The impact of mobile phone fitness applications on the level of physical fitness and psychological well-being during covid-19: The case of university students

Mona Soliman, Abeer Rasheed, Hager Abdel Hady, Malek Jdaitawi, Amany Khamees, Reda Abdelsalam

Abstract:

BACKGROUND: The impact of Coronavirus Disease-19 on peoples' life has become evident. Recently, sport activities are important in improving individual health and their well-being. The aim of this study is to investigate the effect of using mobile phone fitness applications on some characteristics of physical fitness and psychological well-being of female university students.

MATERIALS AND METHODS: A descriptive study design was implemented using a survey which was adapted to collect data from a sample of 50 female participants within the age of 18 to 19 years. As for the results, the participants indicated that they used physical fitness application by smart phone regularly during COVID-19.

RESULTS: The results also illustrate that there was a significant difference on the study variables based on the study groups and test time. The study results extend literature concerning sport activities participation and promoting positive well-being during COVID-19 pandemic.

CONCLUSION: The study indicated a significant difference of the application on physical fitness and psychological well-being among the participants. Based on the results, the study recommended to organize several sport activities among students and encourage them to use smart phones for positive purposes. Finally, practical implications are outlined.

Keywords:

COVID-19, physical fitness, students, well-being

Introduction

In recent times, the impact of COVID-19 on peoples' life has become evident. Recently, technology such as smart phones has been suggested as an effective tool during COVID-19 pandemic.[1] Computers, smart phones, and their applications are significant features of the modern era and they have dominated all aspects of human activities. Applications of the computer technology and smart phones can be used in physical training activity. Physical activity plays a significant role in maintaining human health and preventing diseases. Lack of physical activity has been found to be the fourth risk factor for deaths in the world. According to the World Health Organization, 6% of deaths worldwide are caused by diseases resulting from lack of physical activity. In fact, the World Health Organization highlighted the importance of physical activity and included it in its international strategic plans for the

Department of Self-Development, Imam Abdulrahman Bin Faisal University, Saudi Arabia

Address for correspondence:
Dr. Malek Jdaitawi, Bin Faisal University, Saudi Arabia.
E-mail: mtmustafa@iau.edu.sa

advancement of human health throughout the world, especially during the Corona pandemic. The goal was to reduce the negative effects of the pandemic on people's physical and psychological health.[2,3]

Since its COVID-19 outbreak, researchers have had different viewpoints about the psychosocial, social, and physical effects of exposure to COVID-19. Studies have shown that changing the daily routine of life due to fear of infection and quarantine led to social isolation and separation from relatives. In addition, loneliness, death of a loved one, loss of freedom, worries about the possibilities of getting infected with the virus, and thoughts about the disease as well as the pain it may cause have had a strong negative impact on the physical and psychological health of human beings. It is noteworthy that studies have shown that children and youth, especially university students, are the most vulnerable to mental illnesses such as anxiety, emotional disorders, difficulty concentrating, nervousness, tension, loneliness, and boredom due to stressful situations they went through during the pandemic.[4,5]

Researcher,[6] it is indicated that practicing recreational sports activities at leisure improves both the physical and psychological situation as it increases feelings of happiness and self-satisfaction. As a human being is an integrated and interconnected unit, improving the physical condition of individuals greatly affects their psychological well-being. Literature[6-8] agreed that the physical activity environment affects people's mental health and well-being as it reduces the anxiety of practitioners whether practicing outdoor, indoor, or indoor halls.

