Study on the Effect of Sports APP in the Background of "Internet +"Based on SPSS24.0

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Abstract—In order to explore the influencing factors of college students using sports and fitness APP, specifically solve the problems such as "poor user experience, low user loyalty, and poor user stickiness", retain college student users and improve their utilization rate, students from 83 universities in Wuhan were selected to draw samples, using SPSS24.0 software to test the validity and reliability, the correlation analysis and results were sorted by the gray relational method. The results show that five aspects including "sports APP develop corresponding incentive system" are the main factors affecting the use of sports APP.

Keywords-sports APP; "Internet plus"; college students; product development strategy; gray relative analysis method

1 INTRODUCTION

Sports APP is a third-party application on smartphone or wearable application that helps users record sports and fitness data, guide sports learning, and lead a healthy lifestyle.

The "Internet +" industry is booming, and the sports APP is developing rapidly. With the arrival of the post-epidemic era, people's consumption patterns and living habits have changed accordingly, with the total number of users of sports APP and the number of daily active users growing rapidly. According to the China Reporting Network, in February 2020, the size of active users in the sports APP industry rose rapidly to 89.28 million, up 93.3% year on year[1]. In the investment field, sports APP is also touted by capital, PE investment enthusiasm continues to rise, and capital flows intensively into the sports APP field[2].

At present, the overall physical quality of college students shows a downward trend[3]. It has caused more and more attention to the physical quality of college students. Sports APP products have a very high coverage rate among college students, and constantly attract new users.

However, behind the booming market, how to retain college students and attract users has become the top priority for sports APP[4].

In view of this, facing the dilemma in the use of sports APP, it is necessary to study the key factors affecting the use of sports APP for college students, put forward corresponding suggestions and countermeasures for the functional improvement and product development, and promote college students to develop good exercise habits and improve the physical quality of college students.

2 LITERATURE REVIEW

2.1 Research Status of Sports APP in China

Since sports APP started late in China, domestic scholars have not studied it deeply enough. Domestic research on sports APP, some focus on the perspective of media communication, some focus from the perspective of sports health, and the relationship between the use of fitness APP and physical exercise for college students. More influential studies include: Liu Hao, Wu Huipan, Yang Zexu (2020) believe that sports APP has a high share among college students, and college students gradually develop the habit of exercise and fitness and tend to have fragmented exercise. There are many kinds of sports APP, which can meet the different needs of college students ' record data, sports guidance, and social interaction[5]. Xu Menglian (2018) used a variety of research methods to study the influence of user motivation, attitude, subjective norms, perceptual behavior control and electronic health literacy level on the use of sports APP from the perspective of users[6]. He Ziyu (2020) gave HAPA theory to college students to study the use and impression factors of sports APP, and proposed to intervene in college students ' use of sports APP from three aspects of self-cognition, self-efficacy and psychological characteristics and promote their use and adherence to sports[7]. Yi Linglu (2019) studies the persistent intention of sports APP users through the application of MPLUS software[8]. Zhu Yimei (2019) studied the impact of perceived usefulness, perceived ease of use, information quality, system quality, service quality, health quality, health literacy, personal traits, conversion cost and objective factors on the willingness to continuously use sports APP and reached positive conclusions[9].

In general, due to the short rise time of Internet sports and fitness services, the domestic research on this field is still in the primary stage, and the theoretical basis and systematic research still need to be continuously enriched. Although some studies indicate the current problems, they still need time to test the suggestions on how to improve these problems.

2.2 Research Status of Sports APP Abroad

The research scope of sports APP in foreign countries is wide, the research perspective is broad, and the research results are rich. After combing, the researchers were mainly from the United States, New Zealand, the Netherlands and South Korea. The research perspective involves the influence of APP on user image management, how to serve users, affect their daily activities, the legal influence of collecting user information, etc. (1) Analysis of the impact and impact mechanism of sports APP on users, and explain the connection between sports APP and the audience, including Taylor H, Covery E, J ones A et al. (2017); Kyungbum Choi, Qingshuang

Guo (2020); Weihua Juxiang-XIAO(2019). (2) Research on use motivation, Paula Bitrian, Isabel Buil, Sara Catalan encourages gamification of sports APP to affect users[10]. (3) Three PhD students from Central University, University of Foreign Studies and Hanlin University in South Korea studied the impact of fitness App on college students' attitude towards their image (Cho J, Lee E, Kim SJ, Park D. 2015). (4) Research methods have more quantitative analysis than domestic research, and have good reference value through modeling and system operation. Among the effects of the use of exercise APP, research has shown that exercise APP can improve the exercise time and exercise frequency, enhance the self-efficiency of physical exercise, and reduce the level of exercise perception impairment[11]. Meanwhile, research deeply analyzed the mechanism of this impact, arguing that the importance of physical activity introduction, goal setting, real-time feedback, social support and online consultation are the most useful strategies to encourage physical activity, but research did not explore the mechanism for behavior changes corresponding to each function[12].

