnosed with an STI right now and you were told to not have sex for 7 days until the infection has cleared.]

Probe: What did you understand by that? (Interpretation of instructions/ Did they think it meant all types of sex, or only penetrative sex – explore)

Probe: Did this make sense to you? Did you think it was important or not? And why was it important or not? (e.g. not to infect others or not to get re-infected themselves)

Probe: What was it like to be told not to have sex after treatment (probe by clinician/or text)?

Probe: Did you find this to be doable?/ how doable was it?

Where there any challenges?/What were the challenges, if any to avoid sex for 7 days? OR (If did not abstain) May I ask the reason you did/did not avoid sex? (If not abstained) What were the challenges (if any) and would have helped?

[If did abstain] What strategies did you use to avoid sex?/ how did you manage to avoid sex?

(If not mentioned) Do you remember being advised to avoid sex for 7 days in the text messages?
-Probe: What did you think of this message? How was it phrased?
[show text messages if doesn't remember]

Can I ask what you thought of the information provided in the text messages about treatment?
-Probe: useful, vague, not useful features etc. Did anything put you off?
If not useful, what would have made it more useful to you (more detail on exact issue, alternatives, examples how others dealt with it etc.)

Do you think the text messages made any difference to whether or not you avoided sex for 7 days after treatment?
-Probe: Would you have done this anyway?

Would you change the content of any of the messages around STI treatment and avoiding sex after treatment?
-Probe: If yes, what would you change and why?

Anything else to add?

C. Text messages about telling partner

Can you remember being advised in the text messages to tell your partner(s) about your infection?

-Probe: What did you think of these message (show content here)? How did you find the advice on the messages? Any particularly helpful/unhelpful messages?

Did you tell your partner(s) about your infection?

Did you tell any current or past partners about your infection? Did you ask them to get tested?
- Probe: (If told partner(s)) Were you able to discuss sexual health testing with your partner(s)? If yes, what helped you achieve this?

(if told partner) Can you tell me about when you told your partner about your infection?
Probe: What were you feeling before, how did you feel after?

How useful have the text messages been, in terms of preparing you for telling partners about an infection?
-Probe: Useful, not useful, neutral. If useful, how did they help? Any barriers?

Do you think the text messages made any difference to whether or not you told your partner about your infection?
-Probe: Would you have done this anyway?

Would you change the content of any of the messages?
-Probe: If yes, what would you change and why?

Anything else to add?

D. Text messages about condom use

How easy or difficult did you find it to use a condom with a partner?
-Probe: Different situations, challenges, access to condoms, relationship status, overall consistency of use.

Did you learn anything new from the text messages about condoms?
-Probe: How did the messages help you understand the importance? Were you more likely to use condoms?

Have the text messages changed anything about your condom use?
-Probe: Were you more likely to remember them? Have they affected/changed your confidence in using condoms or not? If yes, which messages helped with this? How did they help?

(If not already answered) Do you think the text messages made any difference to whether or not you used condoms?
-Probe: Would you have done this anyway?

(If used condoms) Will you continue using condoms now that you no longer receive these text messages?
-Probe: Why or why not?

Did you share and discuss your messages with your partner(s)? What discussions did that lead to?
-Probe: Did it help you negotiate condom use?

Would you change the content of any of the messages?
-Probe: If yes, what would you change and why?

Anything else to add?

E. Text messages about STI testing

Have you gone for STI testing since joining the study? (exclude study self testing)
-Probe: Why or why not. Challenges, facilitators, clinic accessibility/opening hours, hassle, confidentiality.

If you have had any new partners since joining the study, did your partner get tested before beginning a sexual relationship?
-Probe: Challenges, facilitators, clinic accessibility/opening hours, hassle, confidentiality.

Have the text messages changed anything about your understanding of STI testing?
-Probe: Are you more likely to get an STI screening?

Have you discussed sexual health testing with a new partner? If yes, what helped you achieve this?
-Probe: Did your partner attend any sexual health screening? If yes, what helped you achieve this?

(If not already answered) Do you think the text messages made any difference to whether you went for STI testing or would you have done this anyway?

(If says more STI testing) Will you continue regular STI testing now that you no longer receive these text messages?
-Probe: Why or why not? (relationship status)

Would you change of any of the messages?
-Probe: If yes, what would you change and why?