Researchers[9,10] emphasized the role of sports in improving the psychological situation. They measured the improving psychological well-being (happiness) and provided some information on aspects of health associated with the consequences and requirements of the current status of the Corona pandemic. More specifically, they implemented a sport program within football training during the Corona 19 pandemic. Their study indicated the importance of the program in improving children's knowledge, physical, and psychological condition.[9,10] Plainly, there has been need for multiple interventions to improve people's psychological and physical condition, and to take advantage of modern technology to meet the challenges of the present time and the emergency situation in the world through the use of technologies.[11,12]

In order to find a good solution to deal with the pandemic's restrictions, the world's attention was directed to take advantage of modern technology in an attempt to adapt to this pandemic through modern technology that could help in managing the crisis resulting from the pandemic and other emergency conditions. Technology could help in different ways including e-learning, digital conferences, and providing health services as well as psychological support through the Internet and various applications for computers and mobile phones.[13,14] During the researchers' review of the literature related to sport, physical, and psychological health of individuals in general, mobile applications for fitness and health attracted their attention. In fact, many types and versions appeared with multiple benefits that can be used and adapted to serve human health. This is confirmed by Direito *et al*. and Tu *et al*.[15,16] Current mobile applications have become of more importance due to the global conditions resulting from the Corona pandemic. Lack of movement of individuals and poor physical activity increased the need for this type of technology. In the past, several studies pointed out the role of technology in improving and tracking the health and fitness of human beings. These applications help humans in tracking their body condition and keeping records of data obtained for long periods of time. Through these data, it is possible to identify an individual's activity and health status. These applications also enable easy access to these data and sharing them with family members, friends, or others. They provide a challenge and competition that encourage continuity and improve levels of performance.[15,17,18]

The industry of devices and applications that help humans track their health condition has grown at the moment. The size of the industry in this field reached 26 billion U.S. dollars. Health and fitness mobile applications have become part of the basic applications on smartphones used by millions of people of all ages. Some of them are intended to preserve and track the health and physical status of individuals including their weight, heartbeat, height, blood type, and fat percentage. In addition, some of them track the activity of the individual (such as the number of walking steps, distance of running, time of daily activity—hours of sleep, waking, and the nature of sleep). Some of them aim to improve fitness through general body exercises or through exercises for certain parts. Applications may also include several integrated services, such as determining a diet based on individual data. Some of them can help in gaining specific body muscles or shape the body in general.

Some applications are supported by voice interactions. International companies such as Amazon alexa, Google assistant, and Apple siri, seek to improve such applications and make them available on modern devices.[15,19] The least used applications in the field of health and fitness are diet tracking applications, followed by health monitoring applications. The most

used applications are fitness and training applications.[19] Despite the great popularity of mobile phone devices with more than 40,000 applications on the iTunes store and despite the huge number of youths who downloaded fitness apps on their phones (58%), some studies indicated that 40% of them did not interact with them and that 75% of users stopped using them.[16,20] Mcgill[21] pointed out that individuals who used tracking devices associated with fitness applications gradually stopped using them. For example, 46% stopped using them after 3 months, 61% after 6 months, and 79% after 1 year.

By reviewing previous studies, it was noted that research on mobile applications for fitness and physical as well as psychological health in general and during COVID-19 was rare. Thus, this study was designed to identify the effect of using mobile phone fitness applications on some characteristics of physical fitness and psychological well-being of female university students.

Research hypotheses
There are statistically significant differences between the mean scores of the pre and post-test of the control group in favor of the post-test on the level of physical fitness and psychological well-being of female students. There are statistically significant differences between the mean scores of the pre and post-test of the experimental group in favor of the post-test on the level of physical fitness and psychological well-being of female students. There are statistically significant differences between the mean scores of the tow post-tests of the control and experimental groups in favor of the experimental group on the level of fitness and psychological well-being of female students.

Materials and Methods

Study design and setting
The study adopted an experimental approach using a control group and an experimental group. The study population consisted of preparatory year students at Imam Abdul Rahman bin Faisal University for the academic year (2020–2021).

Study participants and sampling
The sample was selected in the purposive way from the female students of the preparatory year at Imam Abdul Rahman bin Faisal University, and the experimental aspect is applied to 50 students, and the exploratory survey was conducted on 25 students from the study population, but from outside the study sample. Female students who practice sport outside the university in private women's clubs and injured students with medical reports approved by the university have been excluded.

