

# Using mobile health applications to enhance physical activity in Saudi Arabia: a cross-sectional study on users' perceptions

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Received 31 August 2021; revised 15 December 2021; editorial decision 1 February 2022; accepted 17 March 2022

**Background:** This research aims to assess the users' perceptions of usability and quality of mobile health applications used for promoting physical activity in Saudi Arabia.

**Methods:** This was a quantitative cross-sectional study. A survey was developed based on the Technology Acceptance Model (TAM) and the Mobile Application Rating Scale (MARS) and distributed among the Saudi population through social media to assess the users' perceptions of using mobile applications to enhance physical activity. The survey questionnaire consisted of 27 questions in six sections, including demographics (nine items), perceived usefulness (three items), perceived ease of use (three items), attitudes (three items), user experience (six items) and subjective quality (three items). All the participants were in Saudi Arabia and >15 y of age.

**Results:** A total of 195 m-Health users participated in the survey. Of the total participants, 25.1% were overweight and 21.0% were obese. The workout frequency of most users was rarely (32.3%) and three to four times a week (29.2%). In addition, 55.9% of the users agreed that the application they use served all fitness levels and >80% either agreed or strongly agreed that it was easy for them to learn how to use the application. More than 70% of users agreed or strongly agreed that the application enhanced their knowledge of workouts and physical activity and >90% would recommend the application to others. There were no differences identified between the male and female participants and younger (<40 y) and older (>40 y) participants with respect to perceived usefulness and ease of use, attitudes, experiences and subjective quality. However, significant differences were observed between participants <40 y and >40 y of age in terms of perceived ease of use of mHealth applications.

**Conclusion:** mHealth users across Saudi Arabia believe that the mHealth applications have good usability and quality factors. As a result, they can motivate people and help them achieve their goals in relation to physical activities.

**Keywords:** applications, exercise, experience, m-Health, physical activities.

## Introduction

Exercise and physical activities play a major role in improving the health and well-being of people.<sup>1</sup> Studies have identified that

adopting physical exercise as a daily routine is associated with lowering the risk of depression, cardiovascular disease (CVD; by a maximum of 39%) and chronic diseases like hypertension, diabetes mellitus (type 2) and cancer (such as breast and colon

cancer).<sup>1-4</sup> In contrast, reduced physical activity in daily life is associated with a 52% higher risk of death due to various conditions and a 29% higher risk of death from cancer.<sup>2</sup> Adopting a healthy lifestyle, controlling weight and maintaining it within the suggested range and regular physical activity are some of the major guidelines identified for preventing cancer, which if not followed may increase the risk of cancer by 20% and if followed can significantly reduce the chances of developing cancer.<sup>3,5</sup>

The impact of various chronic diseases can be reduced to a great extent by regularly participating in physical activities.<sup>2</sup> The American Heart Association advises maintaining weekly physical activities for a minimum of 150 min for adults and performing moderate-intensity physical activities for 75 min in order to enhance and preserve cardiovascular strength.<sup>4</sup> Physical activity is also helpful in preventing and controlling chronic conditions such as high blood pressure, obesity and diabetes mellitus.<sup>2</sup> Vast research has been conducted on the benefits of physical activities and their impact on health. A systematic review<sup>6</sup> of recent studies demonstrated a dose-response relationship between physical activities and premature mortality and primary and secondary prevention of chronic conditions. In addition, it was concluded that significant health benefits can be achieved even with a minor amount of physical activity. Studies<sup>7-10</sup> have also identified the benefits of physical activities in preventing other psychological conditions, including mild cognitive impairment, dementia, stress and anxiety and mood fluctuations.