Based on the relevant research at home and abroad, although there are many foreign research angles and a wide range of sports APP, there are various factors such as differences in culture, language and use habits, and they are in isolation from each other. Domestic research in this field still belongs to the primary stage, and the theoretical foundation and systematic research still need to be continuously enriched. In particular, there are few influential factors affecting the use of sports APP products in Wuhan college students, which need to be strengthened.

3 RESEARCH AND DESIGN

The college students in Wuhan are selected as the overall research object, and each college student is the research unit.From 83 universities in Wuhan area randomly selected 12 different grades and types of universities, respectively are Huazhong Agricultural University, Central China Normal University, Wuhan University of Technology, Wuhan University of Science and Technology, Hubei University of Technology, Hubei University of Economics, Hubei University, Jianghan University, Wuhan College of Arts and Science, Wuhan Polytechnic University, Hubei University of Traditional Chinese Medicine and Wuhan Business University, and randomly selected 480 college students. 452 college students using sports APP will be stratified according to the professional nature, liberal arts mainly includes philosophy, business, law, etc., science including mathematics, physics, chemistry, etc., engineering including machinery, electronic information, civil engineering, clinical medicine, maternal and child health care, Chinese medicine, sports related majors including sports, sports basic science, sports technology, etc. Table 1 shows the specific information.

TABLE 1. SAMPLE PROFESSIONAL STRATIFICATION

Layer	Floor rights	Sample size
Liberal Arts	0.3319	150
Science Department	0.2522	114
Engineering Course	0.2854	129
Medical Department	0.0841	38
Sports Related Majors	0.0332	15
Others	0.0133	6
Total	1	452

Optimum sample size n_o based on random sampling calculation formula for the

$$n_{\circ} = \frac{u^2 PQ / d^2}{1 + \frac{1}{N}\left[\frac{u^2 PQ}{d^2} - 1\right]}$$

(1)

In the formula (1), N is the overall number, u is the bilateral α quantile of the standard normal distribution, p is the sample proportion, and d is the absolute allowable error.

According to Hubei Statistical Yearbook 2018, the total number of college students in Wuhan is 1125600, so we estimated the sample with p=0.5, and the best sample amount obtained with the sampling absolute error not exceeding 5% under 95% confidence.Formula (1) was simplified to obtain formula (2), and the optimal sample size was finally calculated to be 384.

$$n_{\circ} = \frac{u^2 p(1-p)}{d^2} = \frac{1.96\,^{\wedge}2 \times 0.5 \times 0.5}{0.05\,^{\wedge}2} = 384$$

(2)

Assuming that the sample recovery rate was 80%, 480 questionnaires were proposed to be issued according to formula (3).

$$n' = n \div (1 - 20\,\%) = 480$$

(3)

4 DATA ANALYSIS

4.1 Reliability and Validity Test

4.1.1 Randomness Test

For 480 effective questionnaires include "gender", "grade", and "the usage frequency of sports APP" three basic information., the study hypothesis was:

H0: Sequence sample data appears sample random

H1: Sequence sample data appears sample is not random

Randomly test the categorical variables in the question through SPSSAU. The test results are shown in the Table 2:

TABLE 2. TOUR ANALYSIS

Tour Analysis Results			
Item	Sample size	Statistics of z value	p
Your gender	480	-0.730	0.466
Your grade	480	-0.119	0.905
The frequency that you use sports APP	480	-0.242	0.809
* p <0.05 * * p <0.01			

From the table above, "gender", "grade", and "the usage frequency of sports APP" show none (p > 0.05), meaning random sequence data. The sample randomness test is continued to be conducted by the SPSS, and the test results show that the sample data order of most variable sequence is random. Therefore, it can be considered that the quality of the survey data obtained by this questionnaire is relatively high and successful.

