O RIGINAL ARTICLE

Fitness-related on health mobile applications during covid-19: case of Turkey

Hasan Erdem Mumcu

Faculty of Sport Sciences, Tokat Gaziosmanpaşa University, Tokat, Turkey

Summary. *Study Objectives:* This study aimed to determine the usage status of Turkish infrastructure applications in the range of 4.5-5.0 points collected under the title fitness, health, and exercise in the Android Operating System Google Play Store application during the COVID-19 pandemic process. *Methods:* The usage cases of mobile fitness, health, and exercise applications used by people were collected according to document analysis. Statistical analyzes were made using the SPSS 24 statistical program. *Result:* There were 95 applications scored in the range of 4.5-5.0 points. 56% of the applications were paid and 44% were free. 35% of users preferred free and 65% paid applications. While the first application on the market was released in 2010, the last application was released in 2020. There were 72 applications released before COVID-19 and 23 applications released after. The number of downloads over the determined score of the applications was 5.0 points 0.5%, 4.9 points 39%, 4.8 points 40%, 4.7 points 8%, 4.6 points 8%, and 4.5 points 5%. Within the application, only applications for males were 20.21%, applications for females only 28.27% and applications for both males and females were 48.51%. It was determined that the usage of mobile sports applications increased during the COVID-19 pandemic. It was observed that the usage rate of females was higher than the rate of males. It was determined that most applications were in the "health and fitness" category according to the restriction status within the platform, and the use of paid applications was more than free ones. *Conclusion*: It was thought that the applications to be produced on such digital platforms to protect and increase the level of physical activity of people under epidemic diseases and similar conditions were more comprehensive and encouraging to prevent various physical, psychological, and mental negative effects of sedentary life.

Key Words: Fitness Applications, Health Applications, Physical Activity, Exercise

Introduction

When the risk factors brought by the pandemic process are added to the increasing health risk factors today, the need to be healthy in individuals has increased even more. Risk factors associated with inactivity lead to the formation of different physical movement styles (1,2). The sleep patterns, eating habits, and moods of people in quarantine have begun to change, and their negative effects have started to occur on people's quality of life (3,4). Quarantine has some long-term effects, particularly related to an unhealthy lifestyle and anxiety. Following quarantine requires a

global action promoting healthy eating and physical activity to encourage people to return to a good lifestyle routine (5). It is known that regular physical activity has extremely important benefits to the health of individuals (6-10). Besides, high intensity physical activity has important benefits for both maintaining health and weight control (11). WHO recommends that individuals who do not have an acute problem of breathing or have an acute problem during the quarantine, need exercise through video-supported programs and mobile applications to stay active at home (12). Such innovative methods are needed to promote physical activity and a healthy lifestyle of individuals

(13). This innovative approach provides benefits in the usage of mobile applications that support the physical and mental state, encouraging healthy behavior (13,14), increasing physical activity, and helping to maintain health (15-18). Moreover, it can be used for aims such as regulating eating habits and lifestyle changes (19-21). The designs of mobile applications, whose based-on weight control and physical activity, are a promising technology (22-24). The level of connectivity and access provided by this technology, combined with the fact that smartphones are often carried during the day, highlights the value of smartphones as a tool to measure and influence physical activity in real time (25). It is usual for smart devices to be accepted as ideal devices for e-health applications and to create appropriate infrastructure for mobile health (m-health) applications (18, 26-28). As the contents and qualities of remote supported mobile applications increase (messages and short videos), they are critical for the user experience. Many fitness apps allow users to create their   workouts while motivating them by providing specific routines. The fitness app can track the user's activities such as sleep patterns and working times. Google Fit is an example of an app that does this. This app works with other apps like 8fit, Calm, and Instant to give users a holistic view of their health (29).

According to the market research firm Technavio, which tracks the development speed of the applications, the fitness application market has determined that it has a growth potential of 1.68 billion dollars in 2020-2024. Moreover, a study by Polaris Market Research shows that the market is expected to reach $ 14.7 billion by 2026 (30). World-famous companies buy fitness and health application companies or produce applications themselves. For example, Under Armor bought MapMyRun and Endomondo, Asics Runkeeper, Adidas Runtastic, and Nike have their own Nike Run Club application (31). According to Adjust's data, daily setups of health and fitness apps increased throughout March. At the beginning of April, the mean installation rates in 2020 exceeded 67%. In a study that measures the status of applications after installation, as a method used by health and fitness applications to calculate their users, it gives users active use status as 21% within seven days after downloading (29).

