ORIGINAL ARTICLE

Comparison between mobile fitness apps users and gender on exercise intensity in university students

BAYU AGUNG PRAMONO[1], ABDUL HAFIDZ[2], MUHAMMAD KHARIS FAJAR[2], WIJONO[2], FIFIT YETI WULANDARI[2], I DEWA MADE ARYANANDA WIJAYA KUSUMA[1], LIM BOON HOOI[3]

[1]*Deparment of Sport Coaching Education. Faculty of Sport Science and Health. State University of Surabaya. Indonesia.*
[2]*Faculty of Vocational Studies. State University of Surabaya. Indonesia.*
[3]*Faculty of Education, Languages, Psychology and Music. SEGi University. Malaysia.*

ABSTRACT

University students are an exclusive subcategory because most of them are young adults at a transformation period, training to stay independently while concurrently working toward completion of their professional degrees. Previous research reported that only 30% to 50% of university students meet the recommended proportion of exercise for health advantage. Mobile fitness apps are invented on purpose to support exercise. Many health advantages like preventing cardiovascular diseases and diabetes, it will marshal exercise and as mobile motivational tools because motivation is a major barrier to exercise. The present study was designed to investigate and compare the exercise intensity between the mobile fitness app users and none-users. The secondary purpose was to examine and compare the exercise intensity between gender from the university students. A total three hundred fifty-five university students were recruited in the study. The International Physical Activity Questionnaires- Short Form (IPAQ-SF) was used to collect exercise intensity of the participants in current study. All participants have been briefed on the objectives of this study and agreed to answer the International Physical Activity Questionnaires (IPAQ) and signed an informed consent form. The independent t-tests to determine the differences of the exercise intensity between mobile fitness app users and nonmobile fitness users. Independent t-tests also to find-out differences exercise intensity between gender in the university students, the statistical significance was set at $p < .05$. There were significant differences of exercise intensity level between nonmobile fitness apps users and mobile fitness apps users [t (352) = 2.82, p = .005, d = 0.28]. It means the nonmobile fitness apps users had a significant higher exercise intensity if compared to the mobile fitness apps users. There were significant differences of exercise intensity level between male and female university students [t (352) = 4.54, p = .001, d = 0.48]. Current results are similar to many studies found that female students participated in less exercise than their male counterparts.

Keywords: Performance analysis, Mobile fitness apps users, Gender, Exercise intensity, University students.

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Corresponding author. *Department of Sport Coaching Education. Faculty of Sport Science and Health. State University of Surabaya. Indonesia.* https://orcid.org/0000-0002-9308-1289
E-mail: bayupramono@unesa.ac.id
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INTRODUCTION

University students are an exclusive subcategory because most of them are young adults at a transformation period, training to stay independently while concurrently working toward completion of their professional degrees (Keating, Guan, Castro-Piñero, & Bridges, 2005). Previous research has indicated that it is important to help university students adopt a healthy lifestyle consisting of adequate exercise and a healthy diet. They may play a censorious part in developing social and cultural norms because they may well become decision-makers and opinion leaders in future. But, past research revealed that many university students decrease their exercise levels in university (Keating et al., 2005).

Previous research reported that only 30% to 50% of university students meet the recommended proportion of exercise for health advantage (Keating et al., 2005). Additionally, this group should be targeted for intervention because the young adulthood exercise and diet habits have valuable carry-over effects. As such, maintaining exercise during university may generate positive advantage on university student lifestyles in the years after graduation (Jenkins, Jenkins, Collums, & Werhonig, 2006).

Also, promoting exercise and increasing opportunities for exercise has intimations to support academic achievement. Exercise and physical activity have been related to positive effects on cognition and concentration in the lecture hall (Etnier et al., 1997). The findings are supported that exercise has been associated with higher levels of self-esteem and lower levels of anxiety, which are contribute to higher academic performance in the university (Flook, Repetti, & Ullman, 2005).

Mobile fitness apps are invented on purpose to support exercise. The support can be influential (problem-solving knowledge and skills) and psychological (encouragement), namely informational and psycho-social support (Wu, Mai, & Huang, 2021). In spite of so many health advantages like preventing cardiovascular diseases and diabetes (Reiner, Niermann, Jekauc, & Woll, 2013), it will marshal exercise and as mobile motivational tools because motivation is a major barrier to exercise (Glowacki, Duncan, Gainforth, & Faulkner, 2017). As such, when tailored to user needs, it may help build exercise habits for the mobile users.

Based on current literature, mobile fitness app functions are designated into five subject matters: Education (Guo, Saab, Post, & Admiraal, 2020), Tracking (Wang & Collins, 2020), Social (Lu, Lin, Raphael, & Wen, 2023), Gamification (Wang & Collins, 2020), and Motivation (Guo et al., 2020).

