An Empirical Study on the After-class Exercise of College Students with the Help of Running APP

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[**Abstract**] This research is intended to explore how college students do extracurricular exercise with the help of running APP. Methods: statistics analysis, questionnaire survey, and expert interview were used to conduct a 32-week follow-up study on the subjects. The intervention of the APP was analyzed from the physical health test data of students before and after the intervention, as well as the paired T-test of the indicators of subjective experience and exercise habit formation scale. The result shows that after the intervention, the physical health indexes of students were positively improved, and the difference was very significant ($P<0.01$); the students' experience of exercise had a positive change with a significant difference ($P<0.05$). The quantitative dimensional changes of exercise habits of male and female students showed a great difference, and the effect of the intervention of male students was greater than that of female students. Conclusion: the running APP's intervention is accepted by most of the students. The intervention can effectively improve students' physical and mental health. Through institutional constraints by the APP, students can maintain regular exercise. When students get positive subjective exercise experience, which plays an educational role of "cultivating" and "rooting", they can cultivate good exercise habits for the rest of their life. Suggestions: school-enterprise cooperation can use the power of science and technology to achieve personalized improvement of exercise APP intervention methods, focusing on arousing the exercise needs of students, and realizing that students of different genders and levels of exercise can provide more quantifiable exercise item selection and intervention intensity intelligent configuration. Exercise feedback, exercise prescription, rehabilitation guidance and increased interaction between runners enhance the effectiveness of exercise intervention.

[**Key words**] running APP; college students; compulsory exercise; intervention effectiveness; empirical research

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1 Introduction

With the development of the "Healthy China" strategy, improving the health of college students has become a key issue for school sports governance. Many scholars have pointed out that insufficient extracurricular physical exercises of college students are the main reason for the decline in their physical health. College students' extracurricular physical exercises have been an unimportant part compared with other courses. Lacking reasonable guidance and intervention is the main problem of this situation. In the era of information intelligence, driven by the Internet+ and artificial intelligence waves, running APP provides a practical solution for college extracurricular physical exercise. But because of its "compulsory" nature, it has also caused external controversy. From a certain level, sports, whether it is the acquisition of technology, the improvement of physical fitness, or even the improvement of health, requires the actual participation of individuals. Such participation needs to follow certain external constraints, which can be understood as certain. Therefore, this study is based on actual cases of college students' APP mandatory running clock-in intervention. The research subjects are followed up for two semesters.

The three dimensions of physiological, psychological, and habit are quantitative indicators from the students before and after the 32-week APP running clock-in. The changes and feedback of "compulsory" running extracurricular physical exercises reflect a certain extent, in order to provide certain research data and opinions for the selection of college students' sports intervention programs under the background of healthy China construction.

2 Research method

2.1 Questionnaire survey method

Three questionnaires were used in this study: The first one is a self-made questionnaire: "Check-in and Exercise Status Questionnaire for Participating in Running APP", which has high validity through expert evaluation (see Table 1). The second one uses McAuley and Courtneya's "Subjective Exercise Experience Scale", which includes a positive happiness subscale, a psychological distress subscale, and a fatigue subscale. In the three subscales, Cronbach's coefficient a are 0.89, 0.92, and 0.91, which is reliable. The third one uses Dr. Wang Kun's "College Students' Exercise Habits Questionnaire", which contains three subscales of exercise behavior, thinking mode and exercise effect. The coefficients of Cronbach's three subscales are 0.90, 0.94 and 0.86 respectively, with high reliability. After the preliminary reliability and validity of the three questionnaires were tested, the questionnaires were issued and collected to the subjects through the questionnaire star platform. 3334 questionnaires were collected before and after, and the IP addresses were compared to ensure the two test samples. Consistently, excluding 26 invalid questionnaires that failed to match, there are a total of 3308 valid questionnaires, with a recovery rate of 99.2%.

2.2 Mathematical statistics

Excel 2010, SPSS 26.0 were used to perform independent sample T test statistics on 3337 students (1128 boys and 2209 girls) before and after compulsory running exercise for 32 weeks and the scale data of 3308 samples were collected through questionnaires analysis.

2.3 Expert interview method

Five experts in the field of physical education were interviewed through WeChat and telephone. The content of the interviews involved the questionnaire used in this study and related content of the research topic, and the questionnaire was revised based on expert suggestions.