Since the choice of applications is determined by the users (32), the applications must meet the needs of the users (33). However, it has been shown that some mobile sports apps are promoting invasively and users are disturbed by this situation (34, 35). Although sports products provide extremely good opportunities in terms of marketing mobile applications, they should also prioritize the personal needs of users (34). Application users generally positively welcome key features that facilitate physical activity participation, such as real-time feedback, social networking, expert counseling, and goal setting (35). In similar studies, it is reported that the message sending the content of the application is effective for preventing immobility and controlling weight (13,36). However, significant efforts should be made by the company in terms of personalization and use as a promotional tool to develop the full potential of the sports app (37). Despite the negativities encountered, the entertainment aspect of sports applications provides interesting support for mobile application users to overcome their difficulties (38). This situation contributes to the increase of mobile sports applications with the increase of smartphones (39). In this context, this study aimed to determine the current usage status of mobile sports applications during the COVID-19 pandemic process.

Materials and Methods

In the research, it was designed in screening model by using document analysis method, one of the qualitative research approaches. The obtained data were analyzed and interpreted following the document analysis method (40), which includes written information about the event or facts being investigated.

Research Strategy

Mobile applications were screened using the Google Play Store (GPS), fitness, health, and exercise keywords. Our research was scored in the range of 4.5-5.0, published or updated until January 5, 2021, and limited to applications with a Turkish language function. The number of downloads of the application, evaluation score, wage status, release status before
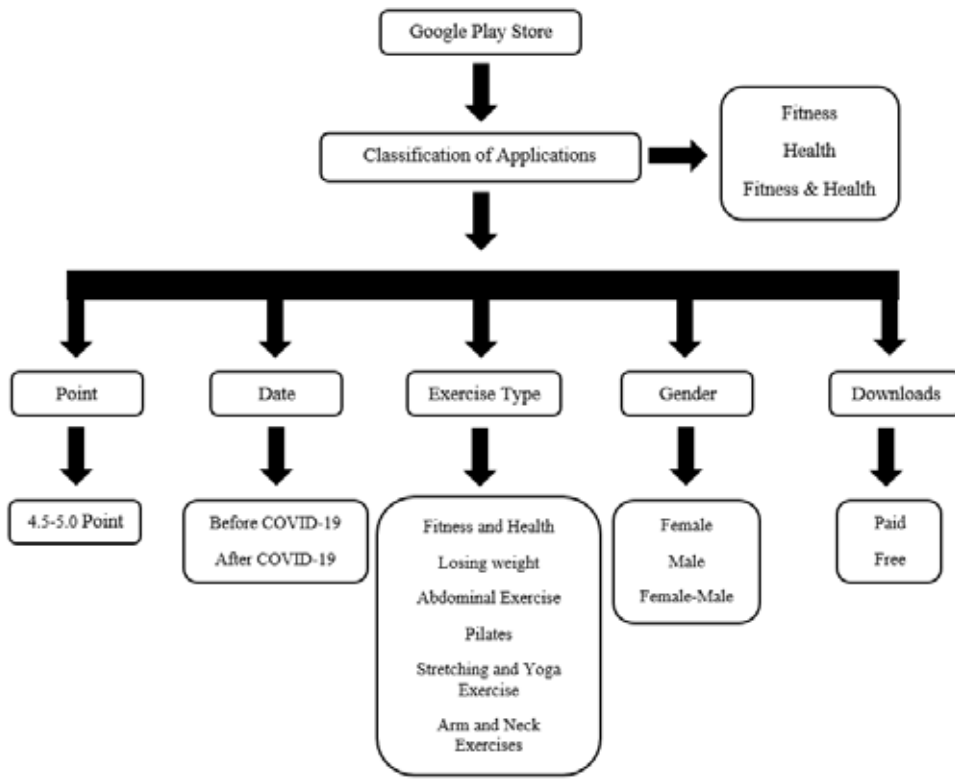
Figure 1. Mobile Application Definition Scale

and after COVID-19, release date, qualifications by exercise type, exercise types were examined in terms of gender. Percentage frequency and comparison methods were used in the analysis of the data.