4.1.2 Reliability Test

The questionnaire was tested by the α reliability coefficient method (see Table 3).

TABLE 3. RELIABILITY ANALYSIS

Cronbach reliability analysis			
Item	Total correction item correlation (CITC)	Item deleted α factor	Cronbach α coefficient
Smooth operation	0.726	0.753	0.811
The interface layout is neat and generous	0.654	0.769	
Rich online and offline activities	0.545	0.786	
Have red envelopes and other reward systems	0.552	0.785	
Stable network and ample traffic enable me to use	0.471	0.812	
Only used in the playground, gymnasium and other special venues	0.483	0.798	
Use sports equipment	0.518	0.791	
Standardized Cronbach α coefficient: 0.811			

The results show that the reliability coefficient value is 0.811, greater than 0.8, indicating high reliability quality. For the "α coefficient of a deleted item", the reliability coefficient does not increase significantly after any item is deleted, indicating that the item should not be deleted. The "CITC values" are all greater than 0.4, indicating that the data can be retained and can be used for further analysis.

4.1.3 Validity Test

Effectiveness test is performed by using KMO and Bartlett tests (see Table 4).

TABLE 4. VALIDITY ANALYSIS

Effectiveness Analysis Results		
Item	Factor load factor	Common degree (common factor variance)
	Factor 1	
Smooth operation	0.933	0.870
The interface layout is neat and generous	0.928	0.860

Rich online and offline activities	0.938	0.880
Have red envelopes and other reward systems	0.921	0.848
Stable network and ample traffic enable me to use	0.927	0.859
Only used in the playground,gymnasium and other special venues	0.915	0.838
Use sports equipment	0.906	0.822
Characteristic root value (before rotation)	5.977	-
Variance interpretation rate% (before rotation)	85.380%	-
Cumulative variance interpretation rate% (before rotation)	85.380%	-
Characteristic root value (after rotation)	5.977	-
Variance interpretation rate% (after rotation)	83.380%	-
Cumulative variance interpretation rate% (after rotation)	83.380%	-
KMO value	0.942	-
Bart spherical value	4406.621	-
df	21	-
p value	0	-

It is shown that the common degree value for all research items is above 0.4, indicating that the study item information can be effectively extracted. Also, the KMO value is 0.942, greater than 0.6, meaning the data is valid. Before rotation,the variance interpretation rate for 1 factor was 85.380%, and the cumulative variance interpretation rate was 85.380% > 50%. It means that the amount of information of the research item can be effectively extracted.

4.2 Analysis of Key Factors affecting the Use of Sports APP in College Students

4.2.1 Descriptive Analysis

4.2.1.1 Basic information of the subjects: A total of 452 questionnaires were collected, including 452 respondents who had used sports APP. Among them, there were 210 men, accounting for 46.6%, and 242 women, 53.54% of the total, the difference is small; There are 121 sophomore students, accounting for 26.77%, and 166 juniors, 36.73% of the total, accounting for a high overall proportion; There are 150 students in liberal arts majors, 33.19% of the total number, accounting for the highest proportion, followed by engineering and science majors, medicine and sports related majors accounting for a lower proportion, and other majors accounting for the least. The distribution of majors is diverse.

4.2.1.2 Current status of subjects using the sports APP: The proportion of college students using sports APP was 94.17%, indicating that only a small number of college students did not use sports APP, sports APP with high penetration among college students. Of them, 324 have used KEEP, 235 people used Rejoice Sport, 221 have used Mi Sport, each accounting for 71.68%, 51.99% and 48.89% of the total, users of other sports APP accounting for less than 40%. It can be seen that college students' tendency to choice sports APP is still relatively

concentrated, mainly in "KEEP", "Mi Sport", "Rejoice Sport", and "Godoon Sport" followed by "trail music running".

4.2.1.3 Status of College students using sports APP for physical exercise: The usage frequency is mainly one or twice or less a week, accounting for 79.42% of the total, and the overall sports enthusiasm is not high. Most students exercise for "half an hour to an hour", 69.69% of the total population, while "two hours and more" and "less" have relatively lower ratios. Correspondingly, the single exercise time of college students is usually from half an hour to an hour.

4.2.2 Identify Key Factors influencing the Use of Sports APP Based on Gray Relative Analysis Method

Using gray relative analysis, explore the influence of various factors on college students using sports APP.