Table. 1. The questionnaire of expert validity test evaluation statistics.

Number/percentage	Perfect	Percentage	Relatively perfect	Percentage	General	Relatively poor	Poor
Overall design	4	80%	1	20%	0	0	0
Structural rational	5	100%	0	0	0	0	0
Accuracy	4	80%	1	20%	0	0	0

Table. 2. 16-week running check-in intervention plan arrangement

	Total mileage	Morning exercise	Limit Per day	Check-in time	Route	Speed
Male	120Kilometer	30 times	3Kilometer	6 am-23 pm	APP randomly generated	No request
Female	120Kilometer	30 times	3Kilometer	6 am-23 pm	APP randomly generated	No request

3 Research results and analysis

Starting from Grade 2017, our school takes students' extracurricular physical exercises as a part of the end-of-term assessment of compulsory physical education for students to promote and interfere with their extracurricular physical exercises. The extracurricular physical exercise standard adopts the APP check-in mode. Students are

required to complete the 120-kilometer running exercise check-in task of the Sports World Campus APP in one semester, including 30 morning exercises of 1 km each. The specific arrangements and requirements are shown in Table 2. Since the school implemented this mandatory intervention policy, we can see running exercises everywhere, and the exercise atmosphere on campus has been greatly improved compared to pre-intervention. This study analyzed the actual effects of compulsory intervention measures by analyzing the changes in the two physical test indicators before and after the 32-week exercise intervention. As a part of the physical education curriculum, college students' extracurricular physical exercise plays an irreplaceable role in promoting their physical and mental health. The extracurricular exercise intervention for college students based on the running APP is also regarded as an educational method. Its effectiveness depends not only on its final effect but also on its process feedback. The feedback of the educational process is also the true feeling of the individual characteristics of this educational method, and the feedback of the research process helps to improve the method. This research will conduct process feedback analysis from the aspects of "improvement of health", "psychological adaptability", and "enhancement of exercise atmosphere".

3.1 The intervention of extracurricular compulsory exercise improves the physical health of students and enhances their sense of personal health

From Table 3 and 4, the changing trend of the physical health indicators of students after receiving the intervention shows that the health promotion effect of exercise intervention methods on most students exists. It can be seen from Table 3 that most of the average values of the physical fitness test of the students have undergone a positive change after receiving the 32-week compulsory running clock. Except for the boys' 1000 meters and the boys' standing long jump, the changes of other indicators before and after the intervention have very significant differences ($P<0.01$). The original intention of the extracurricular exercise is to use external forces to overcome Internet addiction, change bad habits such as homebody and laziness, and take more outdoor exercises to improve their physical health. It can be seen from the changes in the physical fitness test indicators before and after the students check in with APP, that the intervention has achieved certain results and improved the students' physical fitness to a certain extent. Judging from the changes in the 1000-meter and 800-meter test indicators that reflect the endurance level of students, there is a big difference between male and female students. Analyzing the main reasons, the author believes that there are two main points. One is the difference in the degree of obedience and completion quality of male and female students in facing mandatory requirements. Female students complete the task better than male students, which is shown in Table 4. The degree of acceptance of mandatory clock-in exercise is evident; Second, there is a big difference in the amount of activity between male and female students before the intervention. In the intervention, both male and female students used an intervention volume of 120 Kilometers. For boys who originally had more extracurricular physical activities than girls, this intervention increased their endurance while the effect is minimal. Therefore, it is suggested that when formulating intervention strategies to improve the physical health of students, attention should be paid to arranging different intensity intervention loads for students of different genders.

Table. 3. Paired T test results of various indicators before and after the students participated in the mandatory intervention exercise for 32 weeks

Male	N	Before intervention ($x \pm s$)	After intervention ($x \pm s$)	T	P
Weight (kg)	1128	63.77±12.60	65.29±12.80	-8.375	<0.01
Vital capacity (ml)	1128	3261±590	3616±566	-21.808	<0.01
50m dash (s)	1128	7.42±0.57	7.34±0.48	4.209	<0.01