Considering its importance, children should participate in school in various physical activities, including sports, games and exercise.<sup>11,12</sup> However, it may not be possible to participate in physical activity while working. As a result, people depend on professional services such as gyms and instructors to guide their physical activities. It is also important to consider a professional approach, as there is a need to monitor levels of physical activity and diet.<sup>13</sup> Moreover, the recent coronavirus disease 2019 (COVID-19) pandemic has affected many people in various ways due to frequent lockdowns and curfews, restricting them mostly to their homes. A recent study in the UK<sup>14</sup> reported negative changes in eating behaviour and physical activity (e.g. 56% reported snacking more frequently) and experiencing barriers to weight management (e.g. problems with motivation and control around food) compared with before the lockdowns. However, another study<sup>15</sup> found that physical activity is beneficial in improving the clinical conditions that are most frequently associated with severe COVID-19. Therefore there is a need to promote physical activity through cost-effective methods that may not be influenced by the COVID-19 pandemic. Online consultations of mHealth applications in this context can be an effective approach for promoting physical activities through professional guidance.<sup>16</sup>

However, there is a need to assess the readiness of the population in regards to their ability to use online services, which may depend on several factors, including computer/online knowledge; access to the internet, smartphones or computers; users' attitudes and needs etc. A survey conducted in the USA concluded that nearly three-quarters of participants used smartphones, comparable to populations in developing countries.<sup>17</sup> The delivery of healthcare must be ensured whenever the patient is in need. However, recovered cancer patients reported lacking the care needed to overcome depression and post-treatment side effects.<sup>18</sup> Therefore, in many situations, patients acquire this

support and the needed information to improve their well-being from other sources online.<sup>18</sup> Consequently, mobile health (mHealth) utilization to deliver healthcare services, awareness and support is highly beneficial in assuring patients' commitment to their management plan.<sup>1,17,18</sup>

mHealth can help with behavioural changes such as smoking cessation, diet and physical activity.<sup>19</sup> However, the impact of mHealth may depend on its features, including accessibility, cost-effectiveness and interactivity through notifications and reminders.<sup>19,20</sup> In research targeting patients with chronic diseases, patients expressed the positive impact of using mHealth applications in pursuing their desires in improving their health, supporting their judgment and understanding of conversations with their physicians.<sup>21</sup>

This expansion of mHealth reflected on accelerating the development of diet and physical activity applications that support improving habits and positively changing behaviours.<sup>20</sup> Furthermore, this acceleration was supported with research discussing the potential efficacy of these applications on positively changing the users' dietary and physical behaviors.<sup>20</sup> To achieve higher levels of effectiveness, the health applications were equipped with persuasive features such as reminders, achievement recognition and personalization.<sup>1,20</sup> One study found that people using health-promoting applications were motivated to enhance their diet, develop their exercise routines and stay fit.<sup>22</sup> Correspondingly, another study identified a relationship between the utilization of mHealth and higher exercise rates and a preference for a healthier diet.<sup>23</sup> Moreover, using health applications to enhance the physical activity of colorectal patients treated with chemotherapy proved to be successful in increasing muscle health and cardiac and lung capacity and mitigating cancer and the treatment side effects.<sup>18</sup>

A number of research studies have been conducted to analyse the effect of physical activity on healthy individuals and patients with chronic diseases, but few discussed the users' approach toward using mHealth applications supporting physical activities.<sup>6</sup> Moreover, in Saudi Arabia, where the prevalence of various chronic diseases such as diabetes, infectious diseases, hypertension and cancer is increasing,<sup>24</sup> there has not been sufficient, if any, research focusing on evaluating the use and effectiveness of mHealth applications in promoting physical activity. Therefore this research aimed to assess the users' perceptions of mobile health applications to promote physical activity in Saudi Arabia.

