

# An empirical study on university students' continuous utilization of fitness apps in China

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## Abstract

**Introduction.** University students in China faced great health challenges. Fitness apps based on smartphones have the potential to provide an innovative approach to the university students to increase physical activities and conduct health management. This study examined how confirmed usefulness and confirmed ease of use of fitness Apps affect the attitudes, intention of recommendation, and continuous use of fitness apps among Chinese university students.

**Methods.** The study took a quantitative approach, using online questionnaire to collect data from 552 university students who had experiences using fitness Apps.

**Analysis.** All data analyses were conducted in R. Pearson's correlation and multiple linear regression were used to examine associations.

**Results.** Both confirmed usefulness and confirmed ease of use were positively associated with attitude towards fitness Apps and intention of recommending fitness apps to others. However, only confirmed usefulness was positively related to frequency of using fitness apps. Confirmed ease of use was not significantly related to frequency of using fitness apps.

**Conclusions.** We recommend future app-based health interventions targeting on university students to pay more attention to the functionality of the apps and integrate professional instructions into the program designs to help users achieve their goal more effectively.

**Keywords:** health care, technology acceptance, university students

## Introduction

Increases of health problems among university students have reached a challengeable stage in China in recent years. High study pressure and sedentary lifestyle due to Internet and smartphone use increase health risks among university students. An overall decline in physical health indicators found among Chinese university students since 2010 (General Administration of Sports of China, 2015). A study investigating the psychological wellbeing of 1,186 university students revealed that more than one third of participants demonstrated depressive symptoms (Hong and Yue, 2015). Another study reviewed 57 studies with 82,055 university students in China reported that short sleep duration and unhealthy sleep pattern were common issues among this group (Li, et al., 2017). Physical activity is positively associated with sleep quality and health-related quality of life (Ge, et al., 2019; Kvam, et al., 2016). Students' physical activity level was influenced by multiple factors, such as psychosocial impact, residency, time demands, as well as access to the exercise space (van Dyck, et al., 2015).

Fitness apps are smartphone applications that help users to manage their fitness activities and develop healthy lifestyles. The main functions of fitness apps include tracking and recording users' fitness activities, providing tailored exercise plans and instructions, and networking with other users. With the help of fitness apps, users might find that it is easier to keep motivated and follow a regular routine of exercise. With a high popularization of smartphone use in China, university students have proactively formed a strong user base for this novel way to monitor their health and improve their physical activity level. Although the potential of fitness apps in health promotion has been recognized, there is not much strong evidence supporting the effectiveness of fitness apps in physical activity improvement (Milne-Ives, et al., 2020). Moreover, applications of physical activities or app-based intervention programs were short-lived (Romeo, et al., 2019), especially among the younger generation (Cho, 2016). Apart from scholars contributing to the initial adoption of the fitness Apps, researchers shifted their focus to examine post-adoptive behaviours of fitness Apps. Zhang and Xu (2020) investigated the intention of continuous use of fitness apps among Chinese students based on an adjusted expectation confirmation model of information systems. The model addressed users' satisfaction level with the technology but failed to explain how the user experience was associated with the utilization of fitness apps. Therefore, in this study, we explored reasons that university students continuously use fitness Apps and how these factors influence their actual use of such technology.

The Technology Acceptance Model has been widely used to elucidate user behaviours to predict the adoption of technologies. Latest studies employing this model involved constructs encompassing attitude toward use, intention to use, and actual usage (Nadal, et al., 2020). Combining with the Expectation Confirmation Model (Bhattacharjee, 2001), which was applied to predict the continuous utilization of information systems, this study aimed to identify how confirmed usefulness and confirmed ease of use affect users' attitudes towards fitness apps, their intention of recommending fitness apps to others, as well as actual usage of fitness apps.

Accordingly, this research proposed following hypotheses:

H1: Confirmed usefulness and ease of use are significantly associated with users' attitudes towards fitness apps.

H2: Confirmed usefulness and ease of use are significantly associated with users' intention of recommending fitness apps to others.

H3: Confirmed usefulness and ease of use are significantly associated with the frequency of using fitness apps for exercise.

## Methods

The study took a quantitative approach by using a cross-sectional survey design. The data collection was conducted in April 2021. Data were collected by using a survey questionnaire distributed through WeChat and Weibo, which are two major social networking platforms in China. The target group was

students who studied in university in China and had experience of using fitness apps. A consent form was provided to participants before they started taking the survey. A randomly assigned amount of incentives ranging from 1 to 10 Chinese Yuan (1 Yuan  $\approx$  0.16 USD) was provided to each participant after completing the survey. Each survey took about 15 to 20 minutes. The research protocol was approved by a university in east China.

The questionnaire included three sections. The first section collected background information of participants, including gender, age, major of study, location, monthly income, and current health status. In the second section, questions were designed to investigate the utilization of fitness apps among participants. Questions in the third section aimed to collect information related to participants' adoption status of fitness apps, which included confirmed of usefulness, confirmed ease of use, attitude towards fitness apps, and intention of recommending fitness apps to others.