Standing long jump (cm)	1128	225.46±18.52	225.91±17.6	-0.883	>0.05
Sit and reach (cm)	1128	13.42±5.82	16.15±6.23	-12.78	<0.01
1000m (s)	1128	246.02±29.99	247.6±25.17	-1.337	>0.05
Pull-up	1128	5.41±4.01	5.94±4.58	-5.27	<0.01
Weight (kg)	2209	52.48±8.46	52.08±8.76	-7.004	<0.01
Vital capacity (ml)	2209	2193±405	2432±397	-26.183	<0.01
50m dash (s)	2209	9.26±0.58	9.12±0.57	11.185	<0.01
Standing long jump (cm)	2209	166.94±13.26	168.39±13.7	-5.786	<0.01
Sit and reach (cm)	2209	16.25±5.39	18.99±5.49	-21.8	<0.01
800m (s)	2209	257.51±17.82	238.17±20.43	33.125	<0.01
Sit-ups	2209	32.01±7.04	37.54±7.01	-37.883	<0.01

Table. 4. The change trend of various indicators of the physical fitness test after 32 weeks of compulsory exercise

Changes in various indicators	Male (n=1128)			Female (n=2209)		
	Improve	Unchanging	Decline	Improve	Unchanging	Decline
Vital capacity	78.99%	0.00%	21.01%	73.88%	0.18%	25.94%
Weight	69.24%	1.51%	29.26%	58.76%	1.27%	39.97%
50m dash	49.02%	10.28%	40.69%	56.13%	7.83%	36.03%
Sit and reach	66.40%	0.71%	32.89%	69.81%	1.04%	29.15%
Standing long jump	45.30%	10.90%	43.79%	49.07%	10.96%	39.97%
800m				79.58%	1.63%	18.79%
Sit-ups				79.72%	5.43%	14.85%
1000m	43.09%	0.89%	55.85%			
Pull-up	44.06%	22.87%	33.07%			

Looking at the change trend in the physical health indicators of students in the course of the intervention in Table 4, except for males whose scores in the 1,000-meter test decreased by more than the increased rate, they developed in the opposite direction of the intervention target, others showing a positive trend toward the intervention target (see Table 4). From the perspective of changing trends, interventions are positively effective for most students, and follow-up interventions can focus on students whose physical health is on a downward trend.

For the 1000-meter and 800-meter test indicators, there is a big difference between male and female students. Excluding special factors such as climate and timing, the reasons may be analyzed in two aspects: First of all, the difference in obedience and completion quality between males and females is that girls perform better than boys under compulsory exercise requirements. This can be seen from Table 5: students' recognition of compulsory clock-in exercise; Secondly, there is a big difference in the amount of activity between male and female students before the intervention, and the program does not involve individualized and simple-layered management.

Compared with traditional running exercises, APP mandatory running clocking mode has a certain degree of humanization and flexibility. Management improvements in this area are beneficial to stimulate the internal motivation of subconscious students who need to exercise. In this study, men's exercise effect is better than that of

women. This is reflected in the insignificant changes in girls' thinking patterns in the intervention results of this study. The reason for this result is worthy of further research. Therefore, this not only shows that there are differences in the acceptance of exercise intervention between male and female students, but also shows that different projects require scientific and hierarchical guidance.

3.2 The influence of extracurricular compulsory exercise intervention methods on students' psychological adaptation

95.2% of the students completed the required running clocking tasks. The survey results in Table 5 show that nearly two-thirds of the students agree with the intervention and can complete the required mileage with a positive attitude. From the perspective of recognition and obedience, girls are generally better than boys, but from the effect of the intervention, boys are better than girls. In the formulation of follow-up intervention strategies, more emphasis should be placed on the supervision of boys in the early stage, and more attention should be paid to the follow-up guidance and intervention of girls in the later stage.

Table. 5. Students' subjective acceptance of running clocking intervention

Gender	Acceptance	Percentage%	Whether to continue exercising after the intervention is canceled	Percentage%	Attitude	Percentage
Male	Agree	71.73	y	67.5	Positive	62.9
	Disagree	28.27	n	32.5	Negative	37.1
Female	Agree	84.72	y	43.2	Positive	67.7
	Disagree	15.28	n	56.8	Negative	32.3

Table. 6. Students' subjective exercise experience paired T test results before and after intervention

	N	4 weeks after intervention (x ± s)	16 weeks after intervention (x ± s)	T	P
Positive happiness	3282	17.69±4.60	18.72±4.85	-4.06	< 0.05
Psychological distress	3282	11.05±5.10	9.50±4.06	2.96	< 0.05
Fatigue	3282	14.03±4.10	15.13±3.88	-1.58	> 0.05

Subjective experience is the degree of positive emotional state, negative emotional state and physical consumption of exercisers after exercise. Positive well-being is an important indicator to measure people's mental health. It refers to people's satisfaction and pleasure with life or physical exercise; Psychological annoyance refers to an individual's mentally unpleasant state, which can usually be manifested as anxiety, irritability, depression and other negative emotional states; The fatigue index reflects the subjective physical consumption of the exerciser, which will impact the later exercise, and be accompanied by a feeling of fatigue.