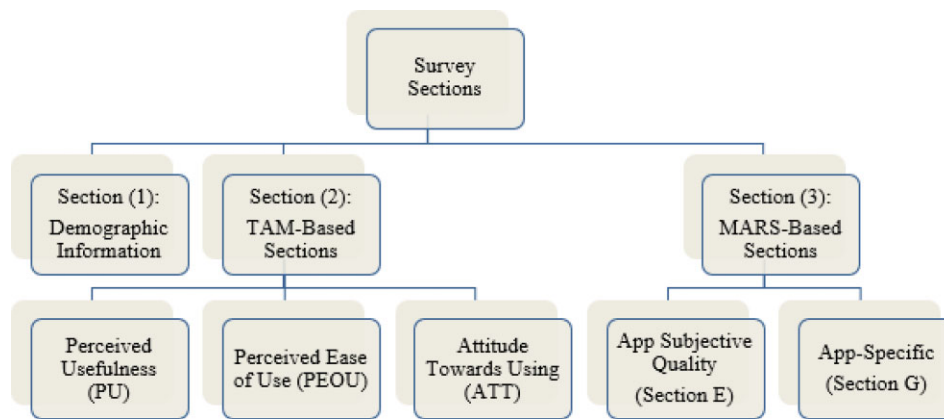
## Methods

### Study design and participants

This is a cross-sectional study. A survey was constructed based on the Technology Acceptance Model (TAM)<sup>25</sup> and the Mobile Application Rating Scale (MARS)<sup>26</sup> and distributed through social media to assess the Saudi population's perceptions of mHealth applications to improve their physical activity.

### Questionnaire design

An online-based survey consisting of 27 questions were distributed in six sections in English. Answers were scored on a



**Figure 1.** Flowchart of the survey sections.

5-point Likert scale testing the individual's degree of agreement:<sup>27</sup> 1=strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree. The first section of the survey included the demographic information of users: gender, age, nationality (Saudi/non-Saudi), place of residence, level of education, occupation, body mass index (BMI), frequency of exercise and fitness application used. Figure 1 summarizes the survey sections.

#### TAM-based sections

The TAM model was created to clarify attitudes toward technology and is believed to be the most applied model in evaluating applications.<sup>28,29</sup> It is built on the Theory of Reasoned Action (TRA), which focuses on the person's deliberate attitudes.<sup>29</sup> Three factors were used in this study: perceived usefulness, which focuses on the positive impact of a technology/application in achieving the desired tasks; perceived ease of use, which reflects the ease and convenience of using a technology/application; and attitude towards using, which translates the person's assessment of elements as useful or not useful.<sup>15,17</sup>

#### MARS-based sections

The Queensland University of Technology (Brisbane, QLD, Australia) created the MARS model to assess applications based on engagement, functionality, ease of use and information management. Two sections, subjective app quality (section E) and app-specific (section G), evaluate the observed influence of the application on the individual's awareness, behaviours, desires to change and possibility of really changing the desired health habits.<sup>30-32</sup>

#### Inclusion and exclusion criteria

All people >15 y of age who were living and using mHealth applications in Saudi Arabia were included in the study. The BMI of the participants was assessed using levels including underweight, normal weight, overweight, obese and not available. The total number of participants in the survey was 505. Participants not using mobile applications to promote their physical activity were excluded. Thus a total of 195 participants were included.

#### Data collection

Informed consent was provided by each participant before the study by checking a box on the online questionnaire. Information about the study was provided to the participants in the survey's introduction page. The survey link to the questionnaire was distributed on various online community portals and social media platforms including Facebook, WhatsApp, and Twitter.

#### Data analysis

Data were analysed using basic descriptive statistics in SPSS software (version 1; IBM, Armonk, NY, USA). T-tests were used to compare the differences between the participants of different age groups and genders.

#### Results

The total number of participants who used mobile applications to improve their physical activity was 195 (62.6% female and 37.4% male). Almost all of the users were Saudi (94.4%) and the majority of them lived in the Eastern Province (76.2%); only 1.5% of users lived in the Northern Province. Most of them were >40 y of age (39.5%); the rest ranged between 15 and 40 y of age. A total of 52.3% held a bachelor's degree and 53.3% were employed. Regarding weight, 37.4% had a normal weight, 25.1% were overweight and 21.0% were obese. Some users utilized applications that provided them with workouts and training programs, such as Nike Training (21.5%) and 30-Day Fitness (14.9%), while 37.4% of users used other applications that provided them with features such as counting steps. The participants' workout frequency was rarely (32.3%), three to four times a week (29.2%), two times a week (17.4%) and more than five times a week (16.4%). Table 1 presents the users' demographic information in more detail.