Out of 699 initial responses, there were 552 valid responses after excluding incomplete questionnaires and those which did not pass the attention check. The average age of valid sample was 20.78, with a standard deviation of 2.79. Among the participants, 68.48% were males, 31.52% were females. In terms of grade, 73.91% of participants were undergraduate students, while 21.74% and 4.35% were Master's students and Doctoral students, respectively. The majority of the participants majored in science (47.83%), followed by management (26.27%), liberal arts (15.22%), medical science (8.33%), arts (1.99%), and other (0.36%). Participants were also asked about their physical health condition and mental health condition. Only about half of them reported very good physical health condition (51.81%) and very good mental health condition (50.18%), respectively. Less than two thirds of the participants reported living with no chronic condition (66.30%). For detailed information regarding the sample characteristics, see Table 1.

Table 1: Demographic Information and Health Status of the Sample (N = 552)

	<i>Frequency (Percentage) / Mean (SD)</i>
<b>Age</b>	20.78 (2.79)
<b>Gender</b>	
Male	378 (68.48)
Female	174 (31.52)
<b>Grade</b>	
Undergraduate	408 (73.91)
Master's student	120 (21.74)
Doctoral student	24 (4.35)
<b>Major</b>	
Liberal Arts	84 (15.22)
Science	264 (47.83)
Management	145 (26.27)
Medical Science	46 (8.33)
Arts	11 (1.99)
Other	2 (0.36)
<b>Physical Health Condition</b>	
Very good	286 (51.81)
Good	172 (31.16)
Fair	85 (15.40)
Poor	7 (1.27)
Very poor	2 (0.36)
<b>Mental Health Condition</b>	
Very good	277 (50.18)
Good	189 (34.24)
Fair	70 (12.68)
Poor	16 (2.90)
Very poor	0 (0)
<b>Chronic Condition</b>	
No	366 (66.30)
One	149 (26.99)
Two or more	37 (6.70)
<b>Monthly Living Expense (RMB)</b>	
0-499	15 (2.71)
500-999	91 (16.49)
1000-1499	233 (42.21)
1500-1999	136 (24.64)
2000 and more	77 (13.95)

## Measurements

There were five main variables involved in this study. We used the confirmed usefulness and confirmed ease of use as independent variables. The attitude towards fitness apps, the intention of recommending fitness apps to others, and the frequency of using fitness apps were set as dependent variables.

The confirmed usefulness was measured by five items. Participants were asked to indicate their agreement with a 5-point Likert scale from strongly disagree (1) to strongly agree (5) for each item. Items indicating the confirmed usefulness included 'fitness apps help me make better health management', 'fitness apps help me access more health information', 'in general, using fitness apps

*improved my physical health condition*, *in general, using fitness apps improved my mental health condition*, and *in general, using fitness apps improved my social adaptation*. The average of confirmed usefulness was 4.06, with a standard deviation of .70. Cronbach's Alpha for five items was .86.

The confirmed ease of use was measured by two items. Participants were asked to indicate their agreement with a 5-point Likert scale from strongly disagree (1) to strongly agree (5) for each item. Items indicating the confirmed ease of use included *I'm happy when using fitness apps* and *I enjoy using fitness apps*. The average of confirmed ease of use was 4.04, with a standard deviation of .85. Cronbach's Alpha for two items was .79.

Attitude towards fitness Apps (M = 4.13, SD = .85) was measured by *I think using fitness apps is a positive behaviour* with a 5-point Likert scale from strongly disagree (1) to strongly agree (5). The intention of recommending fitness Apps to others (M = 4.02, SD = .89) was measured by *in general, I would like to recommend fitness apps to others* with a 5-point Likert scale from strongly disagree (1) to strongly agree (5). The frequency of using fitness Apps (M = 2.81, SD = .80) was measured by *what is your weekly frequency for using fitness apps*. There were five categories in frequency, including " $\leq 0.5$  hour" (1), " $>0.5$  hour and  $\leq 1$  hour" (2), " $> 1$  hour and  $\leq 1.5$  hours" (3), " $> 1.5$  hours and  $\leq 2$  hours" (4), and " $> 2$  hours" (5).

## Analysis

All data analysis processes were carried out in R. First, a descriptive analysis demonstrating the demographic information and health conditions of the participants was conducted. Second, the correlation between every continuous variable was calculated. After that, we used multiple linear regression analyses to examine effects from confirmed usefulness and confirmed ease of use on attitudes towards fitness Apps, intention of recommending fitness Apps to others, and frequency of using fitness Apps separately.

## Results

With strong correlation between each two variables, see Table 2, the data suggested potential associations between confirmed usefulness, confirmed ease of use, and all three dependent variables.