4.2.2.1 Determine the analysis array

Take the use ranking of sports APP as a reference column (see Equation 4), and take the operation use, interface layout, online and offline activities, reward system, network environment, sports field, sports equipment as the comparison column (see Equation 5).

Reference sequence:

$$Y = Y(k) \mid k = 1,2 \dots n \tag{4}$$

Comparison sequence:

$$X_i = X_i(k) \mid k = 1,2,\dots n, i = 1,2,\dots m \tag{5}$$

4.2.2.2 Nondimensionalize of the variables

Initial value conversion processing based on formula (6):

$$x_i(k) = \frac{x_i(k)}{x_i(1)}, k = 1,2,\dots n; i = 0,1,2 \dots m \tag{6}$$

4.2.2.3 Calculate the correlation coefficient

$$\xi_i(k) = \frac{\min\limits_{i}\min\limits_{k} \Delta_i(k) + \rho \max\limits_{i}\max\limits_{k} \Delta_i(k)}{\Delta_i(k) + \rho \max\limits_{i}\max\limits_{k} \Delta_i(k)} \qquad \rho \in (0,\infty) \tag{7}$$

In Equation (7), the smaller ρ, the greater the resolution, the general value range is (0,1), the specific value is determined according to the situation. When ρ≤ 0.5463, the resolution was the best, so taken ρ= 0.5.

4.2.2.4 Calculate the correlation degree

$$r_i = \frac{1}{n} \sum_{k=1}^{n} \xi_i(k), k = 1,2,\wedge, n$$

(8)

The correlation coefficient and correlation of various factors are shown in Table 5 and Table 6 based on Equation (8).

TABLE 5. Sample Correlation Factors of Each Factors

Factors	K_{Si}	K_{Si}	K_{Si}	K_{Si}	K_{Si}	K_{Si}
Smooth operation	0.3976	0.9997	0.9357	0.8539	0.7576	0.7563
The interface layout is neat and generous	0.3978	1	0.9371	0.8598	0.7555	0.7534
Rich online and offline activities	0.3981	0.9826	0.9359	0.8496	0.7667	0.7622
Have red envelopes and other reward systems	0.3984	0.9753	0.9176	0.852	0.7694	0.7761
Stable network and ample traffic enable me to use	0.3992	0.998	0.9250	0.8524	0.7625	0.7665
Only used in the playground, gymnasium and other special venues	0.3970	0.9573	0.9112	0.8345	0.7780	0.7936
Use sports equipment	0.3960	0.9548	0.9041	0.8238	0.7917	0.7921

TABLE 6. Correlation of the Factors

Influencing factors	R_i
Smooth operation	0.7835
The interface layout is neat and generous	0.7839
Rich online and offline activities	0.7842
Have red envelopes and other reward systems	0.7815
Stable network and ample traffic enable me to use	0.7839
Only used in the playground, gymnasium and other special venues	0.7786
Use sports equipment	0.7771

Using gray relative analysis method to analyze the factors influencing the use of sports APP, it can be obtained that the background,page and activity design of the sports APP have played a great role in the use intention of college students, operation smooth, beautiful and neat interface layout, rich design of activities and red envelopes and other reward system can greatly affect the use intention of college students. At present, there are many kinds of APP in the market. College students are inseparable from various APP in their life and study, and they can easily find similar alternatives for using poor APP products. So, there will be high requirements for the performance of APP. At the same time, college students are a group with more independent time, keen on new things and participate in interesting activities. Therefore, the rich online and offline activities can attract college students to participate in and use their products and enrich their after-school life. The cash bonus and other systems can also meet their needs. College students have no job and fixed income, which will have a positive impact on the use of red envelopes. In contrast, sports scenarios have not enough impact on college students' use of sports APP. Because sports APP mainly depends on the network operation, a good network environment is an important factor for college students, and the professional and comprehensive requirements of sports fields and sports equipment are not high. It can be understood that sports APP products contain a wealth of exercise courses, whether equipment movement, or equipment-free movement can be completed through it, and the same on the website. Therefore, in addition to the network environment, the existence of sports fields and facilities can better help college students use sports APP, but the lack of them will not affect the use intention.

5 CONCLUSION

Through empirical analysis, the key factors affecting college students' use of sports APP include (1) the richness of online and offline activities; (2) the network environment at the time of use; (3) the comfortable level of the interface layout of sports APP; (4) the fluency of sports APP; (5) sports APP develop corresponding red envelope and other incentive system.

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