Data collection and tool and technique
The study was conducted in the first and second semesters of the 2020/2021 academic year for a period of 2 months from 1st December 2020 to 27th February 2021. The participants were exposed to manipulated sessions of activities related to the study aims as shown in Figure 1. The measurements used for the students views of the smart phone applications, well-being test which was adopted from Ibrahim,[22] and physical tests which as divided into four parts (running in place, standing broad jump, bottom and side touch, and burpee test). The scales were developed in several stages. First, the items and scales were developed and modified from the literature in well-being and physical education. After generating the 31 items and 4 scales, this study employed an expert review to examine the face validity of the scales. The expert gave some modifications and were considered by the researchers. The 31 items were scaled on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Finally, the reliability test was conducted for the pre-post tests through Cronbach's alpha and the result achieved the suggested values ($\alpha = 0.81$ for the pretest and $\alpha = 0.84$ for the posttest).

Ethical consideration
The study's ethical approval was carried out based on the Imam Abdulrahman bin Faisal University committee guideline. Written informed consent was taken from the department. All the participants were novice to the training and randomly assigned to the study groups. The participants were informed that their responses and participation to the study only be used for the purpose of the study.

Results

Before testing the study hypotheses, the study investigated the homogeneity of variance among the study variables according to the participants' characteristics as shown in Table 1. It is clear from Tables 1 and 2 that all deviation factors for growth rates, physical tests, and well-being of the research sample are limited to ±3 for kurtisis and ±1 for skewness, indicating moderation of values and homogeneity of research sample. In addition, Table 2 shows that there are no statistically significant differences between the averages of the pre-measurements of the two groups (controlled and experimental) as far as the basic variables, well-being, and physical tests (in question) are concerned, as the calculated (T) value is lower than the table (T) value at the level (0.05), indicating equality between the two groups in these variables.

In terms of the participants views on the most common use for the smart phone applications, 98.83% of the participants use smart phone application related to health and physical fitness, and the result was confirmed
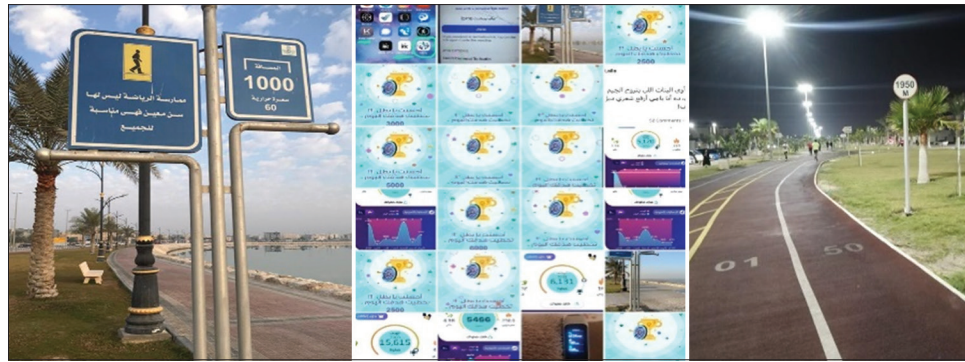
Figure 1: Related activities

Table 1: Descriptive statistics and homogeneity of variance

Variables	Measurement unit	Standard deviation	Mean	Kurtosis	Skewness
Age	Year	0.45	18.58	−0.14	0.61
Height	Cm	7.02	159.58	1.56	0.64
Weight	Kg	10.99	58.14	−0.19	0.59
Bottom and side touch test	Number	1.25	7.2	0.37	−0.60
Standing Broad Jump	Cm	15.20	84.04	−0.48	−0.033
Running in place 15 s	Number	3.11	11.56	−0.12	0.56
Burpee test	Number	1.49	7.7	−0.51	0.35
Well-being	Number	32.17	202.04	−0.59	−0.38