Data Analysis

The arithmetic mean and standard deviation were used as the analysis method of the data obtained in the study. In addition, percentage and frequency were given statistical analysis. Statistical analyzes were performed using the SPSS 24.0 (SPSS, Version 24.0 for Windows; SPSS Inc., Chicago, IL, 179 United States) statistical program.

Results

As can be seen in Table 1, a total of 95 applications, including 53 paid applications and 42 free

applications, were determined in the fitness and health applications in the Google Play Store. 56 % of the applications were determined as paid and 44 % as free.

As seen in Table 2, the number of free applications was 78.773.500 and the paid applications were 144.097.850, and the total number of downloads was 222.871.350.

As seen in Table 3, there were 23 applications in the range of 0.59 / 69.99 TL per download and 30 applications in the range of 70.99 / 569.99 TL per download, depending on the fee status and the number of applications.

Table 1. Fee Status of Fitness and Health Mobile Applications in Google Play Store.

Applications	f	%
Paid	53	56
Free	42	44
Total	95	100

Table 2. Free and Paid Downloads of Fitness and Health Mobile Applications in Google Play Store

	Free Applications	**Paid Applications**
Number of Downloads	78.773.500	144.097.850
Total Downloads	222.871.350	

Table 3. Price Status of Fitness and Health Mobile Applications in Google Play Store Per Download

Price Status Per Download	0.59 / 69.99 TL	70.99 / 569.99 TL
Applications Number	23 Applications	30 Applications

Table 4. Release Dates of Fitness and Health Mobile Applications Available in Google Play Store

First Out Practice	The application named "Daily Abdominal Exercise-Abdominal Exercises" released on December 5, 2010.
Latest Application	The application named "Dumbbell Movements-Home Bodybuilding" released on October 16, 2020.

Table 5. Table of Fitness and Health Mobile Applications in Google Play Store Before and After COVID-19

	f	**%**
Applications Before COVID-19	72	76
Applications After COVID -19	23	24
Total	95	100

Table 6. Table of Score and Number of Downloads of Fitness and Health Mobile Applications in Google Play Store.

	5.0 Point	**4.9 Point**	**4.8 Point**	**4.7 Point**	**4.6 Point**	**4.5 Point**
f	2	15	26	18	22	12
%	0.5	39	40	8	8	5
Number of Downloads	5.500	167.724.000	170.233.000	36.460.000	32.252.500	20.225.000
Total Downloads	222.871.350					

Table 7. Separation of Fitness and Health Mobile Applications in Google Play Store by Gender

	f	**%**
Male Only	20	20.21
Female Only	27	27.28
Applications for Both Male and Female	48	48.51
Total	95	100

As seen in Table 4, among the sports and exercise applications in the Google Play Store, the first application in the program was the "Daily Abdominal Exercise-Abdominal Exercises" application published on December 5, 2010, and according to the research dates, and the last application was published October 16, 2020, named "Dumbbell Movements-Home Bodybuilding".

As can be seen in Table 5, the number of applications before COVID-19 was 72, and 23 applications were published after. Percentage distributions were seen as 76% before COVID-19 and 24% after COVID-19.

As seen in Table 6, there were 2 apps with 5.0 points, 15 with 4.9 points, 26 with 4.8 points, 18 with 4.7 points, 22 with 4.6 points, and 12 with 4.5 points according to the scores of fitness and health applications of Google Play Store users. The number of downloads of the applications were 5.0 points 0.5%, 4.9 points 39%, 4.8 points 40%, 4.7 points 8%, 4.6 points 8% and 4.5 points 5%.

Table 8. Number of Downloads of Fitness and Health Mobile Applications in the Google Play Store by Gender

Application Types	Females Only	Males Only	Both Female and Male
f	75.264.000	59.633.000	112.055.650
%	33	21	46
Total Downloads	222.871.350		

Table 9. Distribution of Fitness and Health Apps Available in Google Play Store by Type of Usage

Distribution of Fitness and Health Apps	f	%
Health and Fitness	29	30.53
Weight Loss	27	28.42
Stretching and Yoga Exercise	6	6.32
Abdominal Exercise	19	20.00
Arm and Neck Exercise	4	4.21
Leg and Plates	10	10.52
Total	95	100

In Table 7, there are 20 applications for male-only, 27 applications for female only, and 48 applications for both male and female, according to the user status of the fitness and health mobile applications in the Google play store for females, males, and both genders. Within the application, applications only for males were 20.21%, applications only for female were 28.27%, and the rate of applications for both male and female was 48.51%.

