ICIC Express Letters
Part B: Applications
Volume **13**, Number **9**, September **2022**

ICIC International ©2022 ISSN 2185-2766
pp. **887–895**

PUBLIC AWARENESS, USES, AND ACCEPTANCE TOWARDS GOVERNMENT HEALTH MOBILE APPS DURING THE COVID-19 LOCKDOWN: THE CASE OF SAUDI ARABIA

Nouf Sahal Alharbi[1], Amany Shlyan AlGhanmi[2] and Mochammad Fahlevi[3]

[1]Department of Health Administration
College of Business Administration
King Saud University
Riyadh 11451, Saudi Arabia
noufsahal@ksu.edu.sa

[2]Department of Health Informatics
College of Health Sciences
Saudi Electronic University
Jeddah 93499, Saudi Arabia
a.alghanmi@seu.edu.sa

[3]Management Department, BINUS Online Learning
Bina Nusantara University
Jl. K. H. Syahdan No. 9, Kemanggisan, Palmerah, Jakarta 11480, Indonesia
mochammad.fahlevi@binus.ac.id

Received December 2021; accepted March 2022

Abstract. *This study aimed to investigate the public awareness, use, and acceptability of the Sehha, Mawid, and Tetamman mobile health applications during the COVID-19 pandemic in Saudi Arabia. A cross-sectional online study was conducted using a convenience sample of 554 participants from the Riyadh and Makkah regions during the lockdown in May 2020. One-third of the respondents were aware of all three apps (31.1%). Participants used the mobile health apps most frequently to obtain information about COVID-19, book appointments and audio-video consultations, and as a COVID-19 symptoms checker. However, their use for self-isolation app for location monitoring or to check COVID-19 lab results were insufficient as intended. A comparison of the number of downloads to actual users showed that the user rates were 42.6%, 87.2%, and 91.54% for the Tetamman, Sehha, and Mawid apps, respectively. The overall acceptance rates for the Mawid and Tetamman apps were 4.21±0.62 vs. 4.22±0.58, while the Sehha app reported a moderate mean score 3.73±1.20. The lowest subscale was related to the reliability 2.18±2.09, 2.38±2.16 and 4.40±0.65 for Mawid, Sehha and Tetamman, respectively, while the learnability scale ranged from 4.04±1.28, 4.44±0.54, and 4.52±0.67 in the Sehha, Tetamman and Mawid, respectively. Despite the low usage of some mHealth functions, we identify a positive attitude towards the mHealth apps' acceptability. Hence, it is possible to improve their usage by increasing the public's trust in these apps in Saudi Arabia.*

Keywords: Acceptability, mHealth app, Mobile applications, COVID-19, Coronavirus, Saudi Arabia

1. **Introduction.** The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes the coronavirus disease (COVID-19), is considered the greatest global health threat in recent history [1]. This virus has spread exponentially since the first case reported in Wuhan, China, in December 2019 and has become a global pandemic [2]. Due to the lack of effective pharmaceutical measures and to limit the transmission

DOI: 10.24507/icicelb.13.09.887

of the virus, many healthcare systems relied on precautionary responses, such as case isolation and social distancing. However, since these measures did not prove to be effective in controlling the spread of the pandemic, many governments-imposed travel restrictions have even resorted to a full lockdown [2,3].

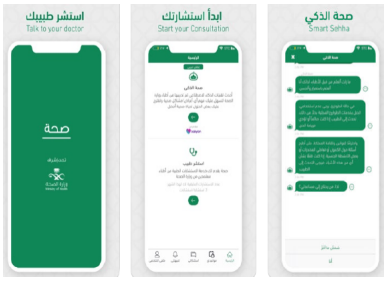
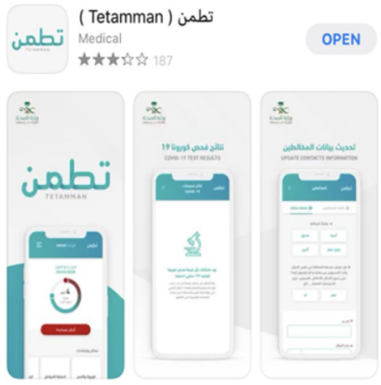
Fortunately, this is the digital technology era, and the World Health Organization (WHO) has disseminated a list of recommendations to improve population health through the adoption of health information technologies [4]. As a result, governments and health organizations began using digital tools to prevent, manage, and control the spread of COVID-19. These technologies include online dashboards, web portals, robots, and mobile health applications (mHealth apps) [5-7]. In 2019, it was estimated that there were more than 40 million mobile cellular users in Saudi Arabia, with 95% having access to the Internet [8]. Considering the widespread adoption of smartphones by the general population, the Saudi Ministry of Health (MOH) launched three mHealth apps for public health purposes [3].