Table 2: Common applications used by the participants

Application	Number of students	Percentage	Application	Number of students	Percentage
Apple Health	65	20.6%	30 Days Weight lose	3	1.0%
Steps App	40	12.7%	Ab and Core workout	2	0.6%
Seven Minutes Workout	34	10.8%	Activity	2	0.6%
30 days - fitness time	25	7.9%	Better Me	2	0.6%
lose Weight at home in 30 days	20	6.3%	Fitbit	2	0.6%
Mi fit	16	5.1%	Sunsa Yoga	2	0.6%
Workout for women	16	5.1%	8 fit	2	0.6%
APPS watch	15	4.8%	Anagym	1	0.3%
Pacer	15	4.8%	SWEAT	1	0.3%
Samsung health	10	3.2%	virtuagym	1	0.3%
Fitness time	9	2.9%	Running (Adidas)	1	0.3%
my fitness pal	6	1.9%	Get Fit	1	0.3%
Lose Weight	6	1.9%	Gym fitness	1	0.3%
Nike exercise	5	1.6%	Hayaa	1	0.3%
Miran	5	1.6%	Bietsnap	1	0.3%
Fitness coach	4	1.3%	Female Workout	1	0.3%

by previous studies.[15] The participants also indicted that they all used smart phone from several brands. The results revealed that 35.45% of the participants usually used one application related to health and physical fitness, 35.21% of them indicated that they use the same app whenever needed, and 29.34% of them never use application related to health and physical fitness.

The most commonly used applications among female students at Imam Abdul Rahman bin Faisal University were (32) applications. Table 2 shows the applications used by the students. The students preferred applications that support participation from family or friends because

such participation encourages continuity and stimulates them to meet the challenge and actively engage in competition. Practicing with family members and friends also increases enthusiasm and makes them feel happy as a result of winning and excelling in achieving their goals.

Unexpectedly, the students prefer applications offered to both men and women, which contain images of exercises provided by men and women. This preference seems to contradict opinions of researchers suggesting that the students would prefer the interface that supports the images of exercises provided by women only in accordance with the social and ideological

customs of society. In addition, 82.93% of the students preferred applications providing exercises by both a man and a woman at the same time and not only one of them. They believed that there are no differences between men and women. They have the same goal which is exercising for better health. Furthermore, 15.78% preferred the exercises provided by women because women differ from men in their needs, anatomical composition, and distribution of body. They can also differ in their goals, so they prefer applications directed to women only because they focus on their interests and needs which is consistent with previous study.[19] Students also prefer applications with weekly and monthly challenges, as 40.93% of them preferred this type of application. Students were asked about the reasons for preferring challenges in this type of application. Their answers indicated that the challenges help them to continue performance and encourage them to achieve their goals. Such applications also help them get rid of boredom and laziness by breaking the daily routine. The challenges also give moral support and strength. Students' preferences were based on the type of the applications and their content. For example, applications that provide fitness exercises, track steps and distances by running and walking, and combine physical training and nutrition regimens ranked first as 14.28% of female students preferred them. As for applications that provide exercises for specific parts of the body or strengthen certain muscles, came in second place with 11.90% of female students preferring them. Then, applications tracking calories came third with a percentage of 11.70%. Applications that track weight got a percentage of 11.43, while applications that track the vital signs of the body such as pulse got a percentage of 11.63%. Applications that organize and save health data came in last place with 10.51% of female students' preferences. The answer to the last open question also explains the reason for students' deleting the applications of fitness and health which require subscription fees. They also deleted applications whose registration required a long time, especially when it comes to filling data. Also, important information was accessed about the reason for students' deleting some applications. Therefore, 27.13% of them indicated that they deleted applications requiring cash payment and 23.21% due to the difficulty of registration and use; 11.55% of students deleted applications with images not coinciding with religious beliefs; and 9.64% of students deleted applications because of the content of the exercises in the application. A percentage of 6.39% was affected by previous evaluations by other users of the application; 4.37% of students were affected by the interface of the application. The students also pointed out that they do not prefer the application if it contains many advertisements that prevent the smooth continuation of exercise.

