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Perceptions on undertaking regular asymptomatic self-testing for COVID-19 using lateral flow tests: A qualitative study of university students and staff

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Title: Perceptions on undertaking regular asymptomatic self-testing for COVID-19 using lateral flow tests: A qualitative study of university students and staff

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Abstract

Background

Successful implementation of asymptomatic testing programmes using Lateral Flow Tests (LFTs) depends on several factors, including feasibility, acceptability and how people act on test results. We aimed to examine experiences of university students and staff of regular asymptomatic self-testing using LFTs, and their subsequent behaviours.

Methods

We conducted semi-structured remote interviews with people who were participating in weekly testing' feasibility study, between December 2020 and January 2021. Additional qualitative data from a survey were also analysed. Data were analysed thematically.

Results

We interviewed 18 and surveyed 214 participants. Participants were motivated to regularly self-test as they wanted to know whether or not they were infected with SARS-CoV-2. Most reported that a negative test result did not change their behaviour but it did provide them with reassurance to engage with permitted activities. In contrast, some participants reported making decisions about visiting other people because they felt reassured by a negative test result. Participants valued the training but some still doubted their ability to carry out the test. Participants were concerned about safety of attending test sites with lots of people and reported home testing was most convenient.

Conclusions

Clear messages highlighting the benefits of regular testing for family, friends and society in identifying asymptomatic cases are needed. This should be coupled with transparent communication about accuracy of LFTs and how to act on either a positive or negative result. Concerns about safety, convenience of testing, and ability to do tests need to be addressed to ensure successful scaling up asymptomatic testing.

Keywords: qualitative; testing; POCT; COVID-19

Article summary

- A unique study exploring people's experiences of regular asymptomatic self-testing including views and understanding of the accuracy of LFT tests
- Our analysis highlights a number of barriers which need to be address to ensure successful scaling up of asymptomatic testing
- Data represent the views of staff and university students who agreed to take part and their motivation to participate and perceived benefits of testing may be different from those in the wider university population, and other non-university settings.

Introduction

Recent data showing that 1 in 3 people infected with SARS-CoV-2 may not show symptoms, prompted an increased interest from governments in the feasibility of testing asymptomatic individuals using lateral flow tests (LFT)[1]. In fact, in a number of countries[2 3], including the UK[4], these devices are part of government strategies for easing of lockdowns. The Liverpool Testing Programme was one of the first to examine, alongside the accuracy of LFTs, the feasibility and acceptability of such programmes in an area with high COVID-19 prevalence[5]. University campuses were also identified as potential sites of high COVID-19 transmission[6], which resulted in pilot studies in a number of universities testing asymptomatic populations [7 8].

Asymptomatic testing (screening) has attracted a lot of attention, with many highlighting that LFTs can give people false reassurance[9-11], and others stressing that targeted testing could help reduce transmission[10 12]. As there are no clinical trials of SARS-CoV-2 screening, there is uncertainty of the effect. The supposition is that identifying positive cases willing to go on to self-isolate rapidly and cheaply could reduce infections more than any increase in infections from falsely reassuring people with false negative results. Furthermore, repeat testing with LFTs for SARS-CoV-2 infections, if shown to be feasible, will markedly improve the relatively poor sensitivity of the tests. For any given test, people's behaviours will determine this balance. Screening pilots usually request that participants do not change their behaviour as a result of being tested and receiving a negative result. The evidence from point-of-care tests for other conditions is that tests are part of complex interventions that change behaviours in unpredictable ways[15]. Evidence is therefore needed on participant perceptions on the use of COVID-19 LFTs.

Few studies have examined acceptability and feasibility of asymptomatic testing in the community [5]using PCR tests[8 13] and even fewer have focussed on these issues in relation to regular testing (rather than one-off)[9] and LFT testing. People's views and understanding of the accuracy of such tests have also not been explored. Our study aimed to address this gap by examining experiences of university students and staff of regular self-testing using LFTs with the aim of identifying key lessons for future asymptomatic testing programmes.

Methods

Study recruitment

The 'Feasibility and Acceptability of community COVID-19 Testing Strategies' (FACTS) study was a mixed methods cohort study conducted at the University of Oxford. University students and staff

were invited to participate in the study to take part in regular testing. The study used the Innova Rapid SARS-CoV-2 Antigen Test Kit (Innova Medical Group, US)[14] Participants were invited to a training session, conducted face-to-face or online, before undertaking weekly testing. Details of training are reported elsewhere[15]. The PIS informed participants that rapid tests are not as reliable as, or a replacement for, a PCR test and that they should follow standard infection prevention procedures. While the original plan was to provide all participants with the testing kits to take home, this was not possible in the initial stages of the study and meant that some participants had to attend their work or study site for testing for several weeks.

Interview recruitment and data collection

A selection of participants who agreed to be contacted about an interview at the study enrolment, were invited via email, using purposive sampling, in order to obtain variation in university role (student or staff) and department. A semi-structured interview guide was developed based on the primary research questions (Appendix 1). Participants were asked about their views and experiences of using the tests, their reasons for taking part in the study, barriers and facilitators to undertaking regular testing, trust in test results and intentions to act on a positive result. After obtaining consent, interviews were conducted over the telephone or online and audio recorded by a senior female postdoctoral qualitative researcher (MW). Interviews continued until data indicated saturation[16] As part of the wider study, we also conducted a survey examining participants' views of regular testing. The survey consisted of 13 questions (Appendix 2) and a free text comment box. The survey was sent to all study participants via email.

Data analysis

Based on the free text comments from the survey, MW and STC created an initial framework consisting of nine categories that captured key areas of interest. Using this framework, detailed summaries of interview data, including verbatim quotes, were made directly from the audio recording after each interview [17]These were further changed and then used to create themes and sub-themes. This method is deemed a pragmatic and efficient approach to collect and analyse data rapidly during a public health emergency[18].

Patient and Public Involvement

This study was rapidly set up and therefore did not include any PPI input. All participants will receive a summary of the results.

Results

734 participants across a number of departments and colleges took part in the study (October 2020 to January 2021) and performed 3187 LFT tests. Participants completed a mean of 4.3 tests over a mean of 4.8 weeks[15].

431 of 733 (59%) participants indicated on the consent form that they would be interested in taking part in an interview. Fifty-two were approached and 18 interviews were conducted (response rate 35%). Of these, 3 were undergraduate students, 3 were postgraduate students and 12 were staff. Each interview participant had completed between 3 and 10 tests during the whole study period (mean 7.7). The interviews took place between 11th December 2020 and 18th January 2021 and lasted between 17 and 43 minutes (mean 26 minutes). In addition, 214 participants completed the survey (29%); 62 provided additional free text comments. Each survey participant completed between 1 and 13 tests (mean=5.8).