The first mHealth app, called "Sehha", was launched in December 2017 and played a vital role at the beginning of the pandemic. This was due to the fact that it was designed to provide sustainable and innovative solutions that enabled the consumers (app users) to receive healthcare and preventive care at home through digital and telecommunication services, such as virtual clinics and teleconsultation. This kind of accessibility was essential, especially for follow ups for the medical condition of the patients without putting them at risk of getting infected due to being physically present at a clinic. The second service was a self-assessment feature on the Ministry's official appointment booking app (Mawid), which had already been launched in 2018. This application was intended to provide a list of self-assessment questions for the app users to determine if they had developed any signs or symptoms in relation to the infection. The third mHealth app (Rest-assured or Tetamman) was created in April 2020. It was designed specifically to assess whether the users were either of an unconfirmed infection status and required social distancing or confirmed infected cases who required quarantine for 14 days. This led to them being offered a timer and general protective and supportive precautions. In addition, an optional feature was provided that allowed the contact numbers to reach the authorities much faster in case of an emergency. Table 1 summarizes the main functions of the three apps.

Mobile health apps can be supportive healthcare tools, especially in developing countries where healthcare systems are ill-equipped to manage the burgeoning COVID-19 cases [9]. Previous studies showed that two of the main advantages of using mobile health systems were the assurance of patient safety and reduction in costs [10,11]. Nevertheless, the benefits of the mHealth apps can only be achieved when the user actually accepts and uses them. With the disease being a recent occurrence, there is now an opportunity for effective use of the mHealth apps during the pandemic [12,13]. Therefore, this study aimed to assess the public awareness, uses, and acceptability of the government's mHealth apps during the COVID-19 lockdown in Saudi Arabia.

The phenomenon that occurs today is a research gap because any sophisticated technology is made, of course it will not work effectively if it does not have a real impact on the community. This is where the adoption of technology platforms plays an important role in fighting the spread of COVID-19. The more people know and apply technology in tracking, the better it will be in fighting this pandemic. This research is useful to provide an overview of population awareness regarding digital adoption of the mHealth apps during this pandemic. Saudi Arabia is also trying to adopt a technology that is easily accessible to the public regarding information on the spread of COVID-19. The government of Saudi Arabia, for example, enforces a policy for immigrants to download the application. Later, the newcomers will be given instructions on how to use them to make tracking and monitoring easier during the quarantine period. Anyone who violates the quarantine rules will be subject to sanctions.

TABLE 1. Sehha, Mawid and Tetamman application's overview

Sehha	Provider: Ministry of Health Saudi Arabia (2017) Price: Free	
	Size: 173.3 MB	
	Category: Medical Functions: Raise awareness, video-audio consultation, medications and current states and statistics	
	Latest update: 29 April 2020	
	Compatibility: - Requires iOS 9.0 or later. Compatible with iPhone, iPad and iPod touch. - Android 4.3 and up.	
	Languages: English, Arabic	
Mawid	Provider: Ministry of Health Saudi Arabia (2018) Price: Free	
	Size: 93 MB	
	Category: Health and Fitness Functions: Self-assessment, book appointment with PHC center and current states and statistics	
	Latest update: 24 June 2020	
	Compatibility: - Requires iOS 10.0 or later. Compatible with iPhone, iPad and iPod touch. - Android 5.0 and up.	
	Languages: English, Arabic	
Tetamman	Provider: Ministry of Health Saudi Arabia (2020) Price: Free	
	Size: 175.9 MB	
	Category: Medical Functions: Self-assessment, raise awareness, test lab results, current states and statistics and self-isolation quarantine	
	Latest update: 25 August 2020	
	Compatibility: - Requires iOS 11.0 or later. Compatible with iPhone, iPad and iPod touch. - Android 5.0 and up.	
	Languages: English, Arabic	