#### Perceived usefulness

More than half of the users (55.9%) agreed that the application they use served all fitness levels, and similarly, almost half of them (48.7%) agreed that it provided different workouts

**Table 1.** Demographic characteristics of the participants

Demographics		Values, n (%)
What is your gender?	Male	73 (37.4)
	Female	122 (62.6)
What is your nationality?	Saudi	184 (94.4)
	Non-Saudi	11 (5.6)
Where do you live?	Eastern Province	150 (76.9)
	Riyadh Province	19 (9.7)
	Western Province	13 (6.7)
	Northern Province	3 (1.5)
	Southern Province	10 (5.1)
How old are you? (years)	15–20	16 (8.2)
	21–25	28 (14.4)
	26–30	29 (14.9)
	31–35	18 (9.2)
	36–40	27 (13.8)
	>40	77 (39.5)
What is your level of education?	Elementary or below	10 (5.1)
	High school	27 (13.8)
	Diploma/certificate	25 (12.8)
	Bachelor's degree	102 (52.3)
	Graduate studies (Masters/PhD)	31 (15.9)
What is your occupation?	Student	29 (14.9)
	Employed	104 (53.3)
	Unemployed	43 (22.1)
	Retired	19 (9.7)
What is your BMI?	Underweight	11 (5.6)
	Normal weight	73 (37.4)
	Overweight	49 (25.1)
	Obese	41 (21.0)
How often do you work out?	Not available	21 (10.8)
	Never	9 (4.6)
	Rarely	63 (32.3)
	2 times a week	34 (17.4)
	3–4 times a week	57 (29.2)
What fitness application do you use?	≥5 times per week	32 (16.4)
	Nike Training	42 (21.5)
	Adidas Training by Runtastic	7 (3.6)
	HASfit: Home Workout Routines	10 (5.1)
	Seven – 7 Minute Workout	20 (10.3)
	30 Day Fitness	29 (14.9)
	Daily Workouts Fitness Trainer	14 (7.2)
Other	73 (37.4)	

targeting different body muscles and various workout types, such as cardio and high-intensity interval training. Moreover, 55.4% agreed and 16.4% strongly agreed that their application was active through notifications, reminders and sharing options that could be adjusted and activated or deactivated. Table 2 provides details of the users' responses.

To identify the differences of opinions in relation to perceived usefulness between male and female participants, a t-test was conducted, as shown in Table 3. The scores for females (mean 3.75 [standard deviation {SD} 0.91]) and males (mean 3.62 [SD

0.90]) identified in the analysis reflected that the applications are effective in terms of perceived usefulness. The t-value, as shown in Table 3, was found to be 0.9694 (0.05 confidence interval [CI]), which was statistically not significant ( $p > 0.05$ ). Therefore, no significant differences of opinions in relation to perceived usefulness of mHealth applications between the genders was observed.

In order to identify the differences of opinions in relation to perceived usefulness between different age groups, a t-test was conducted as shown in Table 4. The scores of participants >40 y of ages (mean 3.55 [SD 0.94]) and participants <40 y of age

**Table 2.** Users' responses to perceived usefulness

Perceived usefulness	Strongly disagree, n (%)	Disagree, n (%)	Neutral, n (%)	Agree, n (%)	Strongly agree, n (%)
The application provides workouts that fit all levels of fitness	7 (3.6)	9 (4.6)	43 (22.1)	109 (55.9)	27 (13.8)
The application contains workouts options for different body muscles and goals (cardio, bodyweight, high-intensity interval training)	11 (5.6)	13 (6.7)	46 (23.6)	95 (48.7)	30 (15.4)
The application provides feedback and contains prompts (reminders, sharing options, notifications etc.) that can be customizable	3 (1.5)	14 (7.2)	38 (19.5)	108 (55.4)	32 (16.4)

**Table 3.** Difference in perceived usefulness by gender

Variable	Sex	n	Mean	SD	df	t-Value	p-Value
Usefulness	Female	122	3.75	0.91	193	0.9694	0.3336
	Male	73	3.62	0.90			

Mean values: 1, very poor; 2, poor; 3, average; 4, good; 5, very good.