We identified four themes, which we report below with supporting quotes.

Theme 1: Perceived benefits to regular testing

Participants reported three main benefits of taking part in the study and having access to regular self-testing. Firstly, they wanted to check regularly whether or not they were infected with SARS-CoV-2, to reduce their fear of unknowingly infecting others, which was a concern they mentioned frequently. In addition, participants wanted to know if they were infected so they could take appropriate action, i.e. self-isolate and thus minimise the risk of spreading the virus.

Secondly, some students highlighted that deciding to self-test with a LFT was perceived as a personal choice and therefore more acceptable than undertaking NHS or university testing when experiencing symptoms. The university protocol for symptomatic testing required everyone in the household to enter into isolation at the time of getting a test rather than at the time of getting a positive result. As participants explained, peer pressure may prevent people from doing NHS or university testing.

> *Getting an NHS test is such an ordeal and in a university context, there is pressure not to get tested because getting that test puts your whole house into a lockdown. This test removes barriers […] You do it as a personal choice and not something where you get permission from the whole household to get tested [P2, Student, Interview]*

Finally, all interviewees wanted to support COVID-19 research to contribute to fighting the pandemic.

Theme 2: Perceptions of test accuracy and its implications

Overall, participants mostly accepted that tests were not 100% accurate. They saw them as just one of the measures to try to avoid spreading the virus (among social distancing, face masks and vaccines in the future). Some participants sought their own information on the accuracy of LFTs in general or had heard information from family and friends. The perceived accuracy varied greatly, with participants citing figures between 50 and 90%. It is important to highlight that often the same figure was seen as reassuring by some participants, and less so by others and some participants lacked any recalled information on accuracy of the tests.

> *I am sceptical because someone who works in the industry told me that some hospital stopped using the tests because with poor training it has an effectiveness rate of 50% [P19, Student, Interview]*

> *I talked to a friend who is a nurse; and she said that they are around 60% which is a decent percentage to be accurate [P18, Staff, Interview]*

Participants' views on test accuracy were important when making decisions about their behaviour. Participants did not view a negative test result as permission to break government guidelines, but reported that negative tests increased their confidence to engage with activities that were allowed.

> *I am not sure [the test result] changed our behaviour but it reassured us that I am going to have two tests during that time and if they are both negative that gives you a bit of reassurance that this is a reasonable thing to do [P11, Staff, Interview]*

Crucially, some participants did make decisions, based on negative test results, about engaging with activities where there was potential for transmission (for example seeing a relative or extent of contact with relatives at home) because they were unaware about tests not being 100% accurate. When later learning that tests were not 100% accurate, participants were concerned about their decisions.

> *I have read online about the reliability of the tests and initially that gave me a lot of confidence. […] and when I had a negative test I felt that I could go and have a cup of tea with a relative and then I read that the reliability was […] so some of the figures were down in the 50s or 60s, so 60% and then you thought 'oh this is not that reassuring [P14, Staff, Interview]*

> *I have done all these tests which were negative and after the 3rd test I was less careful for sure [P5, Student, Interview]*

Finally, some participants were unsure whether the information they had read about LFTs was relevant to the test they had been using. They highlighted the difficulty of making a decision on whether to engage with certain (allowed) activities or not.

> *I read in the newspapers that when done by trained medical staff the tests are only 75% accurate, and by non-medical staff 50%. […] So if I have 50-50 success rate is that a good thing or is it better not to know [P3, Staff, Interview]*

Theme 3: Extent of confidence in ability to do the tests

The majority of participants felt that the training they received enabled them to feel confident about doing the tests. While doing tests repeatedly increased participants' confidence, a number of participants were still unsure whether they were doing the test correctly, especially the tonsil swab. Some questioned whether an incorrect swab would make test less reliable.

> *I have very strong gag reflex so I am unable to reach my tonsils.[…] I have not been able to get an answer on whether it is important to swab the tonsils [P8, Staff, Interview]*

Doing the tests at home was easier as participants had access to mirrors rather than having to rely on their phone cameras to do the test on site. When doing tests at home, having a card which summarised the instructions was also suggested, as instead participants had to re-watch the video every time they were unsure about some aspect of the self-testing. In contrast, doing tests on site was perceived as helpful by some participants as they could ask other participants for tips, seeing other people experience physical sensation and check whether they "were doing it right".

Theme 4: Barriers and facilitators to regular testing

All interviewees experienced swabbing as uncomfortable, at least to a certain extent, with some reporting having a strong gag reflex and testing causing sneezing or watering eyes. However, most participants highlighted that these sensations were temporary, manageable and were a "small price to pay" for getting reassurance on whether they were infected (as described in theme 1).

Participants who were able to take a number of testing kits home seemed to see testing as relatively easy to fit tests into their weekly routine. In contrast, for participants who did not get packs to take home and who had to go to their department to self-test, it was an inconvenience and caused frustration, especially as testing took place over several weeks. This was especially the case for staff.

While training in a group was perceived as beneficial (as described in theme 2), some participants were also concerned about the safety of getting tested on site, around other people, especially if they had not been going out much.

> *It was quite frustrating that we were expected to conduct the test in person in a lecture hall with many other students for the first few weeks, as this was the biggest personal risk I took [P10, Student, Survey].*

Finally, participants wanted a reminder to do the test when it was due each week, and some felt this could provide additional encouragement.

Discussion

We found that interviewees were motivated to conduct regular testing as they wanted to know whether or not they were infected with SARS-CoV-2. While most participants accepted that the test was not 100% accurate, many could not quantify this further and estimates of test accuracy varied greatly among participants. Importantly, most reported that a negative test result did not change their behaviour but some participants reported making decisions about contact with other people when they would not have done otherwise, because they felt reassured by a negative test result. Participants valued the training but some participants still doubted their ability to do the test. Participants also raised the importance of safety and convenience when attending for tests on site.

Comparison with existing literature

Participants in our study wanted to have regular testing to reduce their fear of accidentally infecting their family, friends or other people in their community, while also wanting to contribute to fighting the pandemic. This is in line with the Liverpool COVID-SMART study, which found that people signed up to have a test as they wanted to protect their families, friends as well as local hospitals and NHS workers[5]. Only one study in a university setting explored these issues, albeit involving RT-PCR tests, and also reported similar reasons[7]. Our study also highlights the importance of the perceived benefits but in the context of regular rather than one-off testing and using LFTs. It also suggests that asymptomatic testing using LFTs may be perceived as more accessible and acceptable for students, in comparison to NHS or University testing, which has not been identified before.