Table 2: Correlations between Continues Variables

	<b>Confirmed Usefulness</b>	<b>Confirmed Ease of Use</b>	<b>Attitude</b>	<b>Intention</b>	<b>Frequency</b>
Confirmed Usefulness					
Confirmed Ease of Use	.75***				
Attitude	.72***	.67***			
Intention	.72***	.68***	.59***		
Frequency	.31***	.28***	.20***	.26***	
Mean	4.06	4.04	4.13	4.02	2.81
SD	.70	.85	.85	.89	.80

\*\*\*p  $\leq$  .001, \*\*p  $\leq$  .01, \*p  $\leq$  .05

Results in Table 3 suggested that both confirmed usefulness (B = .61, SE = .06, p<.001) and confirmed ease of use (B = .30, SE = .04, p<.001) were positively associated with attitude towards fitness apps. H1 was supported. Moreover, both confirmed usefulness (B = .61, SE = .06, p<.001) and confirmed ease of use (B = .30, SE = .05, p<.001) were positively associated with intention of recommending fitness apps to others. Therefore, H2 was supported. However, only confirmed usefulness (B = .18, SE = .07, p<.05) was positively related to frequency of using fitness apps while there was a lack of strong evidence to suggest a significant relationship between confirmed ease of use and frequency of using fitness apps. H3 was partially supported.

Table 3: Multiple Linear Regression Results

	<i>Attitude</i>		<i>Intention</i>		<i>Frequency</i>		<i>VIF</i>
	B	SE	B	SE	B	SE	
Confirmed Usefulness	.61***	.06	.61***	.06	.18*	.07	2.59
Confirmed Ease of Use	.30***	.04	.30***	.05	.05	.06	2.50
F	29.50 (24,527)		29.99 (24,527)		4.70 (24,527)		
Adj. R <sup>2</sup>	.55		.56		.14		

\*\*\*p ≤ .001, \*\*p ≤ .01, \*p ≤ .05

Adjusted for age, gender, grade, major, physical health condition, mental health condition, chronic condition, and monthly living expense

## Discussion

The purpose of this study was to investigate determinants of university students' continuance utilization of fitness apps and to understand how they influence university students' attitudes and recommendation intention of fitness apps. Unlike previous studies focusing on the intention of adoption or intention of utilization of fitness apps, this current study took utilization as the main research subject. Three hypotheses were proposed based on the Technology Acceptance Model and the Expectation Confirmation Model and examined to demonstrate associations among the variables. Researchers observed that among the participants, up to one third of the participants claimed to live with chronic disease and a large proportion of the participants have a monthly living expenses below 1,500 Chinese Yuan. The results revealed an urgent need to improve university students' health conditions by implementing affordable interventions, which made fitness apps a good fit in this case and should be widely promoted among this group to meet their health management needs.

Both confirmed usefulness and confirmed ease of use had significantly positive influence on university students' attitude towards fitness apps, though to varying degrees. In terms of recommending fitness apps to others, confirmed usefulness appeared as a stronger positive indicator than confirmed ease of use. The frequency of fitness apps utilization was positively associated with the confirmed usefulness. The confirmed ease of use did not appear as a significant determinant of the utilization frequency. Therefore, we proposed continuously utilization of fitness apps was primarily motivated by achieving health management goals. Meanwhile, considering the studied group have more exposure to and are more skillful in using technologies, they may have few concerns about challenges either from adopting new apps or the less sophisticated design of the apps. Therefore, we recommend future app-based health interventions targeting on university students to integrate more frontier professional health research outcomes into the program design process to help users achieve their goal more effectively.

## Limitations and outlook

This study was also subject to limitations. First, this study used cross-sectional data, which limited the predictive power of users' experience on the utilization of fitness apps. Second, the sample population was university students who have more exposure to technology and are more proficient of adopting mobile apps. Therefore, it constrains the generalizability of study findings to other population. Third, due to the study design, the survey used self-reported data on the utilization of fitness apps, which may cause an overreporting on the utilization frequency. Therefore, we suggest that future research should employ longitudinal data to explore the pattern of continuously use of fitness apps. The research focus can be extended to other populations who also face health challenges and are in needs of assistant in formalizing physical activity habits and routines. In terms of data collection, other than self-reported data, a tracking record of apps utilization could be collected based on a consent agreement from participants in order to strengthen the objectivity of data.

This study investigated the factors which impact the continuous use of fitness apps among university students, a population face health challenges due to a less physically active lifestyle and with a relatively low living expense. The tests for the hypotheses provided evidence to support the positive impact of confirmed usefulness on the attitude, intention, and the frequency of fitness apps use among

university students. Meanwhile, the confirmed ease of use has a lower influencing on the frequency of fitness apps use, which intrigues adjustments of continuous use behaviour model among the target group. Future works might need to work on the remodelling of such behaviours by integrating factors that would help users cross the technological threshold of the apps, such as technology literacy and technology exposure, to further investigate the role played by the confirmed ease of use in the continuous use of fitness apps.

Results of current study indicate potential directions of fitness apps development and application. First, fitness Apps developers need to increase the usefulness and simplify the operation process of the Apps during the program design stage. Second, university administrations should consider promote the use of fitness apps among university students as an approach to increase physical activities and forge healthy lifestyle. In addition, the adoption of fitness apps can be extended to populations who are in needs of exercises for health improvement but live with limited budget. By demonstrating the usefulness and ease of use to a wider group of users, the fitness apps will not only serve as a tool to increase physical activities but can serve as a promising venue to lifestyle change.

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