Anything else to add?

F. Re-infection with an STI

Re-infection with an STI is very common. Since joining the study have you been re-infected with another STI?

If you don't mind me asking, do you think you know how you came to pick up STI? Explore.

If re-infected: Would you have wanted additional messages following re-infection? If so what kind of messages? Change frequent/timing of messages?

G. Testing kit

For you, what part did the home testing kit play in the study?

Would you have taken part in the study if we hadn't sent you a home STI testing kit?
Probe: Do you think this study needs to have a testing kit to work well or would it work just as well without the home testing kit? Do you think the testing kit was a valuable part of this study?

H. Did the text messages impact behavior, information/knowledge, attitudes, (understanding how the intervention produces change)

1. Changes in knowledge / prompting reflection

As a result of taking part in the study, have you learned anything new? (that you haven't mentioned already). Do you think this impact was short-lived or will it be sustained?
-Probe: More detail.

2. Changes in behavior

As a result of taking part in the study, has any aspect of your life changed (that you haven't mentioned already).
-Probe: Reduction of stigma, increased confidence, addressing fears, intention formation for partner notification and/or condom use.

As a result of taking part in the study, has any of your behavior changed?

Do you think this change was short-lived or will it last?

What do you think are the main reasons that encouraged you to make these changes?
-Probe: More detail and why.

How easy/difficult was it to adopt these changes?
-Probe: More detail. Barriers/challenges and facilitators/opportunities to behavior change. Access to condoms, clinic opening hours/appointments, confidentiality concerns, personal motivation, relationship changes, etc.

(If not already answered) Do you think the text messages made any difference to your behavior or would you have done this anyway?

(If the former) Would you continue these behaviours once you stop receiving these text messages?
-Probe: Why or why not? Explore: condoms use, STI testing, partner notification.

As a result of taking part in the study, have you experienced any other unexpected changes?
Probe: More detail. Other impacts? Adverse events?

I. Understanding engagement with the intervention

(If not yet told/ or ask in addition to the above) Did you discuss the content of the messages with anyone?
-Probe: Who with? Was this helpful or unhelpful? Did it make it easier/were you more open to discuss sexual health?

Did you ever look at any of the links of videos in the text messages?
-Probe: If so, which ones? Why or why not? Were they useful or not?

You had the option of texting a number to hear more about a particular message. Did you every make use of this option?
-Probe: If so, was it useful? Did you like having this option? Would you have liked more?

J. Text message delivery and timing

The text messages you received were initially sent more frequently and then became less frequent. What did you think of the timing of the text message?
-Probe: Did the timing of text messages make any difference to changing any aspect of your life? Days of the week and times during the day.

How would you prefer to receive the text messages?
-Probe: Timing of messages. Would you prefer to have some control over how often and when text messages are sent?

Did you opt for turning any text messages off?
-Probe: If yes, why? Did you turn them back on?

K. Future recommendations for the study

If we were to continue this text messaging study and make it available to others, who should it be available for?
-Probe: Any particular groups it would work well or not so well for? Age, relationships status, people with or without diagnosis of an STI

Would you add or change anything?
-Probe: (if not already covered) timing and frequency of messages, control over messages, opt out or opt in (or back in at a later date)?

Anything else?

Is there anything else you would like to say about the Safetxt study that I have not asked you?

End of interview:

Stop tape recording.

Thank participant. Ask if any questions?

Give participant voucher incentive.

Potential follow-up interview:

Your feedback today has been very helpful. We will soon have the results of the study. We may have additional questions in the future to help us understand the results. Would you be interested in a future chat to help us explain the results?

Dissemination:

Once we have finished the Safetxt study we would like to present our findings to everyone that has taken part. We are currently looking for participants to help us decide how best to communicate these findings. As always, your involvement would be completely anonymous and you can be as involved as you would like to be. This is something that you could add to your CV if you like, and we can help you with phrasing this in a way that is acceptable to you.

If this is something you might be interested in please let me know either now, or you can get in touch with me by text or email (give them a text and/or email).

Reflexivity:

Write up observational notes from the interview if they are relevant.

Example text messages (example for heterosexual or bisexual female participants) shown during interviews to participants who had been in the intervention group

Looking at these messages, were there any that were particularly helpful/ not helpful? Why?