Importantly, our study found that while most participants understood that the test was “not 100% accurate”, estimates of test accuracy varied greatly among participants. Most reported that negative test results did not change their behaviour but it did provide them with reassurance to engage with permitted activities. However, some participants felt reassured by the test and reported making decisions involving contact with other people, when they would not have done otherwise. Previous

studies have only explored these issues for antibody testing[19]. Liverpool COVID-SMART study indicated that some participants had concerns about test accuracy[5] and one study in a university setting found that 79.6% of participants were confident in the outcome of their PCR test[7]. Our study highlights that people's understanding of the extent to which LFTs are accurate varied, with potential implications for their behaviour.

Finally, while our participants described swabbing as being uncomfortable, they felt that the perceived benefits outweighed the burden of doing the tests. Having access to a number of tests which they could do at home made it easier for participants to take part, while doing the testing on site provided an opportunity for feedback on how well participants were doing the test but magnified safety concerns. Misinformation related to perception of the risk of infection at test sites, and the need to have physical contact with centre staff, have been described before[5]

Strengths and limitations

This first qualitative study examining views and experiences of students and staff of regular asymptomatic SARS-CoV-2 testing in a university setting using LFTs highlights a number of key issues related to acceptability and feasibility of regular testing as well as its behavioural implications. We note some limitations. The mean number of tests conducted by each interview and survey participant was higher than the mean number of tests in non-interviewed participants, so our sample may over-represent those who continued to test regularly. Additionally, the FACTS participants were university student and staff volunteers, whose motivation to participate and perceived benefits may be different from those in the wider university population, and other non-university settings.

Implications for policy and practice

Our study indicates that messages highlighting the benefits for family, friends and society in identifying asymptomatic cases and contributing to fighting the pandemic and ultimately lifting lockdowns might be beneficial for encouraging regular use of LFTs[20]. However, these need to be coupled with clear and transparent communication about accuracy of LFTs. Also, given that the same reported accuracy of the test might be perceived by different people as more or less favourable, it is crucial that this is framed within clear messages on what it means for an individual's behaviour (i.e. the need to follow COVID-19 safety measures). This is especially important for testing in workplaces or schools (as currently planned in the UK[21]) where a negative test may allow people to return to their study or workplace and will consequently involve contact with other people. Advice that supports people to continue physical distancing, hand hygiene and mask wearing in the context of a

negative test is crucial. A recent report of implementation of asymptomatic testing in local authorities in England showed that 47% of local authority websites did not explain the limitations of LFTs or that people should continue following safety measures despite a negative result[11] and highlighted a lack of standard messaging on test accuracy[11].

When scaling up regular asymptomatic testing, it is important to also consider potential concerns about convenience of testing, and people's confidence and ability to do the testing. In settings where people may be tested on site, safety and convenience may be important to consider. Concerns about physical sensations also need to be addressed. Whereas, for those who are sent tests to take at home, clear information on testing procedures and a reminder to take the test will be of importance.

Conclusions

Clear messages highlighting the benefits of regular testing for family, friends and society in identifying asymptomatic cases are needed. This should be coupled with transparent communication about accuracy of LFTs and how to act on either a positive or negative result. Concerns about safety, convenience of testing, and ability to do tests need to be addressed to ensure successful scaling up asymptomatic testing.

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It was approved by the University of Oxford Research Ethics Committee in October 2020 (CUREC ethics reference R72896/RE001).

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Data available on reasonable request.

Contributorship statement:

MW designed the study, undertook data collection and analysis, and co-wrote the manuscript. ML designed the study and critically appraised the manuscript. JAH designed the study, contributed to the analysis and critically appraised the manuscript. CV, JAH, RP, IT, GD, and PT designed the study and critically appraised the manuscript. TRF and LM designed the study, contributed to the analysis and critically appraised the manuscript. BDN designed the study and critically appraised the

manuscript. STC contributed to data analysis and co-writing of the manuscript. FDRH designed the study and critically appraised the manuscript.

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Appendix

Appendix 1: Topic Guide

Topics to be explored

Below is a list of topics to be discussed in this study. The work will remain flexible with respect to participants' agendas. Therefore, we may add new topics as the interviews progress and data collection continues. However, the key topic of participants' views and experiences using the tests, the perceived benefits of testing, barriers and facilitators to undertaking regular testing, trust in test results and intentions to act on positive result, will remain the same.

1. Participants' views and experiences of using the tests.
2. Participants' views and experiences on barriers and facilitators to undertaking regular testing
3. Participants' views on trust in test results.
4. Participants' views and experiences of perceived benefits of testing
5. Participants' intentions to act on positive result.

Using the tests

1. Can you tell me about your experience of self-testing for COVID so far?
2. Can you tell me about the training you had on how to self-test, as part of the FACT study?
   Prompts: What did the training involve? What did you think about the training? Is there anything which would make the training easier for you? How confident did you feel about doing the test?
3. How did you feel about doing the test for the first time?
4. How have you found self-testing over time?
   Prompts: Have you had any difficulties in doing the test? If, so what happened and what did you do? How did you overcome difficulties?

Barriers and facilitators to undertaking regular testing; perceived benefits of testing

1. Can you tell me why you signed up to this study?
2. How have you found self-testing so far?
   Prompts: What has been most difficult in relation to doing the tests?
3. Is there anything which would making the experience easier for you?
4. What is the main reason for you for continuing in the study?
5. What are the benefits for you in taking part in this study, if any?
   Prompts: Are there benefits for you/your family/your friends?

Trust in test results

[For those who have not tested positive]

1. How accurate do you think your test results have been?
   Prompts: Have you had any reason to question your test result?
2. Have you had any other COVID test during the time you have been in the study?
   If yes: How did you access this test? Why did you have this test carried out?

Intentions to act on positive result

[For those participants who have had a positive result]

1. How did you feel about the positive result?

2. What happened when you got your positive test?
   Prompts: What did you do next?
3. Did you have another COVID test?
   Prompts: How did you access this test? When did you have this test?
4. What were the consequences of you getting a positive result?
5. How accurate do you think you self-test results have been?

Follow up:

1. Is there something that you think we didn't cover that is relevant to what we have discussed?
2. Is there anything else you would like to add?

Online Questionnaire

Study Title: The Feasibility and Acceptability of community COVID-19 rapid Testing Strategies (FACTS) study

This survey asks about your views on using tests as part of the FACTS study. This survey takes approximately 5 minutes to complete.

Your demographic details

Q1. Please confirm that you are a university:

-student (undergraduate)

-student (postgraduate)

-staff member

Q2. What type of training did you receive? (Face to face training/ Online Training)

Please confirm your email address, by which you received this survey link, so we can link your answers to the demographic information you have already provided in the app.