According to the number of gender downloads of fitness and health mobile applications in the Google play store in Table 8, it was seen that 75.264.000 downloads for females and 59.633.000 for males, and 112.055.650 downloads for both male and female. It had 33% downloads for females, 21% for males, and 46% for both males and females.

In Table 9, fitness and health mobile applications in the Google play store were distributed as health and fitness 29, weight loss 27, abdominal exercise 19, leg and plates 10, stretching and yoga exercise 6, and arm and neck exercise 4 applications.

Discussion and Conclusion

During the pandemic process, this study responded to the questions of individuals' use of mobile applications, their distribution by gender, their introduction to the market before and after the pandemic, their wage status, and which type of application was downloaded more frequently. Applications had positive and negative effects on people's lives.

According to the results obtained from the content of the applications in the "fitness, health and exercise" area on the Google Play Store Android download platform; Table 1 showed the price profiles of the sports and exercise mobile applications in the Google play store. According to this; there were a total of 95 applications scored in the range of 4.5-5. Of these, 53 were paid (56%) and 42 were free (44%). It was expected that the total market in the USA would reach 90 billion US dollars in 2022 and approximately 44 billion dollars of this would be created by the m-health sub-market. From the first quarter of 2015 to the third quarter of 2020, there were 47.140 thousand m-health and sports apps available on Google Play worldwide (41). In a similar study, it was estimated that the total global m-health market from 2016 to 2025 will reach approximately US $ 100 billion in 2021. It was predicted that there would be an increase of approximately five times in 2016 and with this, there would be a growth of 332% in the global m-health market from 2020 to 2025 (42). According to Health Works Collective, there were more than 97,000 health and fitness apps for mobile and tablet devices. More than half (52%) of smartphone users were receiving health information from their devices. In addition, the popularity of fitness apps was increasing day by day (43). As of January of 2021 in Turkey, the Turkish unit 236 enabled health and fitness in active use mobile phone/ tablet app was located.

Table 2 showed the total number of downloads of the paid and free of sports and exercise mobile applications in the Google play store. According to this; the number of downloads of free applications was 78,773,500 and the number of downloads of paid

applications was 144,097,850. In Table 3, the lowest and the highest limits of paid applications were given. Accordingly, there were 23 applications in the price range of 0.59 / 69.99 TL per download and 30 applications in the price range of 70.99 / 569.99 TL per download. Among the criteria for evaluating mobile applications in terms of service quality, the fee criterion represented an important place (44). It was observed that there were more free applications available on both platforms (28). In a similar study, when 2016 and 2018 data were compared, it was seen that free applications increased more and the number of paid applications also increased (34). It was stated that issues such as ease of use, the usefulness of the application, whether it is paid or not, which affect the preferences of people in Android applications, are the main download factors.

In a study evaluating the profitability of applications, it was seen that the Fit Time application had significant profitability when the Keep application was compared with the Fit Time application. Profitability was grouped under four main headings; 1. Private membership system, 2. Online training camp, 3. Creating an e-commerce platform, 4. Advertisements and fitness videos (45). Since each application was mainly produced for profit, it was trying to gain profit in different ways. While it did not charge any fees during the download phase in its applications that were described as free, it was gaining from various content such as the purchase of video supports and special education support during the usage phase. However, it could be said that the quality and quality of fitness applications with special content increased since they received a certain amount of money.

Table 4 showed the first and last release dates of the sports and exercise mobile applications in the Google play store. Accordingly, it was seen that the first application to the market in the range of 4.5-5.0 points was on December 5, 2010 and the last application was on October 16, 2020.