**Table 4.** Difference in perceived usefulness by age

Variable	Age (years)	n	Mean	SD	df	t-Value	p-Value
Usefulness	>40	77	3.55	0.94	193	1.8875	0.0606
	<40	118	3.80	0.88			

Mean values: 1, very poor; 2, poor; 3, average; 4, good; 5, very good.

(mean 3.80 [SD 0.88]) reflected that the perceived usefulness of mHealth applications was greater for younger participants than older participants. The t-value, as shown in Table 4, was found to be 1.8875 (0.05 CI), which was not quite statistically significant ( $p=0.06$ ).

### Perceived ease of use

More than 80% of users agreed or strongly agreed that it was easy for them to learn how to use the application. Also, nearly 50% understood the benefit of each workout provided on the application and 76.5% agreed or strongly agreed that each step of the workout was clearly shown and explained. Details are provided in Table 5.

Furthermore, to identify the differences of opinions in relation to perceived ease of use between male and female participants, a t-test was conducted. The scores of females (mean 3.93 [SD 0.85]) and males (mean 3.80 [SD 0.87]) reflected that both female and male participants thought the applications they use

were effective in terms of perceived ease of use. The t-value was found to be 1.0245 (0.05 CI), which was statistically not significant ( $p>0.05$ ). Therefore no significant differences of opinions in relation to perceived ease of use of mHealth applications between the genders was observed. Similarly, to identify the differences of opinions in relation to perceived ease of use between different age groups, a t-test was conducted. The scores of participants >40 y of age (mean 3.72 [SD 0.93]) and participants <40 y of age (mean 3.99 [SD 0.62]) reflected that the perceived ease of use of mHealth applications was greater for younger participants than older participants. The t-value was found to be 2.4335 (0.05 CI), which was statistically significant ( $p=0.01$ ).

### Attitude towards using

A total of 59.0% of users agreed that they did not have difficulty choosing their workout using the application and 50.8% preferred using the application when looking for a workout to do.

**Table 5.** Users' responses on perceived ease of use

Perceived ease of use	Strongly disagree, n (%)	Disagree, n (%)	Neutral, n (%)	Agree, n (%)	Strongly agree, n (%)
It is easy to learn how to use the application, and all the labels and menus are clear	4 (2.1)	5 (2.6)	27 (13.8)	113 (57.9)	46 (23.6)
The benefit of each workout is explained and what it is good for	7 (3.6)	7 (3.6)	47 (24.1)	95 (48.7)	39 (20.0)
The workout steps are clearly displayed and easy to follow	6 (3.1)	5 (2.6)	33 (16.9)	111 (56.0)	40 (20.5)

**Table 6.** Users' responses on attitude toward using

Attitude towards using	Strongly disagree, n (%)	Disagree, n (%)	Neutral, n (%)	Agree, n (%)	Strongly agree, n (%)
It is easy for me to decide my workout in the application	6 (3.1)	6 (3.1)	40 (20.5)	115 (59.0)	28 (14.4)
I prefer using this application to search for a workout to do. It saves me time	9 (4.6)	12 (6.2)	45 (23.1)	99 (50.8)	30 (15.4)
I believe most people can benefit from this application	3 (1.5)	6 (3.1)	34 (17.4)	106 (54.4)	46 (23.6)

Finally, 78% agreed or strongly agreed that the application they use could be advantageous to others, as shown in Table 6.