The second question is answered: What are the characteristics of mobile phone physical fitness and health applications as preferred by female students at Imam Abdul Rahman bin Faisal University? The following are the characteristics of fitness and health applications preferred by preparatory year female students at Imam Abdul Rahman Bin Faisal University: the application should be free; registration in the application should be easy and accessible; simple and clear interface of the application; the application is easy to use and not complicated; students prefer step tracking applications, health tracking, and vital signs such as weight, and outgoing calories; applications that contain fitness exercises for the whole body; the application should combine more than one task, such as tracking health status, vital signs, body measurements, tracking steps and outgoing calories; the application supports family and friends' participation; the applications contain challenges and awards; applications that support Arabic language are easy to use; applications intended to both genders, not just women.

On examining the results obtained from the two groups, the mean, standard deviations, and t-test values in the pre and posttest scores of dependent variables are presented in tables below. Table 3 indicated that there are statistically significant differences between the average of both the pre- and post-measurements for the controlled group in the physical tests and well-being, in favor of post-measurement, as the calculated (t) value is greater than the table (t) value at the level (0.05). On the other hand, Table 4 showed that there are statistically significant differences between the average of both the pre- and post-measurements for the experimental group in the physical tests and well-being, in favor of post-measurement, as the calculated (t) value is greater than the table (t) value at the level (0.05).

Discussion

It is clear from Table 2 that there are differences, but not statistically significant between the pre and post-test of the control group in psychological well-being and the physical tests, as the calculated (t) value is less than the (t) value table at the level (0.05). This indicates that although the students downloaded the applications used in the research according to researchers' guidelines, and although they were given a chance to use and download other types of applications, the students used the applications for a short period and then stopped using them gradually. Also, there was no motivation for use, no tracking of level development and no interest in improvement in general, which led to statistically insignificant differences in any of the research variables, and this is consistent with previous studies[15,16] who pointed out that mobile devices are very popular

Table 3: Pre-posttest differences on the well-being and physical tests for the control group

Variables	Unit of measurement	Controlled group				"*t* test"
		Pre-measurement		after-measurement		
		Mean	SD	Mean	SD	
Bottom and side touch test	Number	7.48	1.12	8.16	1.40	0.065
Standing Broad Jump	Cm	81.80	11.98	90.2	16.67	0.046
Running in place 15 s	Number	11.72	3.80	12.04	2.07	0.71
Burpee test	Number	7.72	1.31	8.84	1.34	0.08
Well-being	Number	207.84	32.45	228.44	38.74	0.047

Table 4: Pre-posttest differences on the well-being and physical tests for the experimental group

Variables	Unit of measurement	experimental group				"*t* test"
		Pre-measurement		after-measurement		
		Mean	SD	Mean	SD	
Bottom and side touch test	Number	6.92	1.28	11.32	2.27	4.89
Standing Broad Jump	Cm	86.08	18.25	138.32	21.13	2.15
Running in place 15 s	Number	12.16	3.03	19.2	4.37	2.85
Burpee test	Number	7.56	1.64	10.2	1.96	4.43
Well-being	Number	200.64	30.91	272.12	33.29	3.50

and there are a huge number of young people who downloaded fitness applications on their phones which reached a percentage of 58%. However, 40% of them interacted with them and 75% of users stopped using them. Mcgill[21] pointed out that individuals who used applications alone without guidance or encouragement gradually stopped using them; 46% stopped using them after 3 months, 61% after 6 months, and 79% after 1 year, which refutes the first hypothesis "there are statistically significant differences between the mean scores of pre-posttests of the control group in favor of post-test on the level of physical fitness and psychological well-being of female students."