The first examples of electronic infrastructure health applications were realized in the 1960s by tracking the vital findings of astronauts from space. The first portable healthcare application emerged in 1975 as a result of Gregory Lektman's work at Biosig Instruments. Lektman collaborated with several companies,

including the Finnish company Polar Electro, to produce the first commercial wireless heart rate device. Healthy people running and cycling learned more about their personal and physical performance and improved their training skills thanks to this device. This usage spread rapidly in a short time. Therefore, Finland is accepted as the origin of today's mobile health industry (46). One of the first examples of the mobile fitness application was funded by the European Commission Information Society Technologies 6th Framework program called "A Mobile Fitness Companion" and developed by Stahl et al in 2008 (47).

In Table 5, the availability of sports and exercise mobile applications in the Google play store before and after COVID-19 was given, and accordingly, 72 applications (76%) appeared before and 23 applications (24%).

In all countries, the number of users increased significantly during the COVID-19 period. The number of people using the applications with the epidemic; peaked at 339.7 million in April, up 83.6% from January and about 42% from March. In the first quarter of 2020, the number of downloads of health and fitness apps reached 593 million (29). The health and fitness apps' download rate in Turkey increased 76% and account usage increased 48% as an annual mean. It was observed that the mean of daily sessions was 25% above during the pandemic period in the USA. In Brazil, it was 73% higher than the previous year's mean. The mean for May was 96% higher than the mean of 2020. The mean for 2020 in Mexico performed above 54%. In Germany, it rose more than 86% from 2020 mean at the end of March. There was an increase in the mean number of sessions in the UK in April, 93% higher than the overall mean for 2020 (48). Looking at the data obtained from the studies, it was seen that the session usage rates increased during the pandemic period and the market expanded to a great extent. According to our results, it was seen that 24% of 95 applications were put on the market shortly after the beginning of the pandemic period.

In Table 6, the scores of the fitness and health mobile applications in the Google play store were given by the user. According to this; the number of downloads out of the app's score was 5.0 points 0.5%, 4.9 points 39%, 4.8 points 40%, 4.7 points 8%, 4.6

points 8%, and 4.5 points 5%. Xie, Nacioglu, and Or, (2018) stated in their research that the quality of the software system should be evaluated in terms of internal and external quality (49). In a similar study, since the internal quality evaluation was generally used in mobile applications, external quality meant the user's acceptance of the software and satisfaction (50). The rating of the applications by the users was important in terms of the approval of the content by the manufacturers and the evaluation of its status. It provided feedback to correct the areas that needed to be updated in order to improve the quality of the applications rated low by the user. In terms of users, it was seen as a factor that guided which application would be preferred. The probability of choosing the application with a high score was seen as high, depending on the nature of the application that the user wanted to do.

Table 7 shows the user status of the content of the fitness and health mobile applications in the Google play store for females, males, and both genders. Accordingly, there were only 20 applications for males, 27 applications only for females, and 48 applications for both genders. In Table 8, it had a 33% discount for females, a 21% discount for males, and a 46% discount for both males and females.

In a study conducted in China in 2018, it was seen that 41% of those who used m-health applications consisted of only females (49). In a different study, 28.9% of males and 39.8 % of females were found to use m-health applications, and similar results were obtained (44). In our study, the number of downloads for females was 12% higher than that of males. Studies that females use more mobile fitness and health applications were supported.

According to the types of fitness and health mobile applications in the Google play store in Table 9; Fitness 29, Weight Loss 27, Abdominal Exercise 19, Leg and Pilates 10, Stretching and Yoga Exercise 6, and Arm and Neck Exercise 4 practices. In a similar study, when the applications were examined, it was seen that the applications in the field of fitness and health on both IOS and Android platforms were more than applications in the health field. While preparing M-health applications, attention was paid to the content, ease of application, and preparation of the applications by experts (28). In another study, it was

determined that 235 (38.4%) of 633 participants used m-health application and that the most used m-health application was healthy life information (32.2%) (49). Applications focusing on physical activities such as mobile applications fitness, yoga, exercise, and general exercise applications contributed to weight loss in line with the user's request (26, 51, 52). The fact that the applications had different contents in line with the needs of the individuals and the more preference of some applications showed that individuals generally had common action needs.