The data in Table 6 show the changes in the three dimensions of students' subjective experience in the early and late stages of the intervention. The results showed that compulsory running and clocking in improved the students' positive happiness and reduced their psychological annoyance, and there was a significant difference between these two changes ($P<0.05$), the difference in fatigue changes before and after the intervention was not significant. From the average point of view, the fatigue degree of the students increased during the later period of the intervention. This may be due to a negative reaction of the students to the single and boring running exercise.

Subjective exercise experience, as an irrational factor, allows college students to naturally form behavior

patterns with self-feelings and impressions. When facing upcoming exercise activities in the future, individuals will rely entirely on subjective experience and experience memory to make choices. Compulsory exercise intervention allows students who lack exercise experience to experience the physical and mental pleasure brought by exercise, which can improve their mental health, and provide a positive impression for their future participation in sports. It is beneficial to their later investment in sports.

3.3 The influence and change of extracurricular mandatory exercise intervention on students' physical exercise atmosphere and habits

Habits are behaviors that people repeat without consideration. Long-term participation in exercise is a prerequisite for habit formation. For people who lack internal motivation for exercise and low self-discipline, exercise participation can only be achieved with the help of external forces. Piaget's theory believes that the development of human behavior is a process from undiscipline to heteronomy to self-discipline. The formation of exercise habits requires an exercise environment, which can be facilitated by the combination of the three factors of institutional heteronomy and student self-discipline, and three factors are equally important.

This study uses Wang Kun's "College Students' Exercise Habits Survey Form" to quantify students' exercise habits, and explores the influence of intervention on students' exercise habits by analyzing the changes before and after the intervention. The exercise behavior subscale has a total score of 35 points. The higher the score is, the stronger the stability of the exercise behaviour can be; the total score of 55 points in the thinking mode, the higher score indicates the higher degree of automation of exercise; the total score of exercise effect is 40 points, the higher score indicates the better effect of exercise.

The data in Table 7 show that the exercise indicators of male and female students have improved after the intervention, and there is a significant difference ($p<0.01$), which confirms that this "heteronomy" intervention can improve the stability of students' exercise. This thinking pattern can predict whether the intervened person will continue to exercise after the intervention is relieved. The results show that the thinking patterns of male college students have improved and are significant after 32 weeks of mandatory exercise intervention, while girls have only small changes and are not significant ($p>0.05$). This result is consistent with the previous results in Table 4. For the after-effect of intervention, boys are better than girls. Existing studies have shown that gender stereotypes and aesthetic deviations in the field of sports lead female college students to give up on exercise. Once the external force stops, the probability of female college students stopping sports is greater than that of boys. The effect of exercise, as the benefit obtained after exercise, is the most direct manifestation of the effects of physical exercise, fitness, heart, bodybuilding, and brain training. It is not only beneficial to strengthen the exerciser's physical body, but also can prompt people with low confidence to change their attitudes. However, these benefits are usually lagging, concealed, and cannot be "immediate". This is also the main reason why the exercise effect of college students in Table 6 does not change much after receiving 32 weeks of exercise intervention.