Treatment and 7-days abstinence after treatment

1 You made the right decision to get a test. Getting treated quickly means you are less likely to have any problems.

1 To treat the infection, take the tablets and then don't have sex (oral, vaginal and anal) for 7 days while the infection clears.

2 It's common to get re-infected. To avoid getting another infection, the next steps are: 1) get treated 2) tell the person you're having sex with to get treated 3) don't have sex for 7 days (oral, vaginal or anal) after you and your partner(s) have been treated.

Telling partner (after initial diagnosis)

A) General

1 Most people who have an infection don't know. Your partner(s) could be infected so it's important to tell them that they need treatment too.

2 It's common to get re-infected. To avoid getting another infection tell the person you're having sex with to get treated…

B) Examples of how to tell a partner

2 There are lots of other ways of telling the person you are having sex with that they need treatment. Here are some examples of how some people started the conversation: "I said that if I didn't respect you I wouldn't be telling you this. It's awkward to tell people but it's not right not to, is it? They may not know. You can't just let them walk round with an infection."

2 "I just couldn't tell some partners so the clinic offered to do it for me. It was good because they kept my name out of it." **Text 17 to hear more.**

2 "I told them getting tested and treated is free, you won't need an examination."

Condom use

A) General

5 You can make sure you don't get another infection by using condoms every time you have sex…

8 Think back to a time (or times) when you had sex without a condom. Think about why you didn't use one. Ask yourself how you could you do things differently next time.

11 Having condoms with you makes it more likely you'll use one. Find a time to put a few in your purse. You could also keep a supply in places where you have sex (bedroom, partner's house, car).

12 If you want a quick refresher on the best way to put a condom on, check out this LINK.
https://www.brook.org.uk/your-life/condoms

B) Talking to a partner about condoms

40 When you just start seeing someone, it can be awkward to bring up condoms. Most people are happy to talk about condoms though.

40 More than likely they're thinking the same thing and will be relieved that you brought it up first. It can help to think about what you'll say beforehand.

STI testing

201 Regular check-ups & check-ups with new partners mean infections can be treated before they cause problems.

4 Here are how others felt when they found out that their test was positive: "I didn't know who to talk to at first so I just looked it up on the Internet. It was like the clinic told me- really common and easy to treat."

Talking about sex

75 Do you have difficulty talking about sex? Follow this link: LINK
http://www.nhs.uk/Livewell/Talkingaboutsex/Pages/Talkingtoyourpartner.aspx

Participant views evaluating the Safetxt intervention

Topic guide for interviews – control group

Introductions

Aim of today / What is this research for?

You where chosen to be interviewed as you took part in the Safetxt study and you kindly agreed. We are interested in your experiences of being in the study.

Interview: Approximately 30-40 min, £20 as a thank you at end.

Confidentiality:

We will keep everything confidential unless you or someone else is in danger of harm (especially for under 18s).

We will not use your name in the report or in any other information that could identify you.

Other:

Ok to stop or take a break at any time. (If phone/Skype) If you have any privacy concerns you can end the phone call at any time and either call us back right away or another time.
You don't have to answer questions you don't want to answer. You can say you prefer not to answer to any question I ask.
There are no right or wrong answers, I am just interested in hearing about your experiences.
I have not been involved in designing this project in any way, so please feel free to be as critical and honest as you want to me.
Mobile on silent if possible.
Let us know if you want to speak about anything privately at the end.

CONSENT FORM + PIS – Sign, and keep information sheet

Any questions before starting?

Recording: Okay to tape record?

A. Participant views and experiences of the intervention

2. Understanding and overall experience of the intervention

Tell me about your overall experience of taking part in the Safetxt trial
Probe: Motivation/reasons to take part?

[If not already answered] Overall, what was it like taking part in this study?
-Probe: Positive, negative, useful, neutral etc. Can you tell me more about why you feel that?

What do you think the Safetxt study was for/ what was it trying to achieve (insight to participants' understanding of intervention)?
-Probe: What do you think the key messages are?

Who do you think the Safetxt study was for?
-Probe: Age, sexuality, relationship status, STI status.

Before you started the study, were you told that you had an equal chance of getting assigned to one of two groups, either the so-called 'intervention group', where people got lots of text messages or the so-called 'control group', where people did not really receive many messages, other than from the questionnaires and the STI test kit at the end.