In term of mobile fitness app users between gender, men and women encounter indistinguishable motivational regulation and social influences, some systematic differences between genders are found in motivations and gratifications related to exercise (Jiang, Zhang, & Teo, 2021). The developmental point of view can partially justify these differences, by which women mainly engage in exercise for surfacing maintenance and weight management, but, men are prompt by strength, competition, and challenges (Craft, Carroll, & Lustyk, 2014). In fact, men normally report higher body satisfaction and higher preferences for exercise than women disregarding of culture (Dumitru, Dumitru Dumitru, & Maher, 2018). Comparison between gender; mobile fitness apps users and none-users on exercise intensity remain relatively unexplored (Utesch, Piesch, Busch, Strauss, & Geukes, 2022).

Therefore, the present study was designed to investigate and compare the exercise intensity between the mobile fitness app users and none-users. The secondary purpose was to examine and compare the exercise intensity between gender from the university students.

METHODS

This study employed a survey method which involves the collection of data through a questionnaire.

Participants

A total three hundred fifty-five university students were recruited in the study. All participants of this study were recruited from the Faculty of Sports and Health Science, Universitas Negeri Surabaya, Surabaya, East Java, Indonesia. Demographic of the participants in this study displayed in Table 1.

Table 1. Demographic of the participants in this study.

Demographic	Male (n = 134)	Female (n = 221)	Total (n = 355)
Gender	134 (38%)	221 (62%)	355 (100%)
Age (years)			
16-17	11 (8%)	18 (8%)	29 (8%)
18-19	116 (87%)	191 (86%)	307 (86%)
20-21	7 (5%)	5%)	17 (5%)
Above 22	0 (0%)	2 (1%)	2 (1%)
Weight (kg)			
35-55	59 (44%)	163 (74%)	222 (63%)
56-76	65 (49%)	48 (22%)	113 (32%)
77-97	7 (5%)	7 (3%)	14 (4%)
Above 98	3 (2%)	3 (1%)	6 (2%)
Height (cm)			
141 – 150	1 (1%)	28 (13%)	29 (8%)
151 – 160	17 (13%)	133 (60%)	150 (42%)
161 – 170	75 (56%)	57 (26%)	132 (37%)
Above 171	41 (31%)	3 (1%)	44 (12%)
App users	59 (44%)	89 (40%)	148 (42%)
Non app users	75 (56%)	132 (60%)	207 (58%)

Procedures

To collect the data needed in this study, the researcher obtained written consent from the university authority, faculty management and the participants prior to conduct surveys. The researcher also informed participants about the study, they volunteered to participate in this research and ethical approval was obtained from the Ethics Committee for Research Involving Human Subjects from Universitas Negeri Surabaya, Surabaya, East Java, Indonesia.

Before the data collection, all participants have been briefed on the objectives of this study and agreed to answer the International Physical Activity Questionnaires (IPAQ) and signed an informed consent form. Participants' demographic attributes such as age, gender, weight, height and status of mobile fitness app user were recorded.

Physical activity is any movement that is carried out by the muscles that require energy. In other words, it is any movement a person does. Exercise is, by definition, planned, structured, repetitive and intentional movement. Exercise is also intended to improve or maintain physical fitness (Thompson, 2023). Since most of the mobile fitness apps are related to improve or maintain physical fitness from exercise. As such, in the IPAQ questionnaire whereby the physical activity intensity will be reflecting exercise intensity in current study.

The questionnaire used to collect exercise intensity of the participants in current study was the International Physical Activity Questionnaires- Short Form (IPAQ-SF)(Chaskar, Loh, & Babs, 2017), it comprises a set of 7 questions, the short version of the questionnaire was transfer into a Google form and sent to all the recruited participants of this study via mobile social media platform such as WhatsApp, Facebook messenger and e-mail addresses. The seven-item short form which involve a seven-day recall of exercise. It was designed to estimate the time spent performing exercise (moderate to vigorous) and inactivity (Chaskar et al., 2017). Test-rest reliability indicated good stability High reliability (α = .80) (Chaskar et al., 2017), the criterion validity of the IPAQ was tested by using an accelerometer. Based on intraclass correlation coefficients, the reliability of the total IPAQ was 0.65 and 0.57 for men and women, respectively (Chaskar et al., 2017).

Data from each question were summed within the item (i.e. moderate and vigorous) to estimate the total amount of time spent in exercise in the last 7 days. The participants only take less than 5 minutes to provide answers for the questionnaire and submit their feedback via mobile phone. The researchers classified the MET scores based on previous research suggestion (Chaskar et al., 2017). The total exercise was calculated based on the number of days, the duration of the minutes, and the intensity of the activity. The final results of the exercise intensity were break down into 3 levels (low, moderate, high) exercise intensity.