Your symptoms

Since receiving the FACTS training, have you had any of the following symptoms:

a. feeling feverish: (Yes / No)

If yes, when did your symptoms start/end?

b. A new, continuous cough? (New: means a cough that you've not had before, or if you usually have a cough, it's got worse. Continuous: means coughing a lot for more than an hour, or 3 or more coughing episodes in 24 hours) (Yes / No)

If yes, when did your symptoms start/end?

c. Feeling unusually short of breath? (Yes / No)

If yes, when did your symptoms start/end?

d. a loss or change to your sense of smell or taste? (Yes / No)

If yes, when did your symptoms start/end?

e. Feeling usually tired? (Yes / No)

If yes, when did your symptoms start/end?

f. Feeling so ill that you've stopped doing all of your usual daily activities? Answer unable to do usual activities if you can't do anything you usually would, such as watch TV, use your phone, read or get out of bed. (Yes/No)

If yes, when did your symptoms start/end?

I have had no symptoms since attending the FACTS training (YES/NO).

Are you taking any medicines for your symptoms? YES/NO. If yes, please tell us the name of the medicines [free text]

Views on testing

Please respond to the statements below using the scale provided. Please give only one answer per statement.

Strongly agree (7), Agree (6), Slightly agree (5), Neither agree nor disagree (4), Slightly disagree (3), Disagree (2), Strongly disagree (1).

I have been provided with [give choice of tests being used in study] self-test.

1. I believe [The test] provides reliable and accurate results
2. I believe it is safe to use [the test].
3. It is important for me to know whether I have COVID-19 or not

Are you carrying out the COVID tests yourself? YES/NO

If YES, go to 4

If NO, go to 8

4. Self-testing with [the test] is easy to fit into my usual activities
5. Self-testing with [the test] every [X] days is easy for me to remember to do
6. I am confident I can carry out [the test]
7. I am confident I can interpret [the test] results
8. Testing for COVID weekly is beneficial to me
9. If I have weekly COVID tests it is beneficial to people who live with me
10. If I have weekly COVID tests it is beneficial to my friends and family
11. If I have weekly COVID tests it is beneficial to the wider community
12. I intend to self-test again in the next week.
13. I would self-isolate if I received a positive test result from [the test].
14. I would self-isolate if I received a positive test result from a laboratory (e.g. NHS or university) test.

Please enter any additional comments you have about self-testing for COVID in the free text box below:

Thank you for completing this survey.

If you have any queries about this survey please contact [insert researcher's name and contact details].

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

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Perceptions on undertaking regular asymptomatic self-testing for COVID-19 using lateral flow tests: A qualitative study of university students and staff

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Title: Perceptions on undertaking regular asymptomatic self-testing for COVID-19 using lateral flow tests: A qualitative study of university students and staff

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Key words: qualitative; testing; POCT; COVID-19

Abstract

Objectives: Successful implementation of asymptomatic testing programmes using Lateral Flow Tests (LFTs) depends on several factors, including feasibility, acceptability and how people act on test results. We aimed to examine experiences of university students and staff of regular asymptomatic self-testing using LFTs, and their subsequent behaviours.

Design and setting: A qualitative study using semi-structured remote interviews and qualitative survey responses, which were analysed thematically.

Participants: People who were participating in weekly testing feasibility study, between October 2020 and January 2021, at the University of Oxford.

Results: We interviewed 18 and surveyed 214 participants. Participants were motivated to regularly self-test as they wanted to know whether or not they were infected with SARS-CoV-2. Most reported that a negative test result did not change their behaviour but it did provide them with reassurance to engage with permitted activities. In contrast, some participants reported making decisions about visiting other people because they felt reassured by a negative test result. Participants valued the training but some still doubted their ability to carry out the test. Participants were concerned about safety of attending test sites with lots of people and reported home testing was most convenient.

Conclusions: Clear messages highlighting the benefits of regular testing for family, friends and society in identifying asymptomatic cases are needed. This should be coupled with transparent communication about accuracy of LFTs and how to act on either a positive or negative result. Concerns about safety, convenience of testing, and ability to do tests need to be addressed to ensure successful scaling up asymptomatic testing.

Strengths and limitations

- A unique study exploring people's experiences of regular, weekly asymptomatic self-testing including views and understanding of the accuracy of LFTs, highlighting a number of barriers and facilitators to successful scaling up of asymptomatic testing.
- The mean number of tests conducted by each interview and survey participant was higher than the mean number of tests in non-interviewed participants (i.e. the main study participants), so our sample may over-represent those who continued to test regularly.
- Data represented the views of staff and university students who agreed to take part and their motivation to participate and perceived benefits of testing may be different from those in the wider university population, and other non-university settings.
- The study did not capture the views of participants who had not completed any tests, which should be explored in future studies.
- The study had relatively low response rate for both interviews and surveys, thus may not have captured the views of all participants (e.g. those who disengaged with the study and subsequently, testing).

Introduction

In January 2020 the World Health Organisation has declared COVID-19 to be a global health care emergency,[1] and by June 2021 the number of cases globally now exceeded 177 million.[2] In response to this crisis, countries across the world have implemented numerous strategies to tackle the pandemic, including various grades of restriction in population movement, social distancing, use of face coverings in public, and testing for patients with typical symptoms using laboratory COVID-19 polymerase chain reaction (PCR) tests. While these tests are considered the gold standard for diagnosis, they have limitations, including slow turn-around time, specialist facilities needed for processing, and detection of non-infectious SARS-CoV-2 particles, limited access, and high costs.[3]

Some individuals infected with SARS-CoV-2 remain asymptomatic, and in symptomatic cases viral shedding is likely to occur before symptoms occur.[4] Consequently, recent data showing that 1 in 3 people infected with SARS-CoV-2 may not show symptoms, prompted an increased interest from governments in the feasibility of testing asymptomatic individuals using lateral flow tests (LFTs).[5] In fact, in a number of countries,[6, 7] including the UK,[8] these devices have been part of government strategies for easing of lockdowns.