Piaget's theory believes that the development of human behavior is a process from undiscipline to heteronomy to self-discipline. The development of exercise habits requires an exercise environment, which can be facilitated by the combination of the three factors of institutional heteronomy and student self-discipline, and each is indispensable. During the intervention period in this study, students' autonomous running exercise time was mainly concentrated in two periods; the first was the morning exercise check-in period, and the second was concentrated in the evening. At the same time, the number of people running and exercising was greater than 500, which effectively created school exercises. The external environment and the herd mentality promote the cultivation of students' exercise and their participation in self-discipline. Self-determination theory believes that human beings have a positive psychological growth, development and self-determination potential. When the external environment has the potential to develop this potential, it is conducive to the transformation of external motivation to internal motivation. Survey data show that less than 30% of the students had participated in extracurricular sports activities

and group competitions more than 3 times a week before the intervention. During the intervention period, the number of people participating in exercise rose to more than 80%. The positive external exercise environment was imperceptibly infects and nurtures the student group that has no need for exercise, and the participation of students in exercise produces a domino effect. Implant students with a stressful heterogeneous experience, and let them generate a positive subjective experience of exercise by themselves; inspire their exercise needs, actively build their own self-discipline behavior and let them achieve self-development under the strong external exercise atmosphere. These may be the special meaning of mandatory exercise.

Table. 7. Three-dimensional paired T test results of exercise habits of students before and after the intervention

Male	N	Before intervention (x ± s)	After intervention (x ± s)	T	P
Exercise	1118	21.76±5.45	23.85±5.44	6.007	<0.01
Mode of thinking	1118	32.94±8.54	35.41±8.94	-4.41	<0.01
Exercise effect	1118	28.13±4.51	28.75±4.88	-2.078	>0.05
Exercise	2190	20.38±4.97	22.30±4.49	4.426	<0.01
Mode of thinking	2190	31.24±7.96	31.37±7.75	0.178	>0.05
Exercise effect	2190	27.70±4.41	27.74±4.09	-0.095	>0.05

In summary, running APP can improve the stability of the intervened people's exercise participation during the intervention period, and improve the exercise autonomy of boys, but it does not change the dimensional indicators of the students' exercise effect much, as the exercise effect is the main body. The exercise experience can promote the internalization of exercise motivation and benefit the continuity of exercise after the intervention. Due to the unity and limitation of exercise content, the compulsory running punch cannot meet the individualized and diversified exercise needs of college students. Therefore, it fails to realize the internalization of the exercise motivation of the intervened. This is also a major defect that affects the development of college students' exercise habits.

4 Conclusions and suggestions

At present, on the basis that sports scores are included in the high school entrance examination in China, all provinces have gradually included sports scores in the college entrance examination. If the physical education entrance examination is understood as a kind of "compulsory", then this shows the importance of sports to the physical and mental health of people, but also points out the role of sports in the field of education in addition to physical value. Although "compulsory" exercise generally differs from education in appearance, if it is seen from the intangible and non-classical characteristics of education, as long as it follows specific rules, "compulsory" exercise can also become an educational method that can help people grow.

4.1 Conclusion

Running APP intervention can achieve the purpose of stimulating students to participate in and maintaining exercise during the intervention period, and can effectively improve their physical health and psychological state. The intervention method achieves the purpose of creating a benign campus exercise atmosphere, allowing students to experience the positive effects of exercise on the body and mind during exercise. However, due to the unity of project selection and the lack of intervention by other means of guidance, students are prone to burnout in the later stage of the intervention, such as fatigue; gender differences in subjective exercise experience and exercise changes of male and female students; endurance programs that do not take into account the effect degradation caused by individual differences expose design flaws.

4.2 Suggestions

The goal of intervention is to establish the effective internal motivation for exercise. According to this research, "compulsory" exercise is roughly reflected in the following aspects at the educational level: 1. on the one hand, positive cognition. Although coercion may go against other's wishes, the individual's result experience is positive and healthy. On the other hand, coercion itself is also one of the ways to overcome inertia. At the same time, collective behavior not only eliminates the negative effects of individual compulsion but also promotes individuals to obtain intangible public benefits (such as exercise persistence). Therefore, whether it is the result of experience or the reduction of compulsiveness within the group, the overall "compulsory" exercise is still positive. 2. humanistic care. From the improvement of sports equipment and venues to the teaching reform of teachers, it reflects the progress of sports work and the implementation of the concept of comprehensive development of people. The humanistic care of "mandatory" exercise is perceived by most students, but in the initial stage of implementation and for some individuals, teachers' direct care will affect the effect of humanistic education. Third, farming and frustration education. The internal motivation that affects people cannot have an immediate effect. It needs to be repeatedly perceived as it grows. Therefore, the perception (forced or free) left by the "forced" exercise can only be experienced in the individual's later understanding. The "forced" is only the education of many experiences in life, but as long as it is scientific and stratified, it can be a feasible way of education.

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