To identify the differences in attitudes towards mHealth applications between male and female participants, a t-test was conducted. The scores of females (mean 3.81 [SD 0.89]) and males (mean 3.78 [SD 0.82]) reflected that both female and male participants had positive attitudes towards mHealth. The t-value was found to be 0.2345 (0.05 CI), which was statistically not significant ( $p > 0.05$ ). Therefore no significant differences of opinions in relation to attitudes towards mHealth applications between the genders was observed. Similarly, to identify the differences of attitudes towards mHealth applications between different age groups, a t-test was conducted. The scores of participants  $>40$  y of age (mean 3.73 [SD 0.93]) and participants  $<40$  y of age (mean 3.84 [SD 0.82]), reflected that attitudes towards mHealth applications were greater for younger participants and older participants. The t-value was found to be 0.8681 (0.05 CI), which was not statistically significant ( $p > 0.05$ ).

### User experience

About 80% of users believed that their fitness application might raise their awareness of their physical activity and 72.3% of them agreed or strongly agreed that their application enhanced their knowledge of workouts and physical activity. More than 50% agreed that the application might change their attitudes toward maintaining their physical activity. Also, 62% believed the application motivated them to change their habits, thus affecting their physical activity. Similarly, more than half of the users (55.4%) agreed that the application supported their commitment toward maintaining their health and 55.9% agreed that using the

application encouraged them to seek additional help to improve their health (as shown in Table 7).

To identify the differences in perceptions towards mHealth applications between male and female participants, a t-test was conducted. The scores of females (mean 3.79 [SD 0.87]) and males (mean 3.80 [SD 0.89]) reflected that both female and male participants had positive perceptions towards mHealth. The t-value was found to be 0.0770 (0.05 CI), which was statistically not significant ( $p > 0.05$ ). Therefore no significant differences of opinions in relation to perceptions and user experiences towards mHealth applications between the genders was observed.

Similarly, to identify the differences of perceptions towards mHealth applications between different age groups, a t-test was conducted. The scores of participants  $>40$  y of ages (mean 3.72 [SD 0.95]) and participants  $<40$  y of age (mean 3.84 [SD 0.82]) reflected that perceptions towards mHealth were greater among younger participants than older participants. The t-value was found to be 0.9377 (0.05 CI), which was not statistically significant ( $p > 0.05$ ).

### Application subjective quality

More than half of the users (53.8%) would recommend the application to everyone, whereas 39.0% chose to recommend it to several people.

Most users believed they would use the application in the future 11–50 times (37.4%) or  $>50$  times (38.5%). However, 44.6% might pay to use the application, but 46.7% would not. Table 8 presents the users' responses on application subjective quality.

**Table 7.** Users' responses on application-specific questions

Application-specific questions	Strongly disagree, n (%)	Disagree, n (%)	Neutral, n (%)	Agree, n (%)	Strongly agree, n (%)
Awareness: This application is likely to increase my awareness of the importance of maintaining my physical activity	4 (2.1)	6 (3.1)	33 (16.9)	102 (52.3)	50 (25.6)
Knowledge: Using this application increased my knowledge of workouts and physical activity	5 (2.6)	12 (6.2)	37 (19.0)	101 (51.8)	40 (20.5)
Attitudes: This application is likely to change my attitudes toward improving my physical activity	4 (2.1)	5 (2.6)	40 (20.5)	108 (55.4)	38 (19.5)
Intention to change: This application is likely to increase motivation to address my negative behaviours affecting my physical activity	6 (3.1)	18 (9.2)	50 (25.6)	86 (44.1)	35 (17.9)
Help-seeking: Using this application is likely to encourage further help-seeking to improve my physical activity	6 (3.1)	7 (3.6)	45 (23.1)	109 (55.9)	28 (14.4)
Behaviour change: Using this application raised my commitment toward my physical activity	5 (2.6)	10 (5.1)	43 (22.1)	108 (55.4)	29 (14.9)