[If not already mentioned:] Do you know which group you were assigned to?
Probe:When/ at what point did you find out? How did you feel when you found out?

Did you receive any text messages at all?
If so: Probe: How did you feel when you received these text messages? What was it like receiving the messages (positive/negative/neutral)? What did they make you think of?

Were there any good or bad things about taking part of the Safetxt study?
-Probe: Anything good/bad? Explain why?

Has eanyone you know also signed up for the Safetxt study?
[If so: Do you know whether they were assigned to the text message intervention group or the no text message control group? probe for contamination.]

Did you tell anyone that you were in the study?
Probe: Partners, family, friends. If told partner(s), do you think that this changed anything about your sexual behavior? Probe: safer sex behavior, STI testing, etc.

Anything else to add?

B. Text messages about STI treatment, including 7-day abstinence

Did you get treated for an STI?

Do you remember what your treatment involved?
-Probe: Was this said at the clinic/pharmacy? Avoiding sex after treatment or not?

Did you take your treatment as you were instructed to?
-Probe: Why or why not?

People are often advised to not have sex for 7 days until the infection has cleared. How did you find that/ what did you think about that?

> [if don't remember: check enrollment date _____– try to jog memory by reminding them their enrolment date and asking how they got their treatment (clinic/pharmacy etc)]
>
> [if still don't remember: Don't worry, I understand it's been a long time, let's try a hypothetical scenario: Imagine you are diagnosed with an STI right now and you were told to not have sex for 7 days until the infection has cleared.]

Probe: What did you understand by that? (Interpretation of instructions/ Did they think it meant all types of sex, or only penetrative sex – explore)

Probe: Did this make sense to you? Did you think it was important or not? And why was it important or not? (e.g. not to infect others or not to get re-infected themselves)

Probe: What was it like to be told not to have sex after treatment (probe by clinician/or text)?

Probe: Did you find this to be doable?/ how doable was it?

Where there any challenges?/What were the challenges, if any to avoid sex for 7 days? OR (If did not abstain) May I ask the reason you did/did not avoid sex? (If not abstained) What were the challenges (if any) and would have helped?

[If did abstain] What strategies did you use to avoid sex?/ how did you manage to avoid sex?

Do you think that the fact that you were in the study (even if you were in the control group only) made any difference to whether or not you avoided sex for 7 days after treatment?
-Probe: Would you have done this anyway?

Anything else to add?

C. Telling partner

Can you remember being advised to tell your partner(s) about your infection?
-Probe: By whom? How did you find the advice?

Did you tell any current or past partners about your infection? Did you ask them to get tested?
- Probe: (If told partner(s)) Were you able to discuss sexual health testing with your partner(s)? If yes, what helped you achieve this?

(if told partner) Can you tell me about when you told your partner about your infection?
Probe: What were you feeling before, how did you feel after?

Do you think that the fact that you were in the study made any difference to whether or not you told your partner about your infection?
-Probe: Would you have done this anyway?

Anything else to add?

D. Condom use

How easy or difficult did you find it to use a condom with a partner?
-Probe: Different situations, challenges, access to condoms, relationship status, overall consistency of use.

Do you think that the fact that you were in the study made any difference to whether or not you used condoms?
-Probe: Would you have done this anyway (especially following STI diagnosis)?

(If used condoms) Will you continue using condoms now that you are no longer participating in the study?
-Probe: Why or why not?

Anything else to add?

E. Text messages about STI testing

Have you gone for STI testing since joining the study? (exclude study self testing)
-Probe: Why or why not. Challenges, facilitators, clinic accessibility/opening hours, hassle, confidentiality.

If you have had any new partners since joining the study, did your partner get tested before beginning a sexual relationship?
-Probe: Challenges, facilitators, clinic accessibility/opening hours, hassle, confidentiality.

Have you discussed sexual health testing with a new partner? If yes, what helped you achieve this?
-Probe: Did your partner attend any sexual health screening? If yes, what helped you achieve this?

Do you think the fact that you were in the study made any difference to whether you went for STI testing or would you have done this anyway?

(If says more STI testing) Will you continue regular STI testing now that you are no longer in the study?
-Probe: Why or why not? (relationship status)

Anything else to add?