Statistical analysis

Data analysis was performed using the IBM SPSS Statistics for Windows, version 26 was used. The demographic background of the participants was presented in percentages for the categorical data and mean with standard deviation (SD) for the continuous data. The independent t-tests to determine the differences of the exercise intensity between mobile fitness app users and nonmobile fitness users. Independent t-tests also to find-out differences exercise intensity between gender in the university students. The statistical significance was set at $p < .05$.

RESULTS

Table 2 presents the exercise intensity level (MET min/week) of participants in this study from IPAQ Questionnaire.

Table 2. Exercise intensity from IPAQ Questionnaire.

Exercise Intensity Level	Description	Male (n = 134)	Female (n = 221)	Total
Low	<600 MET min/week.	85 (63%)	185 (84%)	270 (76%)
Medium	600 – 2999 MET min/week	30 (22%)	26 (12%)	56 (16%)
High	≥3000 MET min/week	19 (14%)	10 (5%)	29 (8%)

Table 3 displays the descriptive group statistics of mobile fitness apps users and nonmobile fitness apps users.

Table 3. Descriptive group statistics of mobile fitness apps users and nonmobile fitness apps users on exercise intensity.

Users	N	Mean (M)	Standard Deviation (SD)
Non-Mobile fitness apps users	143	1.43	0.70
Mobile fitness apps users	211	1.25	0.55

An independent-samples t-test was conducted to compare exercise intensity on mobile fitness apps users and nonmobile fitness apps users. The results as shown in Table 4.

Table 4. Independent sample t-test of exercise intensity between mobile fitness apps users and nonmobile apps users.

Variable	Levene's Test of Equality of Variances		t-test for Equality of Means			
	f	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Exercise intensity	23.66	.001	2.82	352	.005	1.87

There were significant differences of exercise intensity level between nonmobile fitness apps users and mobile fitness apps users [t (352) = 2.82, *p* = .005, d = 0.28].

Descriptive group statistics on the exercise intensity for male and female university students in this study as shown in Table 5.

Table 5: Descriptive group statistics on exercise intensity for male and female university students.

Gender	N	Mean (M)	Standard Deviation (SD)
Male university students	134	1.51	0.73
Female university students	221	1.21	0.51

Another independent samples t-test was conducted to compare exercise intensity on male university students and female university students. The results as shown in Table 6.

Table 6: Independent samples t-test between male and female university students.

Variable	Levene's Test of Equality of Variances		t-test for Equality of Means			
	f	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Exercise intensity	56.39	.001	4.54	352	.001	.30

There were significant differences of exercise intensity level between male and female university students [t (352) = 4.54, *p* = .001, d = 0.48].

DISCUSSION

Regarding exercise intensity, current study found that majority of university students categorized in the low level of exercise intensity, which below 600 MET min/week with 85 (63%) males, 185 (84%) females from the total of 270 (76%) in the three categories of exercise intensity ranking (Chaskar et al., 2017). The results of current study similar to previous research which monitoring university students' changes in the first two years in university indicated that 30% of students reported no exercise during freshman year and no significant changes were found at the second year (Racette, Deusinger, Strube, Highstein, & Deusinger, 2010). Moreover, significantly fewer students took part in aerobic and more students just performed stretching exercises from the freshman to sophomore year (Racette et al., 2010).

The participants of current study were recruited from the Faculty of Sports and Health Science, Universitas Negeri Surabaya, Surabaya, East Java, Indonesia. They were enrolled in sport science programme, this group should be more active compared to other university students. Interestingly, only 19 (14%) males were categorized as high exercise intensity which more than 3000 MET min/week (Chaskar et al., 2017), 10 (5%) from the females with a total of 29 (8%) students from the overall, 355 university students in this study. This

group of students should be encouraged to participate in regular exercise because exercise will increase the amount of oxygen delivered to the brain, which increases student's capacity to learn (Lagally & Robertson, 2006). Allowing oxygen to flow to the brain enables one to cognitively function and make decisions. Exercise is also contributing to lowered risks of obesity, increased cardiovascular fitness, improved health, and academic achievement in university (DeBate, Pettee Gabriel, Zwald, Huberty, & Zhang, 2009).

The findings of current study also comparable to other studies which have examined university student exercise (Aelterman et al., 2012; Corder, Ekelund, Steele, Wareham, & Brage, 2008). As anticipated, they found that one to two thirds of university students did not engage in exercise for at least three days weekly (L. D. Elliott et al., 2022; Zarei, Mohd Taib, Zarei, & Abu Saad, 2013). The results of current study also supported previous studies on the topic indicating that university student exercise levels decreased as years in university increase (Elliott, Munford, Ahmed, Littlewood, & Todd, 2022; Racette et al., 2010).