LFTs were brought to market for the rapid detection of SARS-CoV-2 antigen in late 2020.[9] LFTs do not require specialist laboratory equipment and can be performed in the community with results returned within 30 minutes. In October 2020, the UK government launched a mass-testing initiative using LFTs across the UK.[10] However, the diagnostic performance of one-off LFTs[11] does not meet the WHO accepted minimum of 97% specificity and 80% sensitivity, and there is still limited evidence related to diagnostic performance when used by individuals without symptoms.[12]In order to deliver a successful testing programme, it was proposed that testing needs a 90% or higher uptake followed by isolation of infected individuals,[13, 14] coupled with re-testing every few days to improve the diagnostic performance of the overall testing strategy.[15] In the UK, the LFTs are authorised for use in detecting positive cases of asymptomatic individuals and are now used in schools and before larger events. The public can also order two cost-free tests per week for general use.[16]

Asymptomatic testing (screening) has attracted a lot of attention, with many highlighting that LFTs can give people false reassurance,[17] and others stressing that targeted testing could help reduce transmission.[18, 19] As there are no clinical trials of SARS-CoV-2 screening, there is uncertainty of the effect. The supposition is that testing frequently may identify asymptomatic cases willing to self-isolate, which could reduce transmission of infections more than any increase in transmission that

arises from falsely reassuring people with false negative results. For any given test, people's behaviours related to use of tests and behaviours following the test will determine this balance. Screening pilots usually request that participants do not change their behaviour as a result of being tested and receiving a negative result. The evidence from point-of-care tests for other conditions is that tests are part of complex interventions that change behaviours in unpredictable ways.[20] Evidence is therefore needed on end user perceptions on the use of COVID-19 LFTs.

Few studies have examined acceptability and feasibility of asymptomatic testing in the community[21] using PCR tests[22, 23] and even fewer have focused on these issues in relation to regular testing (rather than one-off)[23] and LFTs. People's views and understanding of the accuracy of such tests have also not been explored. Our study aimed to address this gap by examining experiences of university students and staff of weekly self-testing using LFTs with the aim of identifying key lessons for future asymptomatic testing programmes.

Methods

Study design: a qualitative study embedded within a mixed methods cohort study.

Study recruitment

The 'Feasibility and Acceptability of community COVID-19 Testing Strategies' (FACTS) study was a mixed methods cohort study conducted at the University of Oxford. The recruitment began in two sites on 29th October and one site on 17th November 2020 (sites A, B and C). In late November, recruitment was extended across the University, but stopped in early December when a University-wide COVID screening programme was implemented leaving only sites A, B and C continuing with the study. Invitations to participate were sent by email, first only to students and later to staff, to take part in once a week testing. The email invitation also contained a five-minute video explaining how to prepare to test, perform the swab, extract the sample, test the sample and read the results. Eligible participants were asked to complete an e-consent process on the 'CVm-Health+ Education' app on their phones, which was developed by Sensyne Health PLC (Oxford, UK). Those who wanted further information had the opportunity to ask research team members questions at the training session and then consent via the app if they were happy to participate.

Sampling

Eligibility criteria for the main study included: aged > 16 years old, working or studying across the chosen sites at the University, showing no COVID-19 symptoms (new continuous cough; and/or high temperature; and/or loss of/change to, sense of smell/taste) and being capable of LFT self-administration following training.

Training

The email invitation also contained a five-minute video explaining how to prepare to test, perform the swab, extract the sample, test the sample and read the results. Participants were invited to a training session, conducted face-to-face or online, before undertaking weekly testing. Face-to-face training was carried out at participants' work or place of study. Participants were talked through the aims of the study, followed by a demonstration of the swabbing, sample preparation, testing, and recording and interpreting of the test result. Following the demonstration, participants performed the test, with support from the trainers if required. When 30 minutes had elapsed since applying the sample to the test device, participants were asked to interpret the result, record this on the app, and photograph the result using the app. The trainers visually checked each test result and confirmed whether the participant's interpretation of the result was correct or not. For a small number of participants, live on-line training was offered. These participants collected test kits in advance from a central location. This online training was delivered by two trainers via Zoom and involved similar procedures to the face-to-face training. The session was interactive so participants could ask questions. Everyone had also been provided with PDF step-by-step illustrated guide to testing.

The Participant Information Sheet (PIS) informed participants that rapid tests are not as reliable as, or a replacement for, a PCR test. In the event of a positive test result, participants were advised to self-isolate and book a PCR test through the University COVID-19 testing service; in the event of a negative test, participants were advised to follow normal infection prevention procedures. This information was repeated during the training where participants were also told that there is limited evidence on the accuracy of the test in asymptomatic people. At the time of the study the Innova test had not received MHRA authorisation for asymptomatic testing, nor for self-testing, and the test was used under research ethics.

Testing processes

While the original plan was to provide all participants with the testing kits to take home after training, this was not possible in the initial stages of the study. This meant that the repeat weekly testing took place at the test sites until late November. This involved participants attending at a testing station at their college or department. Thereafter, participants recruited to the three main sites (Sites A, B and C) were supplied with sufficient test kits to continue testing in their accommodation or home throughout the Christmas break until 18th January 2021 (the study end date). Follow-up did not take place at the other recruiting sites. If participants missed administering a test, they were still eligible to remain in the study and resume testing on a weekly basis. If a participant received a COVID-19 positive

result from a PCR test, they were asked to stop self-testing. Participants could withdraw from the study by contacting the study team, without providing a reason.

All participants used the same test, the Innova Rapid SARS-CoV-2 Antigen Test Kit (Innova Medical Group, US), developed for testing symptomatic individuals. The manufacturers report it can detect the SARS-CoV-2 antigens within 20 minutes and a negative test result within 30 minutes.[24, 25] The instructions for use require nasal and tonsil swabbing, transfer of the sample to an extraction buffer solution, then application of the mixture to the device.[26]

Interview recruitment and data collection

Eligibility criteria for the interview study included: aged > 16 years old, working or studying across the chosen sites at the University. A selection of participants who agreed to be contacted about an interview at the study enrolment stage, were invited via email. We used purposive sampling, in order to obtain variation in university role (student or staff) and department, aiming to obtain equal number of staff and student participants. A semi-structured interview guide was developed based on the primary research questions (Appendix 1). Participants were asked about their views and experiences of using the tests, their reasons for taking part in the study, barriers and facilitators to undertaking regular testing, trust in test results and intentions to act on a positive result. After explaining the purpose of the interview, participants were asked to give oral consent, which was in addition to the main study consent. Following the interview, they were also provided with a written record of their consent. The interviews were conducted by a senior female postdoctoral qualitative researcher (MW) over the telephone or using video conference software, depending on participant preference. The interviewer was not involved in training of participants. The interviews were audio recorded and continued until data indicated saturation.[27] NVivo 12 was used to facilitate data analysis.

Survey recruitment and data collection

As part of the wider study, we also conducted a survey examining participants' views of regular testing (Appendix 2). The survey was designed using JISC Online Surveys software which was in line with Information Governance procedures of the University of Oxford. The survey was sent to all participants of the main study via email, asking them to complete it as part of the study. There was no separate consent form for the survey as it was part of the main study, to which all participants gave consent via the app. After data collection was completed, the data was deleted from the platform and stored securely on a University network.