F. Re-infection with an STI

Re-infection with an STI is very common. Since joining the study have you been re-infected with another STI?

If you don't mind me asking, do you think you know how you came to pick up STI? Explore.

(If re-infected) Would you have liked to get more support following re-infection? If so what kind of support and from whom?

I. STI testing kit

How did you find getting a home STI testing kit in the study?

Would you have taken part in the study if we hadn't sent you a home testing kit?

Probe: Do you think the testing kit was a valuable part of this study?

Did knowing you were going to receive a testing kit influence your behavior in any way?

F. Behavior, information/knowledge, attitudes, (understanding whether/how being in study produced change)

3. Changes in knowledge / prompting reflection

Since taking part in the study, have you learned anything new from anywhere? -Probe: More detail.
-Probe: More detail.

4. Changes in behavior

As a result of taking part in the study, has any aspect of your life changed (that you haven't mentioned already).
-Probe: Reduction of stigma, increased confidence, addressing fears, intention formation for partner notification and/or condom use.

As a result of taking part in the study, has any of your behavior changed?

Do you think this change was short-lived or will it last?

What do you think are the main reasons that encouraged you to make these changes?
-Probe: More detail and why.

How easy/difficult was it to adopt these changes?
-Probe: More detail. Barriers/challenges and facilitators/opportunities to behavior change. Access to condoms, clinic opening hours/appointments, confidentiality concerns, personal motivation, relationship changes, etc.

Do you continue these behaviours even now that the study has ended?
-Probe: Why or why not? Explore: condom use, STI testing, partner notification.

As a result of taking part in the study, have you experienced any other unexpected changes?
Probe: More detail. Other impacts? Adverse events?

Anything else?

Is there anything else you would like to say about the Safetxt study that I have not asked you?

End of interview:

Stop tape recording.

Thank participant. Ask if any questions?

Give participant cash/voucher incentive.

Potential follow-up interview:

Your feedback today has been very helpful. We will soon have the results of the study. We may have additional questions in the future to help us understand the results. Would you be interested in a future chat to help us explain the results?

Dissemination:

Once we have finished the Safetxt study we would like to present our findings to everyone that has taken part. We are currently looking for participants to help us decide how best to communicate these findings. As always, your involvement would be completely anonymous and you can be as involved as you would like to be. This is something that you could add to your CV if you like, and we can help you with phrasing this in a way that is acceptable to you.

If this is something you might be interested in please let me know either now, or you can get in touch with me by text or email (give them a text and/or email).

Reflexivity:

Write up observational notes from the interview if they are relevant.

Supplementary file 3 - Participant quotes regarding recommendations for future interventions

Targeting younger age groups, e.g. at secondary school or first year at university "I feel like if this service (safetxt) was open to that kind of age group in secondary schools and college, I think it'd be so beneficial. […] I just feel that in school it's taught as a very serious thing and everyone's embarrassed and the teachers are embarrassed and it's not a safe space to talk about things. […] you don't learn about possible reinfection at school, you don't learn about how to have difficult conversations with someone, at school you don't actually learn to have a conversation with someone about how to put a condom on." (23, WSM, intervention, I) "if it's made available to final year sixth formers who might be going to uni, because that topic, sex topic isn't really touched on properly yet, sixth form through to secondary school. So giving them the option, sending them texts before they get to uni or whilst they're at uni, in their first year, that would be useful" (21, WSM, intervention, I) "I also found some of the messages a little patronising but can see how they'd work for a younger audience." (24, WSM, intervention, OF) "Some of them I feel like I was probably quite older, I reckon I'd be probably, I don't know if I'd have listened to them more if I was like younger." (20, WSM, intervention, I) "It would be very useful for the younger teens who recently became sexually active to always be safe and careful." (18, WSM, intervention, OF) "I mean a lot of the kids are more or less starting (having sexual intercourse) from 12, it's quite bad, so I think from really, from when you get to secondary school I think they should be aware, because you do get exposed to all of that in school. (20, WSM, intervention, I) "I can honestly say that this is a brilliant idea. You never think you'd be the one to catch an STI, but things can surprise you. The idea is amazing, especially for people who are at university, studying away from home. As people like to experiment and not think or realise the consequences that could happen." (21, WSM, intervention, OF)
Expansion on other topics ***Peer pressure:*** "perhaps more topics related to the younger ages, sort of like nervousness, to be honest with you I felt so pressured to have sex when I was 17 for the first time because all my friends had done it and I was like, ooh, and they were talking about it in college, and I was like, oh god, I didn't even, I'd never had a boyfriend or whatever, and I felt perhaps messages, you know, relating towards that would be so beneficial, oh my goodness." (23, WSM, intervention, I) "Uhm, maybe more links, just because that was, they're the ones I sort of really clicked on and interacted with, […] as I've said (links) about how to deal with someone who's not wanting to use protection." (21, WSWM, intervention, I) ***Pleasure:*** "Maybe, I don't know, maybe talk more about the pleasure part of the condoms, because I know quite a few people don't really find it quite pleasurable, but I know some, I know you could still kind of make it work in that aspect, so maybe a bit more information about that." (20, WSM, intervention, I)