2. **Methods.** A cross-sectional study was conducted among the general population of two major provinces in Saudi Arabia: Riyadh, the capital city in the eastern region, and the Makkah region. We focused on these cities as they had the highest number of reported COVID-19 cases. We conducted an online survey from May 7 to 17, 2020 due to the social distancing regulations. Saudi citizens and residents aged 18 years and older were invited to participate in this study. The study protocol and informed consent form were in

accordance with the standards of the Research Ethics Committee, Deanship of Scientific Research at Saudi Electronic University and received approval (SEUREC-CHS20107).

Data were collected via an online self-administered questionnaire developed by the researchers and adopted from the technology acceptance theories [9,14-16]. The questionnaire consisted of three parts.

- Participants' characteristics
- Participants' awareness and uses of the mHealth apps
- Participants' acceptance of the mHealth apps

In general, the instrument examined public perceptions of the government's health apps. The respondents' awareness and use of the apps were solicited based on their actual downloading and use of the apps. If the respondents were unaware and/or had never actually used the apps, they were asked to skip the third section, which examined the acceptability levels of the mHealth apps individually. We assessed the acceptability level using 18 questions which covered the following six domains: learnability – the users' ability to learn how to use the app; usability – the design aspects in terms of ease of use; usefulness – the extent to which the apps helped the users achieve their purpose; cognitive-load, the total amount of mental effort used by the individual's working memory in order to understand the app; security, the users' concern about digital privacy; and reliability, the users' trust and dependability on the app [9,14-16]. Respondents were asked to rate their perceptions on a 5-point Likert scale which ranged from 1 (strongly disagree) to 5 (strongly agree).

Data were analyzed using the Statistical Package for Social Science (SPSS) version 22 (Armok, NY, USA). The analysis procedures included the calculation of frequencies and percentages for the participants' demographic characteristics and questionnaire items. Additionally, we calculated the mean and standard deviation for all questionnaire items in the last section of the instrument. Finally, we performed Spearman's rank correlation to explore the association between the user's acceptance level and their demographic characteristics. Statistical significance level was assumed for all estimations as a $p \leq 0.05$.

3. **Results.** A total of 554 participants completed the survey, most of whom were Saudi citizens (92.6%), female (65.7%), aged between 18 and 30 years (36.3%), and bachelor's degree holders (54.3%). Descriptive data of the subjects' characteristics are presented in Table 2.

Table 3 presents the participants' awareness and use of the mHealth apps. Majority of the study sample (85.7%) were aware of all three apps. However, only a little over 50% of the participants had downloaded at least one of the health apps (57%). This figure reflected the low adoption level of the app services, such as video calls and COVID-19 symptom checkers, which ranged from 5.8% to 22%. Compared to the number of app downloaders to users, we found that the user rates for Tetamman, Sehha, and Mawid were 42.6%, 87.2%, and 91.54% (Figure 1).

Table 4 presents the acceptability mean scores of the apps. Descriptive analysis revealed a high overall mean of acceptability scores for the Mawid and Tetamman apps 4.21±0.62 vs. 4.22±0.58, while a moderate mean score of 3.73±1.20 was revealed for the Sehha app. Reliability scores were 2.18±2.09 and 4.40±0.65 for the Mawid and Tetamman apps, respectively, while learnability scores were 4.04±1.28, 4.44±0.54, and 4.52±0.67 for the Sehha, Tetamman, and Mawid apps, respectively. Regarding the level of user acceptance in accordance with the participants' characteristics, none of them were significantly associated (shown in Table 3).