It is clear from Table 3 that there are statistically significant differences between the pre and post-test of the experimental group in psychological well-being and the physical tests, as the calculated (T) value is greater than the (T) value table on the level of (0.05). This indicates the clear improvement on the level of well-being and psychological happiness of the students and the level of their physical fitness. The researchers attribute that improvement to the use of applications and guiding the students in choosing applications that fit their needs and meet their requirements and preferences (free applications—easy to register and use—take into account the diversity of the content, progress in the level, interesting distinctive interface, and contain a large number of diverse exercises). This is consistent with Direito *et al.* and Dhiman *et al.*[15,17] who pointed out the importance of using mobile phone applications in improving users' physical and psychological condition. Continued encouragement has also been taken into account through social media applications, groups, and competitive challenges, which led to boosting the desire for challenge, competition, and excellence.

The researchers also attribute the improvement on the level of physical fitness, psychological condition, and happiness among female students to the clear impact of using applications with the encouragement, participation, and social interaction created by communication through the shared WhatsApp group. This helped researchers in monitoring students' performance. The gradual rise in the level of students' performance which came as a response to raising the weekly challenges set by researchers led to a higher level of control over the environment. This has been made possible by applications designed to face the challenges of COVID-19 and its subsequent restrictions. In addition, students' self-esteem and self-acceptance increased as a result of attaining a high level of physical fitness and winning the successive challenges set by the researchers in the program. Furthermore, the clear progressive goals set at the beginning of the program motivated students to work hard, excel, and break weekly and monthly records, which can be seen as an illustration of self-assertion and superiority. It is also noteworthy that using applications allowing group performance, establishing contact groups for members of the experimental group, publishing students' results, encouraging outstanding students, urging everyone to be excellent and distinguished, and the presence of dialogue and interaction among all participants increased positive relationships among them. They further wanted to pursue common challenges at the same time in multiple places and take photos of themselves and urge others to join them. Such interest and enthusiasm can be attributed to a higher sense of psychological happiness. This result is consistent with the results indicated by previous studies.[6-9,23]

The discussion above confirms the second hypothesis of the research which indicates that "there are statistically

significant differences between the mean scores of the pre and post-tests of the experimental group in favor of the post-test on the level of physical fitness and psychological well-being of female students." Table 4 shows that there are statistically significant differences between the two post-tests of the control and experimental groups in psychological well-being and physical tests, as the calculated (T) value is greater than the (T) value table at the level (0.05). This indicates that the improvement in the levels of well-being, psychological happiness, and physical fitness of the female students in the experimental group was attributed to using applications and the program prepared by the researchers. The result also supported previous studies who confirmed the importance of technology applications in students' lives.[24-26] It is clear from the discussion above that the third hypothesis has been confirmed. It shows that "there are statistically significant differences between the mean scores of the two post-tests of the control and experimental groups in favor of the experimental group on the level of physical fitness and psychological well-being of female students at Imam Abdul Rahman bin Faisal University."

Recommendations of the study
As other studies, this study has some limitations, such as the sample size was limited to 50 female students, therefore, future studies should maximize the sample size and include both genders—males and females. The study also limited to one university at the eastern region of Saudi Arabia; therefore, future studies should be conducted in some other universities in Saudi Arabia and in other countries to validate the result of this study. Finally, this study suggests that future studies also should include some other demographic variables such as age, gender, and economic status.

Conclusions

The result of this study indicated that using mobile physical fitness applications during the Corona 19 pandemic has a significant role in reducing the negative effects of the pandemic on mental and physical health. In addition, psychological well-being represents a positive interrelationship between exercising and the psychological condition of the individual. The results also revealed that using social media applications to support using mobile applications reduces the weaknesses of many applications and makes them more useful. Finally, specialists' supervision and interventions in implementing programs using free applications can achieve more goals by boosting girls' willingness to download, participate, and continue training through applications.

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Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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