Chem sex: "I think especially when I lived in London not too long ago it seemed to be like chem sex was the main thing in regards to people inviting you and this drug use, and so it was great to have Safetxt but it would be nice I think if it did get expanded." […] "But the main points for me like I said would be more targeting depending on what the person wants to share… Be a bit more current in regards to what events are going on for different communities. So only speaking for myself you've got the whole like super strains and you've got the like chem sex parties and the different drugs taken that's out there and how to prevent that." (26, MSM, intervention, I)
Better mental health support "Better mental health support to deal with why people have unprotected/harmful sex would be better. (22, MSWM, intervention, OF) "I mean, I've never been so depressed as I was within the past, you know, three years. So I think, because of my mental health, in a sense, I was just thinking that, okay, what's the point in actually living anymore, so then that's why it's making this kind of like idea that if I have unsafe sex, then I catch something, maybe I die. [...] I discovered that I was, in a sort of way, interested in like bug chasing and gift giving. So this whole idea about getting positive for HIV and stuff like that." […] Maybe it's just a sense that I'm not doing much with my life. So it's like this continuous sense of like not being good enough, in a sense. So… I went to therapy a few times… […] [I am] not anymore [in therapy] because, obviously, my, I was in the therapy with my, for the university, I wasn't paying for a therapist outside of the university. So obviously they have limited resources for the, for the students […]. The availability was quite limited as well. So I had like an appointment every three weeks, so obviously it's not the same as people that would have therapy every week, helping them more with that. Well, it wasn't really therapy, it was more like counselling. (22, MSM, control, I)
Further tailoring "maybe you could kind of, I don't know how but like kind of ask people like what they were sort of like worried about and then you could target it more, target that thing that they've spoken about, if that makes sense? Like if I said I was scared about like, uh, like condoms or whatever, then you could kind of target my messages to things about condoms or whatever." (25, WSM, intervention, I) "I think it really should, it should become more specific to the person." (26, MSM, intervention, I) "I guess it would be good like if they went into the clinic and got offered, like, "We've got this thing that sends you texts", and … it could be offered like, I guess, in the leaflet that you're reading about when you're like sat there. … like it includes like a lot of stuff, like it's not just like, it's not just about the STIs, like you can get different, different texts that could apply to different people. So I guess maybe like you could, I don't know, maybe choose, … if you feel like that one doesn't apply to you, then you could say, "I don't really want to hear anything about that. But I'm happy to hear about these things" (20, WSM, intervention, I)
Message frequency/ timing "Bit confused because the texts were very frequent at first but then died out. Constant reminders might have been better" (20, WSM, intervention, OF)

"One improvement I would say is to spread the texts more evenly. After being diagnosed, I think people are more likely to use condoms immediately after and more likely to forget a few months down the line." (19, WSM, intervention, OF)
"Would be cool if you could text and get a reminder just before having sex..." (21, WSM, intervention, OF)
"My recommendation would be use the safetxt to remind people to get tested when they are due to be tested." (24, MSM, intervention, OF)

Information in parenthesis: age at interview or, in case of open feedback, age at enrolment, gender and sexual orientation, allocation arm, data source; I, interview; OF, open feedback; WSM, women who have sex with men only; MSW, men who have sex with women only; MSM, men who have sex with men only; WSMW, women who have sex with men and women; MSWM, men who have sex with women and men; (Table created by the authors)