To the best of our knowledge, this is the first study to provide a comprehensive picture of the government's mHealth apps in terms of public awareness, uses, and acceptability during the COVID-19 lockdown in Saudi Arabia. There was a relatively low level of

TABLE 2. Study participants' characteristics ($N = 554$)

Participants characteristics	N (554)	%
Gender		
Male	190	34.3
Female	364	65.7
Nationality		
Saudi	513	92.6
Non-Saudi	41	7.4
Age		
18-30 years	201	36.3
31-40 years	205	37
41-50 years	96	17.3
$>$ 50 years	52	9.4
Education level		
Highschool or less	68	12.2
Diploma	53	9.5
Bachelor	300	54.3
Postgraduate	133	24
Monthly income		
7000 SR or less	189	34.1
$>$ 7000 SR	365	65.9
Occupation		
Healthcare providers	177	31.9
Non-healthcare providers	377	68.1
Region		
Riyadh	245	44.2
Makkah	309	55.8

awareness as only about one-third of the participants were aware of all three apps. The level of app usage was moderate to high among participants who had downloaded the apps. The most used functions on the mHealth apps were using a mobile device to obtain information about COVID-19, booking appointments and audio-video consultations, and as a COVID-19 symptom checker. In contrast, their use for self-isolation app for location monitoring or to check COVID-19 lab results were insufficient as intended. The lack of mHealth app use has also been observed in recent studies among patients with cardiovascular disease and cancer. This suggests that the public is generally uncomfortable seeking health services online, which is also consistent with previous studies that have highlighted some of the barriers [17,18].

Consistent with previous studies that assessed mHealth app acceptance in developed and developing countries, the participants of our study reported relatively moderate to high technology acceptance [19-23]. Furthermore, when we attempted to identify the factors that influenced the acceptance of the mHealth apps, we did not find any contributing demographic factors. These observations reflected findings from an earlier study that assessed the awareness of Malaysian patients regarding the use of health smartphone technology and how useful they found it [24]. In our study, the acceptability level was categorized according to six domains. All subscales reported a high to moderate level of reliability or trustworthiness on the Sehha and Mawid apps. Previous studies have demonstrated a relationship between trust and the optimal use of digital health technologies [18,25-30]. Furthermore, a recent study explored user acceptability of a COVID-19

TABLE 3. Knowledge and extent of the mHealth apps' uses ($N = 554$)

	N (554)	%
Do you know about the health apps?		
Yes	475	85.7
No	79	14.3
Do you know that all these apps are provided by MOH?		
No	127	22.9
I know only one app	131	23.6
I know 2 apps	120	21.7
Yes, I know for all of them	176	31.8
Number of apps downloaded		
0	236	42.59
1	175	31.58
2	115	20.78
3	28	5.05
Have you got COVID-19 information from the apps?		
Yes	205	37
No	349	63
Have you used a video call via the Sehha app?		
Yes	32	5.8
No	522	94.2
Have you got an online consultation via the Sehha app?		
Yes	140	25.3
No	414	74.7
Have you booked an appointment via the Mawid app?		
Yes	160	28.9
No	394	71.1
Have you used the service designed for self-isolation via the Tetamman app?		
Yes	30	5.42
No	524	94.58
Have you used COVID-19 symptoms checker via the Mawid app?		
Yes	122	22
No	432	78
Have you checked your COVID-19 lab results via the Tetamman app?		
Yes	23	4.2
No	531	95.8
Have you registered all name of persons that are in direct contacts with you via the Tetamman app?		
Yes	13	2.3
No	541	97.7
In emergency cases, have you used the Tetamman or Mawid apps?		
Yes	40	7.2
No	514	92.8