Data analysis

Based on the free text comments from the survey, MW and STC created an initial framework consisting of nine categories that captured key areas of interest. Using this framework, detailed summaries of interview data, including verbatim quotes, were made directly from the audio recording after each interview.[28]These were further developed and then used to create themes and sub-themes. This method is deemed a pragmatic and efficient approach to collect and analyse data rapidly during a public health emergency.[29]

Patient and Public Involvement (PPI)

This study was rapidly set up and therefore did not include any PPI input. All participants will receive a summary of the results.

Results

At the three primary recruitment sites (A, B and C), 551 (25%) participated. A further 183 participants were recruited across other sites, so the total sample size was 734. Between October 2020 and January 2021, they performed 3187 LFTs.

Participants completed a mean of 4.3 tests over a mean of 4.8 weeks. Eighty percent (n=588) of participants were students, with a mean±SD age of 26±8 years, 20% (n=146) were staff, with a mean±SD age of 42±11 years. Overall, 55% were women and 83% were of white ethnicity. Table 1 describes demographic characteristics of all FACTS study participants per site.

431 of 734 (59%) participants indicated on the main study consent form that they would be interested in taking part in an interview. Fifty-two were approached and 18 participants responded and all chose to take part (response rate 35%). Of these, 3 were undergraduate students, 3 were postgraduate students and 12 were staff. Each interview participant had completed between 3 and 10 tests during the whole study period (mean 7.7). Table 2 provides demographic characteristics pf interview participants. The interviews took place between 11th December 2020 and 18th January 2021 and lasted between 17 and 43 minutes (mean 26 minutes). In addition, 214 participants completed the survey (29%); 62 provided additional free text comments. Each survey participant completed between 1 and 13 tests (mean=5.8). Table 3 provides demographic characteristics of survey participants.

We identified four themes in relation to participants' views and experiences on SARS-CoV-2 self-testing with LFT, which we report below with supporting quotes.

Theme 1: Perceived benefits to regular testing

Participants reported three main benefits of taking part in the study and having access to regular self-testing. Firstly, they wanted to check regularly whether or not they were infected with SARS-CoV-2, to reduce their fear of unknowingly infecting others, which was a concern they mentioned frequently. In addition, participants wanted to know if they were infected so they could take appropriate action, i.e. self-isolate and thus minimise the risk of spreading the virus.

Secondly, some students highlighted that deciding to self-test with a LFT was perceived as a personal choice and therefore more acceptable than undertaking National Health Service (NHS) or university testing when experiencing symptoms. The university protocol for symptomatic testing required everyone in the household to enter into isolation at the time of getting a test rather than at the time of getting a positive result. As participants explained, peer pressure may prevent people from doing NHS or university testing.

> *Getting an NHS test is such an ordeal and in a university context, there is pressure not to get tested because getting that test puts your whole house into a lockdown. This test removes barriers […] You do it as a personal choice and not something where you get permission from the whole household to get tested [P2, Student, Interview]*

Finally, all interviewees wanted to support COVID-19 research to contribute to fighting the pandemic.

Theme 2: Perceptions of test accuracy and its implications

Overall, participants mostly accepted that tests were not 100% accurate. This was related to the fact that they saw them as just one of the measures to try to avoid spreading the virus (among social distancing, face masks and future vaccines). Some participants lacked any recalled information on test accuracy, while others sought their own information on the accuracy of LFTs in general or had heard information from family and friends. The perceived accuracy varied greatly, with participants citing figures between 50 and 90%. It is important to highlight that often the same figure was seen as reassuring by some participants and not by others.

I am sceptical because someone who works in the industry told me that some hospital stopped using the tests because with poor training it has an effectiveness rate of 50% [P19, Student, Interview]

I talked to a friend who is a nurse; and she said that they are around 60% which is a decent percentage to be accurate [P18, Staff, Interview]

Participants' views on test accuracy were important when making decisions about their behaviour. Participants did not view a negative test result as permission to break government guidelines, but reported that negative tests increased their confidence to engage with activities that were allowed.

I am not sure [the test result] changed our behaviour but it reassured us that I am going to have two tests during that time and if they are both negative that gives you a bit of reassurance that this is a reasonable thing to do [P11, Staff, Interview]

Crucially, some participants did make decisions, based on negative test results, about engaging with activities where there was potential for transmission (for example seeing a relative or extent of contact with relatives at home) because they were unaware that tests were not 100% accurate. When later learning that tests were not 100% accurate, participants were concerned about their decisions.

I have read online about the reliability of the tests and initially that gave me a lot of confidence. […] and when I had a negative test I felt that I could go and have a cup of tea with a relative and then I read that the reliability was […] so some of the figures were down in the 50s or 60s, so 60% and then you thought 'oh this is not that reassuring [P14, Staff, Interview]

I have done all these tests which were negative and after the 3rd test I was less careful for sure [P5, Student, Interview]

Finally, some participants were unsure whether the information they had read about LFTs was relevant to the test they had been using. They highlighted the difficulty of making a decision on whether to engage with certain (allowed) activities or not.

I read in the newspapers that when done by trained medical staff the tests are only 75% accurate, and by non-medical staff 50%. […] So if I have 50-50 success rate is that a good thing or is it better not to know [P3, Staff, Interview]

Theme 3: Extent of confidence in ability to do the tests

The majority of participants felt that the training they had received enabled them to feel confident about doing the tests. While doing tests repeatedly increased participants' confidence, a number of participants were still unsure whether they were doing the test correctly, especially the tonsil swab. Some questioned whether an incorrect swab would make the test less reliable.

> *I have very strong gag reflex so I am unable to reach my tonsils.[…] I have not been able to get an answer on whether it is important to swab the tonsils [P8, Staff, Interview]*

Participants felt that doing the tests at home was easier as they had access to mirrors; in contrast, they highlighted having to rely on their phone cameras to do the test on site. When doing tests at home, having a card which summarised the instructions was also suggested, as instead participants had to re-watch the video every time they were unsure about some aspect of the self-testing. In contrast, doing tests on site was perceived as helpful by some participants as they could ask other participants for tips. Seeing other people experience physical sensations such as watering eyes or gagging, was helpful in knowing what to expect and provide reassurance that they "were doing it right".

Theme 4: Barriers and facilitators to regular testing

All interviewees experienced swabbing as uncomfortable, at least to a certain extent, with some reporting having a strong gag reflex and testing causing sneezing or watering eyes. However, most participants highlighted that these sensations were temporary, manageable and were a "small price to pay" for getting reassurance on whether they were infected (as described in theme 1).

