

Daily COVID-19 Self-Testing with a Lateral Flow Antigen Test (CoV-SCAN): an Acceptability Study

Alicia H. Li – Columbia University, Vagelos College of Physicians & Surgeons | Class of 2024
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 Mentor: Kathrine Meyers, DrPH, MS, MPP, Columbia University Irving Medical Center

How acceptable do adults find a once-a-day COVID-19 self-testing regimen with a rapid lateral flow antigen test (CoV-SCAN)?

BACKGROUND

The polymerase chain reaction (PCR) test is widely regarded as the gold standard for COVID-19 diagnosis, but rapid antigen tests also have an important role to play in containing the pandemic. Because rapid antigen tests can be performed at a much higher frequency than PCR tests can, are cheaper to produce, and do not require specialized equipment, they are useful for rapidly identifying individuals with COVID-19, allowing testers to isolate quickly and reduce transmission. Therefore, there is value in the development and dissemination of inexpensive rapid antigen tests that are easy for the lay individual to access, use, and interpret. This is a sub-study of an investigation measuring the sensitivity and specificity of a daily antigen testing regimen compared to a weekly PCR testing regimen. The daily antigen test is CoV-SCAN, a self-administered COVID-19 lateral flow antigen test that is interpreted through an application that incorporates a machine learning algorithm and reports the results.

THEORETICAL FRAMEWORK

This study seeks to understand how acceptable participants find the use of CoV-SCAN. Proctor et al. introduced "acceptability" as an implementation outcome, meaning "the perception among implementation stakeholders that a given treatment, service, practice, or innovation is agreeable, palatable, or satisfactory."¹ Sekhon et al. later proposed the Theoretical Framework of Acceptability (TFA), defining acceptability as consisting of seven domains: affective attitude, burden, ethicality, intervention coherence, opportunity costs, perceived effectiveness, and self-efficacy.² For our study, "acceptability" was operationalized with these definitions in mind.

Figure 1: Preferred COVID-19 Testing Method

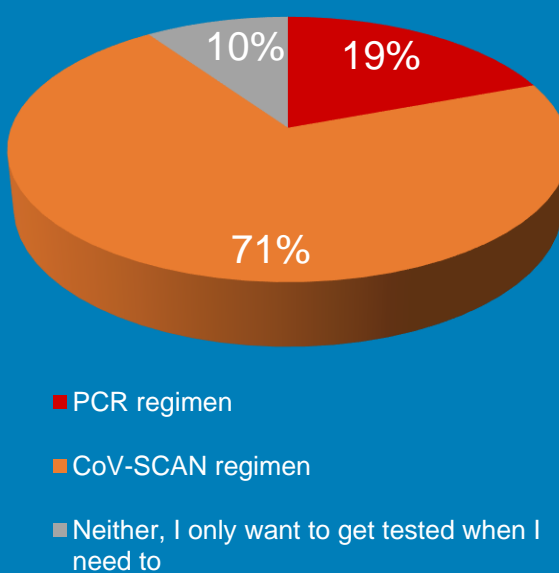


Table 1: CoV-SCAN 21-day Testing Adherence Summary Statistics

Overall (N=31)	
Mean (SD)	87.86% (20.94%)
Median (25%, 75%)	95.24% (90.48%, 100%)
Adherence	N
100%	13
50-99%	15
<50%	3

TABLES

Table 2: Participant Demographics

Overall (N=31)		
Mean age (SD)	44.13	
Race/ethnicity	N	%
Black / African-American / Afro-Caribbean	2	6.45%
Hispanic	5	16.13%
White	19	61.29%
Asian / Pacific Islander	4	12.90%
Native American / Alaskan Native	0	0.00%
Other	0	0.00%
Skipped	1	3.23%
Sex	N	%
Male	11	35.48%
Female	20	64.52%
Intersex	0	0.00%
Prefer not to say	0	0.00%
Highest level education achieved	N	%
Less than high school	0	0.00%
High school	0	0.00%
College	17	54.84%
Above college	14	45.16%
Lives with	N	%
Yes, I live alone	8	25.81%
No, I live with family members	21	67.74%
No, I live with my coworkers	2	6.45%
No, I live with other roommates (who are not my family members or coworkers)	0	0.00%
Lives with an at-risk population	N	%
Children under 18	12	38.71%
Someone who is in a COVID-19 risk group (e.g., people over 65 years and/or with chronic disease)	2	6.45%
None of the above	17	54.84%
Any of the above	14	45.16%

Table 3: Selected Quotes about Context from In-depth Interviews

Personal Context:
 "Interviewer: Can you say a little bit more about how, you know, you'd said me personally I take it very seriously. What do you mean by that?"
 Interviewee: **Oh, I know quite a number, you know I, I know a couple people who have had COVID, and a couple, a number of people who have even passed away from COVID to be honest, so."**