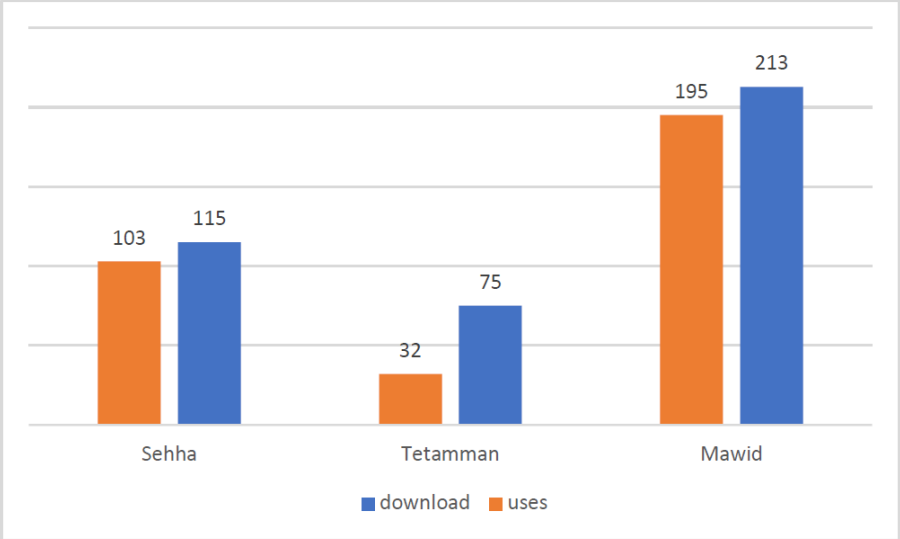


FIGURE 1. A comparison of the mHealth app users to downloaders

TABLE 4. The acceptability mean scores of all three apps

Scales mean/(SD)	Mawid ($N = 195$)	Sehha ($N = 103$)	Tetamman ($N = 35$)
Overall	4.21 (.62)	3.73 (1.20)	4.22 (.58)
Learnability	4.52 (.67)	4.04 (1.28)	4.44 (.54)
Usability	4.47 (.70)	4.0 (1.29)	4.41 (.58)
Usefulness	4.10 (.85)	3.85 (1.29)	4.24 (.74)
Cognitive load	4.10 (.84)	3.69 (1.28)	4.10 (.58)
Security	4.25 (.72)	2.92 (1.64)	3.17 (1.0)
Reliability	2.18 (2.09)	2.38 (2.16)	4.40 (.65)

contact tracing app in France, Germany, Italy, the UK, and the US, and the results revealed that individuals with lower trust in the mHealth app were less likely to use it [31]. Moreover, it was observed that the lack of trust resulted in poor adoption of the apps among the users of mHealth for asthma. Users' readiness has always been a key element in achieving technology trust [32,33]. Within the context of our study, since COVID-19 is a new phenomenon which requires urgent reliance on mHealth apps as a strategic option to deliver healthcare services, this lack of trust might affect the population's readiness for sustainable use.

Like in many other countries, during the COVID-19 pandemic in Saudi Arabia, the public was exposed to a number of mHealth apps. However, according to a recent review, the number of available apps was not necessarily related to the severity of the disease in this region [34]. Since the Sehha, Mawid, and Tetamman apps were developed by the same organization with an overlap in some of the functions, such as COVID-19 symptoms checkers, it might affect the reliability scale in our study. Therefore, for this project to succeed, more effort needs to be put into distributing the apps more directly to the users along with the strategies for effective use. A review of more than 100 studies of mHealth apps recommended that instructions about the apps functionalities and advantages should be introduced to users to reduce their complexity [24]. Without guidance, the users might simply choose the most popular app, which was reflected in our study, where the lowest users' rate was related to the Tetamman app, which had 5000 downloads at the time of the study [6,10,11]. Therefore, by introducing many apps, health policymakers must consider the issue of fragmentation [24,35,36].

4. **Conclusions.** This cross-sectional survey reported the public awareness, uses, and acceptability of the government's mHealth apps during the COVID-19 pandemic in Saudi Arabia. Despite low awareness and usage of some mHealth functions, we identified a positive attitude towards the mHealth apps' acceptability, which suggests that it is possible to improve usage by increasing the public's trust in these apps. However, this study has several limitations. First, the data were cross-sectional; therefore, biases can result from non-responses and self-reported data. Second, since the number of actual users of the Tetamman app was considerably lower compared to the other two, the generalizability of the findings is limited. Therefore, future research should examine the efficacy of these apps and their potential for improvement.

REFERENCES

[1] World Health Organization, *Clinical Management of Severe Acute Respiratory Infection (SARI) When COVID-19 Disease is Suspected: Interim Guidance*, (No. WHO/2019-nCoV/clinical/2020.4), https://apps.who.int/iris/bitstream/handle/10665/331446/WHO-2019-nCoV-clinical-2020.4-eng.pdf?sequence=1&isAllowed=y, Accessed on Mar. 25, 2020.

[2] R. Forman, R. Atun, M. McKee and E. Mossialos, 12 lessons learned from the management of the coronavirus pandemic, *Health Policy*, vol.124, no.6, pp.577-580, 2020.

[3] M. Hassounah, H. Raheel and M. Alhefzi, Digital response during the COVID-19 pandemic in Saudi Arabia, *Journal of Medical Internet Research*, vol.22, no.9, e19338, 2020.