Participants who were able to take a number of testing kits home seemed to see testing as relatively easy to fit tests into their weekly routine. In contrast, for participants who did not get packs to take home and who had to go to their department to self-test, it was an inconvenience and caused frustration, especially as testing took place over several weeks. This was especially the case for staff.

While training in a group was perceived as beneficial (as described in theme 2), some participants were also concerned about the safety of getting tested on site, related to being around other people, especially if they had not been going out much.

> *It was quite frustrating that we were expected to conduct the test in person in a lecture hall with many other students for the first few weeks, as this was the biggest personal risk I took in terms of COVID-19 exposure [P10, Student, Survey].*

Going to the college […] makes me a bit worried about exposure to COVID while testing, despite social distancing measures [P17, Student, Survey]

Finally, participants stated that they aimed to carry out testing on a weekly basis but wanted a reminder to do so when the test was due each week, and some felt this could provide additional encouragement.

Discussion

We found that interviewees were motivated to conduct once weekly testing as they wanted to know whether or not they were infected with SARS-CoV-2. While most participants accepted that the test was not 100% accurate, many could not quantify this further and estimates of test accuracy varied greatly among participants. Importantly, most reported that a negative test result did not change their behaviour but some participants reported making decisions about contact with other people when they would not have done otherwise, because they felt reassured by a negative test result. Participants valued the training but some individuals still doubted their ability to do the test. Participants also raised the importance of safety and convenience when attending for tests on site.

Comparison with existing literature

Participants in our study wanted to have once weekly testing to reduce their fear of accidentally infecting their family, friends or other people in their community, while also wanting to contribute to fighting the pandemic. This is in line with the Liverpool COVID-SMART study, which found that people signed up to have a test as they wanted to protect their families, friends as well as local hospitals and NHS workers.[21] Only one study in a university setting explored these issues, albeit involving PCR tests, and also reported similar reasons.[22] Our study also highlights the importance of the perceived benefits but in the context of regular once weekly rather than one-off testing and use of LFTs. It also suggests that asymptomatic testing using LFTs may be perceived as more accessible and acceptable for students, in comparison to NHS or University testing, which has not been identified before.

Importantly, our study found that while most participants understood that the test was “not 100% accurate”, estimates of test accuracy varied greatly among participants. Most reported that negative test results did not change their behaviour but it did provide them with reassurance to engage with permitted activities. However, some participants felt reassured by the test and reported making decisions involving contact with other people, when they would not have done otherwise. Previous studies have only explored these issues for antibody testing.[30] The Liverpool COVID-SMART study indicated that some participants had concerns about test accuracy[21] and one study in a university setting found that 79.6% of participants were confident in the outcome of their PCR test.[31]

Finally, while our participants described swabbing as being uncomfortable, they felt that the perceived benefits outweighed the burden of doing the tests. Having access to a number of tests which they could do at home made it easier for participants to take part, while doing the testing on site provided an opportunity for feedback on how well participants were doing the test but magnified safety concerns. Misinformation related to perception of the risk of infection at test sites, and the need to have physical contact with centre staff, have been described before.[31]

Strengths and limitations

This first qualitative study examining views and experiences of students and staff of regular asymptomatic SARS-CoV-2 testing in a university setting using LFTs highlights a number of key issues related to acceptability and feasibility of regular testing as well as its behavioural implications. We note some limitations. Firstly, the mean number of tests conducted by each interview and survey participant was higher than the mean number of tests in non-interviewed participants (i.e. the main study participants), so our sample may over-represent those who continued to test regularly. In fact, we have not captured the views of those participants who had not completed any testing during the study period. Future studies should include the perspectives of participants who did not use the test even when provided with the opportunity and resources to do so, in order to understand the barriers to uptake and regular testing. Secondly, the FACTS participants were university student and staff volunteers, whose motivation to participate and perceived benefits may be different from those in the wider university population, and other non-university settings. Thirdly, while the aim was to recruit equal numbers of students and staff for interviews, we interviewed more staff. This was in line with the main study where we found a higher follow-up rate in staff than in students, suggesting that staff were more likely to be compliant to testing and remained in the study for a higher proportion of their potential follow-up time than students. Finally, the response rate of the interview and survey was relatively low, which may have meant that views of some participants have not been captured (for example, those disengaged with the programme). This may be explained by the timing of both the survey and interview study; recruitment took place very close to the Christmas break thus possibly limiting opportunities for staff and student to commit time to these aspects of the programme.

Implications for policy and practice and future research

Our study indicates that messages highlighting the benefits for family, friends and society in identifying asymptomatic cases, contributing to fighting the pandemic and ultimately lifting lockdowns might be beneficial for encouraging regular use of LFTs. However, these need to be coupled with clear and transparent communication about LFT accuracy. Also, given that the same

reported accuracy of the test might be perceived by different people as more or less favourable, it is crucial that this is framed within clear messages on what it means for an individual's behaviour (i.e. the need to follow COVID-19 safety measures). This is especially important for testing in workplaces or schools where a negative test may allow people to return to their study or workplace and will consequently involve contact with other people. Advice that supports people to continue physical distancing, hand hygiene and mask wearing in the context of a negative test is crucial. A recent report of implementation of asymptomatic testing in local authorities in England showed that 47% of local authority websites did not explain the limitations of LFTs[17] or that people should continue following safety measures despite a negative result and highlighted a lack of standard messaging on test accuracy.[17]

When scaling up regular asymptomatic testing, it is important to also consider potential concerns about convenience of testing, and people's confidence and ability to do the testing. In settings where people may be tested on site, safety and convenience may be important to consider. Concerns about physical sensations also need to be addressed. Whereas, for those who are sent tests to take at home, clear information on testing procedures and a reminder to take the test will be of importance.

Conclusions

Clear messages highlighting the benefits of regular testing for family, friends and society in identifying asymptomatic cases are needed. This should be coupled with transparent communication about accuracy of LFTs and how to act on either a positive or negative result. Concerns about safety, convenience of testing, and ability to do tests need to be addressed to ensure successful scaling up asymptomatic testing.

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Data sharing statement: No additional data are available.