As a result, it was determined that the use of mobile sports applications increased during the COVID-19 pandemic period. It was observed that the usage rate of females was higher than that of males. According to the restriction status within the platform, it was determined that most applications were in the "health and fitness" category and the use of paid applications was more than free ones. Mobile applications, which allow unlimited freedom of movement without space limitations and with personal selection functions, were thought to have the capabilities to prevent all the negativities brought by our age. In order to protect and increase the level of physical activity of people under epidemics and similar conditions, the more comprehensive and encouraging applications to be produced on such digital platforms could prevent various physical, psychological, and mental negative effects of sedentary life. It can be aimed to make the language options of mobile applications more comprehensive and to increase their accessibility around the world. Reporting the usage frequency, duration, and usage rates of the applications in certain periods could provide more reliable data in terms of researching the market.

References

1. Aktuğ ZB, İri R, Demir NA. COVID-19 immune system and exercise. Journal of Human Sciences, 2020; 17(2), 513-520.
2. Jimenez-Pavon D, Carbonell-Baeza A, Lavie CJ. Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people. Prog Cardiovasc Dis, 2020; [Epub ahead of print].
3. Kanık ZH. COVID-19 pandemisinde ev tabanlı fiziksel aktivite. Gazi Sağlık Bilimleri Dergisi, 2020; 46-51.

4. Turgut M, Soylu Y, Metin SN. Physical activity, night eating, and mood state profiles of athletes during the COVID-19 pandemic. Progress in Nutrition, 2020; 22. https://doi.org/10.23751/pn.v22i2-S.10567

5. Mattioli AV, Sciomer S, Cocchi C, Maffei S, Gallina S. Quarantine during COVID-19 outbreak: Changes in diet and physical activity increase the risk of cardiovascular disease. Nutrition, Metabolism and Cardiovascular Diseases, 2020; 30(9), 1409-1417.

6. Turgut M, Soylu Y. Effects of 8-week zumba exercise on blood lipids profile in sedentary women. Pedagogy of Physical Culture and Sports, 2021; 25(3), 172–177. https://doi.org/https://doi.org/10.15561/26649837.2021.0305

7. Chekroud SR, Gueorguieva R, Zheutlin AB, Paulus M, Krum- Holz HM, Krystal JH, Chekroud, AM. Association between physical exercise and mental health in 1.2 million individuals in the USA between 2011 and 2015: A cross-sectional study. The Lancet Psychiatry, 2018; 5(9), 739–746. https://doi.org/10.1016/S2215-0366(18)30227-X

8. Mathieu RA, Powell-Wiley TM, Ayers CR, McGuire DK, Khera A, Das SR, Lakoski SG. Physical activity participation, health perceptions, and cardiovascular disease mortality in a multiethnic population: The Dallas heart study. Ameri- can Heart Journal, 2012; 163(6), 1037–1040. https://doi.org/10.1016/j. ahj.2012.03.005

9. Ozemek C, Laddu DR, Lavie CJ, Claeys H, Kaminsky, LA, Ross R, ... Blair SN. An update on the role of cardiorespiratory fitness, structured exercise and lifestyle physical activity in preventing cardiovascular disease and health risk. Progress in cardiovascular diseases, 2018; 61(5-6), 484-490.

10. Ozemek C, Lavie CJ, Rognmo, Ø. Global physical activity levels-Need for intervention. Progress in cardiovascular diseases, 2019; 62(2), 102-107.

11. Khaleghzadeh H, Afzalpour ME, Ahmadi MM. Effect of high intensity interval training along with Oligopin supplementation on some inflammatory indices and liver enzymes in obese male Wistar rats with non-alcoholic fatty liver disease Obesity Medicine, 2020; p. 17100177, 10.1016/j.obmed.2019.100177

12. WHO. Guideline Stay physically active during self-quarantine. 2020; Access address: http://www.euro.who.int/en/health-topics/healthemergencies/coronavirus-COVID-19/novel-coronavirus-2019-ncovtechnical-guidance/stay-physically-active-during-self-quarantine

13. Stephens J, Allen J. Mobile phone interventions to increase physical activity and reduce weight: a systematic review. J Cardiovasc Nurs. 2013; 28(4):320–9.

14. Dallinga JM, Mennes M, Alpay L, Bijwaard H, Baart de la Faille-Deutekom M. App use, physical activity and healthy lifestyle: A cross sectional study. BMC Public Health, 2015; 15,1-9.