[4] World Health Organization, *Coronavirus*, https://www.who.int/health-topics/coronavirus, Accessed on Mar. 27, 2020.

[5] M. F. Alwashmi, The use of digital health in the detection and management of COVID-19, *International Journal of Environmental Research and Public Health*, vol.17, no.8, p.2906, 2020.

[6] J. Budd, B. S. Miller, E. M. Manning, V. Lampos, M. Zhuang, M. Edelstein, G. Rees, V. C. Emery, M. M. Stevens, N. Keegan, M. J. Short, D. Pillay, E. Manley, I. J. Cox, D. Heymann, A. M. Johnson and R. A. McKendry, Digital technologies in the public-health response to COVID-19, *Nature Medicine*, vol.26, no.8, pp.1183-1192, 2020.

[7] M. N. Islam, I. Islam, K. M. Munim and A. N. Islam, A review on the mobile applications developed for COVID-19: An exploratory analysis, *IEEE Access*, vol.8, pp.145601-145610, 2020.

[8] The World Bank, *Mobile Cellular Subscriptions (per 100 People)*, https://data.worldbank.org/indicator/IT.CEL.SETS.P2, Accessed on May 8, 2020.

[9] A. R. Ahlan and B. I. Ahmad, User acceptance of health information technology (HIT) in developing countries: A conceptual model, *Procedia Technology*, vol.16, pp.1287-1296, 2014.

[10] W. J. Gordon, A. Landman, H. Zhang and D. W. Bates, Beyond validation: Getting health apps into clinical practice, *NPJ Digital Medicine*, vol.3, no.1, pp.1-6, 2020.

[11] C.-K. Kao and D. M. Liebovitz, Consumer mobile health apps: Current state, barriers, and future directions, *PM&R*, vol.9, no.5S, pp.S106-S115, 2017.

[12] C. Nadal, C. Sas and G. Doherty, Technology acceptance in mobile health: Scoping review of definitions, models, and measurement, *Journal of Medical Internet Research*, vol.22, no.7, e17256, 2020.

[13] G. Fagherazzi, C. Goetzinger, M. A. Rashid, G. A. Aguayo and L. Huiart, Digital health strategies to fight COVID-19 worldwide: Challenges, recommendations, and a call for papers, *Journal of Medical Internet Research*, vol.22, no.6, e19284, 2020.

[14] F. D. Davis, Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, vol.13, no.3, pp.319-340, 1989.

[15] J. Schobel, R. Pryss, T. Probst, W. Schlee, M. Schickler and M. Reichert, Learnability of a configurator empowering end users to create mobile data collection instruments: Usability study, *JMIR mHealth and uHealth*, vol.6, no.6, e9826, 2018.

[16] R. Harrison, D. Flood and D. Duce, Usability of mobile applications: Literature review and rationale for a new usability model, *Journal of Interaction Science*, vol.1, no.1, pp.1-16, 2013.

[17] E. E. Ali, S. S. L. Chan, J. L. Leow, L. Chew and K. Y.-L. Yap, User acceptance of an app-based adherence intervention: Perspectives from patients taking oral anticancer medications, *Journal of Oncology Pharmacy Practice*, vol.25, no.2, pp.390-397, 2019.

[18] V. Haldane, Y. G. Tan, K. W. Q. Teo et al., Perspectives on acceptance and use of a mobile health intervention for the prevention of atherosclerotic cardiovascular disease in Singapore: Mixed-methods study, *JMIR mHealth and uHealth*, vol.7, no.3, e11108, 2019.

[19] X. Liu, R. Wang, D. Zhou and Z. Hong, Feasibility and acceptability of smartphone applications for seizure self-management in China: Questionnaire study among people with epilepsy, *Epilepsy & Behavior*, vol.55, pp.57-61, 2016.

[20] A. Miner, E. Kuhn, J. E. Hoffman, J. E. Owen, J. I. Ruzek and C. B. Taylor, Feasibility, acceptability, and potential efficacy of the PTSD Coach app: A pilot randomized controlled trial with community trauma survivors, *Psychological Trauma: Theory, Research, Practice, and Policy*, vol.8, no.3, pp.384-392, 2016.