Study Context:
 "I remembered to take it because I had the bag with the stuff in a prominent place in my kitchen; and also, I've been on a health kick where I've been doing a lot of writing down of things. So, it's just another thing on the day to do. **So, plus, I was happy that I was maintaining a perfect score of doing it. So, I was like 'I'm just going to do this.'"**

Public Health Context:
 "So, I was pleasantly surprised that even with missing the alarms and the notifications, that I was able to remember daily. **Maybe part of that was because - I mean, I took it a little while ago before the numbers were even as low as they are now. I remember at the time of taking, it still felt like I had received some advantage over everyone else. So, it was something that was on the forefront of my mind. Like, "Oh, that's right. I get to do this cool thing every day." Whereas, if the virus continues at the numbers that they are now, I'm wondering if that would slip a little."**

Table 4: Quantitative Measures of Acceptability

Acceptability domain and associated questions		Overall (N=31)	
		Strongly agree/agree	Strongly disagree/disagree
Affective attitude	Using the antigen test every day makes me nervous.	0.00%	96.77%
	I like using the antigen test every day.	58.06%	12.90%
Burden	It is burdensome to learn your COVID status on a daily basis.	19.35%	61.29%
	It is easy wait 15 minutes every day to find out your results.	51.61%	29.03%
Self-efficacy	I think using the antigen test every day is inconvenient.	29.03%	61.29%
	It is easy to learn to use CoV-SCAN.	90.32%	9.68%
	It is easy follow the instructions to run the test.	100.00%	0.00%
	It is easy understand the results of the test.	100.00%	0.00%
Opportunity cost	I have developed a habit of using the antigen test in my everyday routine.	54.84%	22.58%
	It is easy for me to find a time to use the antigen test every day.	67.74%	16.13%
Coherence	It is easy for me to find a place to use the antigen test every day.	83.87%	16.13%
	Testing every day using CoV-SCAN to prevent the spread of COVID-19 makes sense to me.	77.42%	9.68%
Perceived effectiveness	I trust the results of CoV-SCAN.	80.65%	6.45%
	I am confident that testing daily using CoV-SCAN will help keep the people I work with safe from COVID-19.	90.32%	3.23%
Ethicality	I believe that it is ethical for an employer to require its employees test regularly for COVID-19.	87.10%	0.00%
	I believe testing for COVID-19 should be a personal choice.	9.68%	74.19%
	I believe sharing COVID-19 test results should be a personal choice.	41.94%	41.94%

METHODS

We conducted a mixed-methods study consisting of a post-intervention survey and in-depth interview. Survey and interview questions were developed by the study team to reflect the seven Sekhon domains of acceptability. 31 employees of a large media company who were engaging in both remote and on-site work were recruited using convenience sampling. Participants were then provided CoV-SCAN tests and instructions to test daily for 21 days. Participants also underwent weekly PCR testing as a condition of their employment. At the conclusion of the testing period, participants completed a survey designed to measure CoV-SCAN acceptability along Sekhon's seven domains of acceptability. A subset of the participants (N=15) engaged in semi-structured in-depth interviews to discuss their experiences using CoV-SCAN. Interview transcripts were coded using a thematic framework analysis using Sekhon's domains. The study team developed an initial codebook organized by seven domains articulated in Sekhon's TFA and applied the codebook to interview transcripts (Dedoose V. 9.0). Additional domains that emerged from the data, as well as child codes in each domain, were incorporated into the codebook.

- Daily COVID-19 self-testing using CoV-SCAN is acceptable to participants and a majority prefer it to weekly PCR.
- The role of context (personal context, study context, and public health context) is **not** accounted for in the TFA but may be an additional "domain" that influences the relationship between acceptability and adherence.

DISCUSSION

Preliminary results suggest that most participants find daily CoV-SCAN testing acceptable across all Sekhon domains (Table 4) and prefer it to other testing schedules (Figure 1). However, adherence was varied (Table 1). This may be explainable by context. Participants' discussions of how their circumstances, including their experiences and work responsibilities (personal context), participation in the study (study context), and perceptions of the pandemic (public health context), influenced how they approached testing suggest a new "context" domain not captured in the TFA that may modulate the relationship between acceptability and adherence. A limitation of this study is its small sample size. COVID-19 numbers were decreasing and vaccination rates were increasing at the time of the study, so many participants became ineligible while others may no longer have felt a sense of urgency to participate.

REFERENCES

1. Proctor E, Silmere H, Raghavan R, et al. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Adm Policy Ment Health*. 2011;38(2):65-76. doi:10.1007/s10488-010-0319-7
2. Sekhon M, Cartwright M, Francis JJ. Acceptability of healthcare interventions: an overview of reviews and development of a theoretical framework. *BMC Health Services Research*. 2017/01/26 2017;17(1):88. doi:10.1186/s12913-017-2031-8

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Contact Information: Alicia H. Li, she/her/hers
 ahl2174@cumc.columbia.edu
 609-619-2692