15. Cole-Lewis H, Kershaw T. Text messaging as a tool for behavior change in disease prevention and management. 2010; Epidemiol Rev.32:56Y69.

16. Glynn LG, Hayes PS, Casey M, Glynn F, Alvarez-Iglesias A, Newell J, … Murphy AW. Effectiveness of a smartphone application to promote physical activity in primary care: the SMART MOVE randomised controlled trial. British Journal of General Practice, 2014; 64(624), e384-e391.

17. Lau PW, Lau EY, Wong DP, Ransdell L. A systematic review of information and communication technology–based interventions for promoting physical activity behavior change in children and adolescents. Journal of medical Internet research, 2011; 13(3), e48.

18. Kopmaz B, Arslanoğlu A. Mobil sağlık ve akıllı sağlık uygulamaları. Sağlık Akademisyenleri Dergisi, 2018; 5(4), 251-255.

19. Bhuyan S, Lu N, Chandak A, Kim H, Wyant D, Bhatt J, Kedia S, Chang C. Use Of Mobile Health Applications For Health-Seeking Behavior Among Us Adults, Journal Of Medical Systems, 2016; 40: 153

20. DiFilippo KN, Huang WH, Andrade JE, Chapman-Novakofski KM. The use of mobile apps to improve nutrition outcomes: A systematic literature review. Journal of Telemedicine and Telecare, 2015; 21(5), 243–253. doi:10.1177/1357633x15572203

21. Paramastri R, Pratama SA, Ho DKN, Purnamasari SD, Mohammed AZ, Galvin CJ, ... Iqbal U. Use of mobile applications to improve nutrition behaviour: A systematic review. Computer methods and programs in biomedicine, 2020; 192, 105459.

22. Pavel P, Lukas J, Jan, Z. Mobile apps that support physical activities and potential of these applications in physical educaiton at school. Journal of Human Sport and Exercise, 2016; 1(1), pp. 176-194.

23. Spring, B., Schneider, K. and McFadden, H.G. (2012). Multiple behavior changes in diet and activity: a randomized controlled trial using mobile technology. Arch Intern Med; 172: 789–96.

24. Turner-McGrievy GM, Beets MW, Moore JB. Comparison of traditional versus mobile app self-monitoring of physical activity and dietary intake among overweight adults participating in an mHealth weight loss program. J Am Med Inform Assoc 2013; 20: 513–5188.

25. Intille SS, Lester J, Sallis JF, Duncan G. New horizons in sensor development. Medicine and science in sports and exercise, 2012; 44(1 Suppl 1), S24.

26. Liu C, Zhu Q, Holroyd AK, Seng KE. Status and trends of mobile-health applications for 1os devices: a developer's perspective, The Journal Of Systems And Software, 2011; 84, 2022-2033.

27. Yang TY, Silverman DY. Mobile health applications: the patchwork of legal and liability ıssues suggests strategies to ımprove oversight, Health Affaırs, 2014; 33, 2: 222–227.

28. Güler E, Eby G. Akıllı ekranlarda mobil sağlık uygulamaları. Journal of Research in Education and Teaching Ağustos 2015; 4:3

29. Verhoeven A. Everything you need to develop your fitness app marketing plan. 2020. Access address: https://www.adjust.com/blog/fitness-app-marketing-plan/

30. Shoeb A. Global Fitness App Market Analysis, 2021. 2021. Available from: https://www.researchgate.net/publication/350089845_Global_Fitness_App_Market_Analysis_2021 [accessed Apr 06 2021].

31. Tucker I. Nike, Strava and Instagram: 10 of the best apps for runners. The Guardian. 2017; Retrieved from https://www.theguardian.com/lifeandstyle/2017/aug/13/10-best-apps-for-runners-fitness

32. Holzer A, Ondrus J. Mobile application market: A developer's perspective. Telematics and informatics, 2011; 28(1), 22-31.

33. Kang S. Factors influencing intention of mobile application use. International Journal of Mobile Communications, 2014; 12(4), 360-379.

34. Jasiulewicz A, Waśkowski Z. Possibilities of Brand Promotion Through Lifestyle Mobile Sports Applications. Marketing Instytucji Naukowych i Badawczych, 2020; (3, 37), 1-16.