Additionally, from the literature search in this area, the health fitness and educational professionals believe that physically active students perform better in the classroom. As one studies reported a statistically significant relationship between fitness and academic achievement (Chomitz et al., 2009). The relationship between fitness and academic achievement were supported by a few studies that positive associations between physical fitness and academic performance (Kim et al., 2003; Lipscomb, 2009).

Research has shown that mobile apps are effective tools for administering health and fitness interventions and changing user behaviours in key lifestyle areas, such as exercise (Stiglbauer, Weber, & Batinic, 2019). Fitness mobile apps to produce their intended effects, users need to use the apps for a continuous period of time, during which the desired behaviour changes are incorporated into their daily routines (Austin-McCain, 2017).

Current study revealed that the exercise intensity of nonmobile fitness apps users comprises of 147 participants (M = 1.43; SD = 0.70) and mobile fitness apps users with 211 participants (M = 1.25; SD = 0.55). An independent-samples t-test was conducted to compare exercise intensity on nonmobile fitness apps users and mobile fitness apps users. Results indicated that there were significant differences of exercise intensity level between nonmobile fitness apps users and mobile fitness apps users [t (352) = 2.82, p =.005, d = 0.28]. It means the nonmobile fitness apps users had a significant higher exercise intensity if compared to the mobile fitness apps users.

Another independent samples t-test was conducted to compare exercise intensity on male university students (n = 134 students) and female university students (n = 221 students). Results of current study found that male students had higher (M = 1.51; SD = 0.73) of exercise intensity compared to the female students (M = 1.21; SD = 0.51). There were significant differences of exercise intensity level between male and female university students [t (352) = 4.54, p = .001, d = 0.48] in current study. Current results are similar to many studies found that female students participated in less exercise than their male counterparts (McArthur & Raedeke, 2009). The results of current findings supported the previous finding that females performed significantly less moderate exercise, and vigorous exercise than males (McArthur & Raedeke, 2009).

Current findings supported that the importance of mobile device-based health & fitness apps, particularly, are revolutionizing the ways in which smartphone users self-manage their health & fitness. These apps aim at disease management such as diabetes (Goyal & Cafazzo, 2013) and prevention such as promoting healthy food and physical activities (Bice, Ball, & McClaran, 2015).

Also, the findings similar to another study examined 15 fitness apps that perform GPS tracking, workout planning, and workout performance assessment (Kranz et al., 2012). The study highlighted user-app interaction through playful, social, and long-term motivation. Users adhere to a fitness app more if they find it fun, interesting, trendy, cool (Huang & Ren, 2019).

Fitness apps are mHealth tools that provide information and guidance on health enhancement in weight loss, diet, and exercise, and they are considered a feasible, low-cost solution for self-health management (Chu et al., 2022). As a means of health interventions, fitness apps differ from other social media in their specialized foci (Gui, Fasoli, & Carradore, 2017). Accordingly, fitness app users tend to focus on exercise levels tracked by the apps. Besides, fitness app users primarily share fitness data and exercise information rather than generic posts. They facilitate the social comparison process regarding exercise within social networks formed in the app-based community (Mulgrew & Tiggemann, 2016).

As with most survey studies, this study has the following limitation, the data were collected using a self-reported survey and it is well-known that people tend to over-report (Wilson, Papalia, Duffey, & Bopp, 2019). Caution, therefore, needs to be exercised when generalizing the results of the study to the wider population.

CONCLUSION

The present findings suggest that students in the university under study did not meet the exercise objectives. New and more innovative efforts to increase physical activities participation among university students are needed. Exercise is beneficial to the university students, especially in their academic performance. Thus, university authorities should recognize the positive aspects of exercise on students and encourage them to participate in various extra-curricular activities.

AUTHOR CONTRIBUTIONS

Bayu Agung Pramono: preparation and research design, data collection, statistical analysis, result interpretation, manuscript writing, supervision of the study, and review of the final version. Abdul Hafidz, Muhammad Kharis Fajar, and Wijono: data collection, manuscript writing (introduction). Fifit Yeti Wulandari, manuscript writer and result interpreter, reviewed the manuscript. I Dewa Made Aryananda Wijaya Kusuma: manuscript writing (introduction) and discussion. Lim Boon Hooi was the manuscript writer and reviewed the manuscript. All authors have read and agreed to the published version of the manuscript.

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No potential conflict of interest were reported by the authors.

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