[21] K. H. McManama O'Brien, M. LeCloux, A. Ross, C. Gironda and E. A. Wharff, A pilot study of the acceptability and usability of a smartphone application intervention for suicidal adolescents and their parents, *Archives of Suicide Research*, vol.21, no.2, pp.254-264, 2017.

[22] R. C. Moore, C. N. Kaufmann, A. S. Rooney et al., Feasibility and acceptability of ecological momentary assessment of daily functioning among older adults with HIV, *The American Journal of Geriatric Psychiatry*, vol.25, no.8, pp.829-840, 2017.

[23] G. A. Melvin, D. Gresham, S. Beaton, J. Coles, B. J. Tonge, M. S. Gordon and B. Stanley, Evaluating the feasibility and effectiveness of an Australian safety planning smartphone application: A pilot study within a tertiary mental health service, *Suicide and Life-Threatening Behavior*, vol.49, no.3, pp.846-858, 2019.

[24] M. Hussain, A. Al-Haiqi, A. A. Zaidan, B. B. Zaidan, M. L. M. Kiah, N. B. Anuar and M. Abdulnabi, The landscape of research on smartphone medical apps: Coherent taxonomy, motivations, open challenges and recommendations, *Computer Methods and Programs in Biomedicine*, vol.122, no.3, pp.393-408, 2015.

[25] F. Hanif, J. C. Read, J. A. Goodacre, A. Chaudhry and P. Gibbs, The role of quality tools in assessing reliability of the Internet for health information, *Informatics for Health and Social Care*, vol.34, no.4, pp.231-243, 2009.

[26] D. M. Zulman, M. Kirch, K. Zheng and L. C. An, Trust in the Internet as a health resource among older adults: Analysis of data from a nationally representative survey, *Journal of Medical Internet Research*, vol.13, no.1, e19, 2011.

[27] L. Dennison, L. Morrison, G. Conway and L. Yardley, Opportunities and challenges for smartphone applications in supporting health behavior change: Qualitative study, *Journal of Medical Internet Research*, vol.15, no.4, e86, 2013.

[28] H. Khalid, E. Shihab, M. Nagappan and A. E. Hassan, What do mobile app users complain about?, *IEEE Software*, vol.32, no.3, pp.70-77, 2014.

[29] E. L. Murnane, D. Huffaker and G. Kossinets, Mobile health apps: Adoption, adherence, and abandonment, *Adjunct Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2015 ACM International Symposium on Wearable Computers*, pp.261-264, 2015.

[30] R. Schnall, T. Higgins, W. Brown, A. Carballo-Dieguez and S. Bakken, Trust, perceived risk, perceived ease of use and perceived usefulness as factors related to mHealth technology use, *Studies in Health Technology and Informatics*, vol.216, pp.467-471, 2015.

[31] S. Altmann, L. Milsom, H. Zillessen et al., Acceptability of app-based contact tracing for COVID-19: Cross-country survey study, *JMIR mHealth and uHealth*, vol.8, no.8, e19857, 2020.

[32] J. S. M. Belisario, K. Huckvale, G. Greenfield, J. Car and L. H. Gunn, Smartphone and tablet self management apps for asthma, *Cochrane Database of Systematic Reviews*, no.11, 2013.

[33] D. H. Mcknight, M. Carter, J. B. Thatcher and P. F. Clay, Trust in a specific technology: An investigation of its components and measures, *ACM Transactions on Management Information Systems (TMIS)*, vol.2, no.2, pp.1-25, 2011.

[34] R. Collado-Borrell, V. Escudero-Vilaplana, C. Villanueva-Bueno, A. Herranz-Alonso and M. Sanjurjo-Saez, Features and functionalities of smartphone apps related to COVID-19: Systematic search in app stores and content analysis, *Journal of Medical Internet Research*, vol.22, no.8, e20334, 2020.

[35] E. Charani, E. Castro-Sánchez, L. S. Moore and A. Holmes, Do smartphone applications in healthcare require a governance and legal framework? It depends on the application!, *BMC Medicine*, vol.12, no.1, pp.1-3, 2014.

[36] N. Alharbe, Impact of digitization of healthcare system in Saudi Arabia, *ICIC Express Letters*, vol.15, no.3, pp.285-296, DOI: 10.24507/icicel.15.03.285, 2021.