Table 1 Demographic characteristics of participants in the main study

		Three main sites				
	Overall	**Combined main sites**	**Site A**	**Site B**	**Site C**	**Other sites**
Participants, N (%)	734	551 (26%)	165 (20%)	141 (18%)	245 (50%)	183
Staff	146	115	31	23	61	31
Students	588	436	134	118	184	152
Number of tests	3187	2728	1047	690	991	459
Male sex, N (%)	327 (45%)	244 (44%)	64 (39%)	56 (40%)	124 (51%)	83 (45%)
Mean (SD) age	28.8 (10.7)	29.3 (10.7)	27.4 (12.0)	25.4 (10.4)	32.7 (8.6)	27.5 (10.7)
White ethnicity, N (%)	608 (83%)	451 (82%)	150 (91%)	131 (93%)	170 (69%)	157 (86%)

Table 2 Demographic characteristics of interview participants

	Overall number	Site A	Site B	Site C	Other sites
Participants, N	18	8	3	4	3
Role: Staff, N	10	4	3	2	1
Students, N	8	4	0	2	2
Male sex, N (%)	11 (61%)	4	2	4	1
Mean (SD) age	35.1 (14.2)	34.6 (17.3)	45.3 (10.8)	28.8 (6.80)	34.3 (15.3)
White ethnicity, N (%)	17 (94%)	7 (88%)	3 (100%)	4 (100%)	3 (100%)

Table 3 Demographic characteristics of survey participants

	Overall number	Site A	Site B	Site C	Other sites
Participants, N (%)	214	64	47	39	64
Role: Staff, N	72	19	21	16	16
Students, N	142	45	26	23	48
Male sex, N (%)	101 (47%)	22	31	14	34
Mean (SD) age	31.6 (12.8)	29.9 (12.7)	36.2 (11.8)	32.3 (14.4)	29.6 (11.9)
White ethnicity, N (%)	202 (94%)	62 (96%)	47 (91%)	37 (95%)	56 (87%)

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Appendix

Appendix 1: Topic Guide

Topics to be explored

Below is a list of topics to be discussed in this study. The work will remain flexible with respect to participants' agendas. Therefore, we may add new topics as the interviews progress and data collection continues. However, the key topic of participants' views and experiences using the tests, the perceived benefits of testing, barriers and facilitators to undertaking regular testing, trust in test results and intentions to act on positive result, will remain the same.

1. Participants' views and experiences of using the tests.
2. Participants' views and experiences on barriers and facilitators to undertaking regular testing
3. Participants' views on trust in test results.
4. Participants' views and experiences of perceived benefits of testing
5. Participants' intentions to act on positive result.

Using the tests

1. Can you tell me about your experience of self-testing for COVID so far?
2. Can you tell me about the training you had on how to self-test, as part of the FACT study?
   Prompts: What did the training involve? What did you think about the training? Is there anything which would make the training easier for you? How confident did you feel about doing the test?
3. How did you feel about doing the test for the first time?
4. How have you found self-testing over time?
   Prompts: Have you had any difficulties in doing the test? If, so what happened and what did you do? How did you overcome difficulties?

Barriers and facilitators to undertaking regular testing; perceived benefits of testing

1. Can you tell me why you signed up to this study?
2. How have you found self-testing so far?
   Prompts: What has been most difficult in relation to doing the tests?
3. Is there anything which would making the experience easier for you?
4. What is the main reason for you for continuing in the study?
5. What are the benefits for you in taking part in this study, if any?
   Prompts: Are there benefits for you/your family/your friends?

Trust in test results

[For those who have not tested positive]

1. How accurate do you think your test results have been?
   Prompts: Have you had any reason to question your test result?
2. Have you had any other COVID test during the time you have been in the study?
   If yes: How did you access this test? Why did you have this test carried out?

Intentions to act on positive result

[For those participants who have had a positive result]

1. How did you feel about the positive result?

2. What happened when you got your positive test?
   Prompts: What did you do next?
3. Did you have another COVID test?
   Prompts: How did you access this test? When did you have this test?
4. What were the consequences of you getting a positive result?
5. How accurate do you think you self-test results have been?

Follow up:

1. Is there something that you think we didn't cover that is relevant to what we have discussed?
2. Is there anything else you would like to add?

Online Questionnaire

Study Title: The Feasibility and Acceptability of community COVID-19 rapid Testing Strategies (FACTS) study

This survey asks about your views on using tests as part of the FACTS study. This survey takes approximately 5 minutes to complete.

Your demographic details

Q1. Please confirm that you are a university:

-student (undergraduate)

-student (postgraduate)

-staff member

Q2. What type of training did you receive? (Face to face training/ Online Training)

Please confirm your email address, by which you received this survey link, so we can link your answers to the demographic information you have already provided in the app.

Your symptoms

Since receiving the FACTS training, have you had any of the following symptoms:

a. feeling feverish: (Yes / No)

If yes, when did your symptoms start/end?

b. A new, continuous cough? (New: means a cough that you've not had before, or if you usually have a cough, it's got worse. Continuous: means coughing a lot for more than an hour, or 3 or more coughing episodes in 24 hours) (Yes / No)

If yes, when did your symptoms start/end?

c. Feeling unusually short of breath? (Yes / No)

If yes, when did your symptoms start/end?

d. a loss or change to your sense of smell or taste? (Yes / No)

If yes, when did your symptoms start/end?

e. Feeling usually tired? (Yes / No)

If yes, when did your symptoms start/end?

f. Feeling so ill that you've stopped doing all of your usual daily activities? Answer unable to do usual activities if you can't do anything you usually would, such as watch TV, use your phone, read or get out of bed. (Yes/No)

If yes, when did your symptoms start/end?

I have had no symptoms since attending the FACTS training (YES/NO).

Are you taking any medicines for your symptoms? YES/NO. If yes, please tell us the name of the medicines [free text]

Views on testing

Please respond to the statements below using the scale provided. Please give only one answer per statement.

Strongly agree (7), Agree (6), Slightly agree (5), Neither agree nor disagree (4), Slightly disagree (3), Disagree (2), Strongly disagree (1).

I have been provided with [give choice of tests being used in study] self-test.

1. I believe [The test] provides reliable and accurate results
2. I believe it is safe to use [the test].
3. It is important for me to know whether I have COVID-19 or not

Are you carrying out the COVID tests yourself? YES/NO

If YES, go to 4

If NO, go to 8

4. Self-testing with [the test] is easy to fit into my usual activities
5. Self-testing with [the test] every [X] days is easy for me to remember to do
6. I am confident I can carry out [the test]
7. I am confident I can interpret [the test] results
8. Testing for COVID weekly is beneficial to me
9. If I have weekly COVID tests it is beneficial to people who live with me
10. If I have weekly COVID tests it is beneficial to my friends and family
11. If I have weekly COVID tests it is beneficial to the wider community
12. I intend to self-test again in the next week.
13. I would self-isolate if I received a positive test result from [the test].
14. I would self-isolate if I received a positive test result from a laboratory (e.g. NHS or university) test.

Please enter any additional comments you have about self-testing for COVID in the free text box below:

Thank you for completing this survey.

If you have any queries about this survey please contact [insert researcher's name and contact details].

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.