35. Kirwan M, Duncan MJ, Vandelanotte C, Mummery WK. Design, development, and formative evaluation of a smartphone application for recording and monitoring physical activity levels: the 10,000 Steps "iStepLog". Health Education & Behavior, 2013; 40(2), 140-151.

36. Fanning J, Mullen S, McAuley E. Increasing physical activity with mobile devices: a meta-analysis. J Med Internet Res. 2012; 14(6):161–9.

37. Janssen M, Scheerder J, Thibaut E, Brombacher A, Vos, S. Who uses running apps and sports watches? Determinants and consumer profiles of event runners' usage of running-related smartphone applications and sports watches. PLoS One, 2017; 12(7). Retrieved from https://search-1proquest-1com-1000757ap0569.han.bg.sggw.pl/docview/1901780453?accountid=48272

38. Sun H, Zhang P. The role of moderating factors in user technology acceptance. International journal of human-computer studies, 2006; 64(2), 53-78.

39. Jae-Pil H, Dun JK, Yukyoum K. Sport fans in a "smart sport" (SS) age: Drivers of smartphone use for sport consumption. International Journal of Sports Marketing and Sponsorship, 2017; 18(3), 281–297

40. Büyüköztürk Ş, Kılıç Çakmak E, Erkan Akgün Ö, Karadeniz Ş, Demirel F. Bilimsel araştırma yöntemleri: Pegem Akademi Yayınları, Ankara, 2013.

41. Statista. Google Play: number of available medical apps as of Q4 2020. 2021. Access address: https://www.statista.com/statistics/779919/health-apps-avaialable-google-play-worldwide/

42. Stewart C. Total mhealth market size forecast worldwide 2016-2025. 2018. Access address: https://www.statista.com/statistics/938544/mhealth-market-size-forecast-globally/

43. Nehabaluni. Mobil medikal app: a game changing healthcare inovation. 2020. Access address:https://www.healthworkscollective.com/mobile-medical-apps-a-game-changing-healthcare-innovation/

44. Uslu B, Gür Ş, Eren T, Özcan E. Mobil uygulama seçiminde etkili olan kriterlerin belirlenmesi ve örnek uygulama. İstanbul İktisat Dergisi, 2020; 70(1), 113-139.

45. Liang Y, Lu X. A Research on the Profit Model of Mobile Fitness Industry. DEStech Transactions on Economics, Business and Management, 2018; (icems).

46. Tezcan C. Sağlığa yenilikçi bir bakış açısı mobil sağlık, İstanbul, TÜSİAD Yayınları, 201629-71.

47. Stahl O, et al. A mobile fitness companion. The Fourth International Workshop on Human-Computer Conversation. 2008.

48. Hainzinger B. Fitness app installs up 67% since COVID-19. 2020; Access address: https://appdeveloper-magazine.com/7196/2020/8/20/Fitness-app-installs-up-67%25-since-COVID-19

49. Xie Z, Nacioglu A, Or C. Prevalence, demographic correlates, and perceived ımpacts of mobile health app use amongst chinese adults: cross-sectional survey study. Eysenbach G, ed. JMIR mHealth and uHealth. 2018; 6(4): 1–9

50. Şipka, S. (2019). Mobil spor uygulamalarının sportif çalışmalara etkisinin araştırılması ve yeni bir mobil spor uygulamasının tasarlanması (Doctoral dissertation, Marmara Universitesi (Turkey).

51. Güner PD, Bölükbaşı H, Kokaçya SH, Yengil E, Özer C. Mustafa kemal üniversitesi öğrencilerinin mobil sağlık uygulamalarını kullanımı. Konuralp Medical Journal/Konuralp Tip Dergisi, 2018; 10(3).

52. İçözü T. 2020'de mobil sağlık ve fitness uygulaması kullanımı dünya genelinde yükseldi. 2020. Access address: https://webrazzi.com/2020/08/25/2020-de-mobil-saglik-ve-fitness-uygulamasi-kullanimi-dunya-genelinde-yukseldi/

───────

Correspondence:
Hasan Erdem Mumcu
Faculty of Sports Sciences,
Tokat Gaziosmanpaşa University, Tokat, Turkey
E-mail: erdemumcu@gmail.com