**Table 8.** Users' responses on application subjective quality

Application subjective quality	Values, n (%)	
Would you recommend this app to people who might benefit from it?	• Not at all – I would not recommend this app to anyone	3 (1.5)
	• There are very few people I would recommend this app to	11 (5.6)
	• Maybe – There are several people whom I would recommend it to	76 (39.0)
	• There are many people I would recommend this app to	50 (25.6)
	• Definitely – I would recommend this app to everyone.	55 (28.2%)
How many times do you think you would use this app in the next 12 months?	• None.	4 (2.1%)
	• 1–2	37 (19.0%)
	• 3–10	6 (3.1%)
	• 11–50	73 (37.4%)
	• >50	75 (38.5%)
Would you pay for this app?	• No	91 (46.7%)
	• Maybe	87 (44.6%)
	• Yes	17 (8.7%)

## Discussion

This research aimed to assess users' perceptions of using mHealth applications to improve their physical activity in Saudi Arabia. Nearly 70% of users believed that their attitudes toward improving their physical activity had probably changed by using the application and that they were motivated to improve habits affecting achievement of that change. The application not only supported them to initiate change, but the application helped them maintain their physical activity and pursue assistance if they needed it. These findings support the research that concluded that people utilizing mHealth applications were driven to enhance their physical activity and food choices.<sup>22,23</sup>

More than half of the users held a bachelor's degree and 15.9% were Masters/PhD graduates, which suggests an

association between education and a focus on improving physical activity using the mHealth application. The reason for this might be a reflection of the individual's understanding and adeptness of using mobile applications.<sup>22,33</sup> A total of 45.6% of users exercised or engaged in physical activities more than three times a week. Research has shown that individuals who regularly exercise are more likely to use mHealth applications to support their physical activity.<sup>34</sup>

More than 60% of users were engaged with their applications by receiving notifications, reminders and the option of sharing achievements with others, which, consequently, motivated more than half of the users to continue improving their physical activity and using the application. These persuasive features, including goal setting, reminders and providing helpful tips, are essential

in strengthening the effect of the mHealth applications on behaviour improvement.<sup>1,20</sup>

More than half of the users believed that the health application was suitable for all fitness levels and they agreed that it would be beneficial for others. A total of 75.9% of users said they would use the application >11 times in the next year, and almost all of the 195 users would recommend using the health application they use to others.

A total of 46.1% of users who participated in the survey were either overweight or obese. mHealth applications can aid in supporting physical activity, providing encouragement to enhance the physical activity of the population in Saudi Arabia. Thus this study contributes to the literature of mHealth and physical activities in maintaining good health in the context of Saudi Arabia.

The study has a few limitations. The ratio of female participants to male participants was not appropriate and most of the participants were located in the Eastern province. Therefore future studies should focus on other regions in order to generalize the results to a larger section of the population in Saudi Arabia. Second, the small number of users who participated in the study did not represent the diverse population in Saudi Arabia. However, to the best of our knowledge, this is the first study focusing on the users' perceptions of using mHealth applications to promote physical activity.

## Conclusions

Improving physical activity is known to be useful in preventing cardiovascular disease, chronic diseases, depression and cancer. mHealth interventions are one of the most effective interventions to promote physical activity, as they have greater reachability and accessibility for the population. Therefore the focus of this study was to analyse perceptions on the usability and quality of mHealth applications. The results suggest that mHealth applications' usability aspects and subjective quality aspects were perceived to be effective for promoting physical activity among the participants.

Most participants believed that using mHealth applications helped them achieve their goals to improve their physical activity. Moreover, mHealth applications raised their awareness and intention to manage their physical activity and they would recommend using such applications to others.

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**Authors' contributions:** All the authors contributed equally to the concept, drafting and editing of the manuscript.

**Acknowledgements:** None.

**Funding:** None.

**Competing interests:** None declared.

**Ethical approval:** Ethical approval was obtained from the Institutional Review Board of Imam Abdulrahman Bin Faisal University.

**Data availability:** On request from the author.

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