

Research on the Effect of Roller Skating on College Students' Physical Health

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Abstract. To study the effect of roller skating on college students' physical health.

Methods A total of 2 lessons of roller skating were conducted every week for 15 weeks.

Results (1) The effect of roller skating on the weight of college students was not significant ($P>0.05$). (2) Roller skating can improve students' cardiopulmonary function ($P<0.05$); (3) Roller skating has a significant effect on the flexibility of college students ($P<0.02$); (4) Roller skating can significantly improve the core strength ($P<0.01$); (5) There was a significant effect of roller skating on the explosive force of lower limbs of college students ($P<0.03$). **Conclusion** Roller skating can improve the physical health of college students.

Key words: roller skating; physical health; students' physique

1 Introduction

Roller skating means wearing special shoes with wheels and then skating in a specific venue. Similar to skating, it is also known as roller skating, as they are very similar in some related theories, technical movements, and methods. While skating is carried out on the ice, roller skating only needs relatively smooth ground^[1]. As a new sport, roller skating has developed for more than 30 years in China and the form of roller skating events has developed from the initial single race to the common development of multiple events^[2].

In the existing literature, although there are many studies on roller skating, few are conducted on the impact of roller skating on college student's physical health, and most of the studies are based on the physical quality, psychological status, biomechanical characteristics of roller skating, sports injury, and prevention. At present, as roller skating has entered colleges and universities, there is also relevant literature on the research of the teaching methods of roller skating, but there is little research on the physical health of college students. By studying the relationship between physical health and sports activities, this paper explores ways to promote physical health through sports activities.

College students are in the critical stage of learning professional knowledge and shaping their personalities, but their physical condition is generally declining. Therefore, the study of the impact of roller skating on the physical health of college students is helpful for college students to establish a good sports lifestyle. As roller skating is interesting and exciting, it can improve newly enrolled college students' self-confidence and help them actively participate in sports activities.

With the continuous reform of the physical education curriculum in colleges and universities, characteristic roller skating has become one of the physical education courses in colleges and universities. With the increasing number of participants, the impact of roller skating on college students' physiques has been paid attention to by many people. This paper uses the physical fitness index of college students to make a comprehensive analysis of the impact of roller skating on their physical health, to improve their physique [3].

2 Research Objects and Methods

2.1 Research Object

Students with no significant difference in physical health tests from Guangdong University of Science and Technology are selected for the experiment. A total of 39 boys and 24 girls are selected from the control group, and 39 boys and 24 girls are selected from the experimental group. A total of 78 students participated in the experiment.(as shown in Table 1)

Table 1 Basic data of the experimental subject($X \pm SD$)

Indicators	Control group (N = 39)	Experimental group (N = 39)
Height (cm)	164.07±7.74	164.34±6.69
Weight (kg)	55.86±9.91	54.36±8.38
BMI	20.76±1.24	20.21±1.58
Gender (M/F)	15/24	15/24

2.2 Research Methods

The experimental group engages in roller skating according to the course design of roller skating(as shown in Table 2), while the control group continues with a regular physical education course. The students in both groups do not participate in any physical exercise in their spare time. Control group have engaged in regular physical education that meets the course requirements for college students.(as shown in Table 3)

The experiment starts from September 6, 2022, to December 26, 2022. Except for the National Day and Mid-Autumn Festival holidays, students will engage in two sessions of training per week, a total of 90 minutes, Lasts 15 weeks. The experimental place is the overhead floor of the laboratory building of the Guangdong University of Science and Technology.

The teaching content comes from the training book *Speed Roller Skating Techniques and Training* [4] recommended by China Roller Skating Association. The main content of the course is divided into two parts: skill teaching and physical training.

Table 2 Teaching content of the experimental group

Teaching content
1. Warm-up activities; front gourd slide, back gourd slide; Learn to brake with both feet buckled in and brake with your brake pad; Squat: five 90-second groups with intervals of 30 seconds per group; Lateral slide: three 20-time groups with intervals of 30 seconds.(2 sessions)
2. Pre-Pisces moves Action explanation and demonstration; Squat on one foot: five 30-second groups with intervals of 30 seconds; Horizontal one-foot step: five 30-time groups with intervals of 30 seconds per group.(4 sessions)
3. Front Crossover; When crossing forward, students should pay attention to the distance between the front and back feet, the route of the front crossing, and the range of the feet; Squat on one foot: five 45-second groups, with intervals of 30 seconds per group; Horizontal one-foot step: five 45-time groups with intervals of 30 seconds per group.(4 sessions)
4. Back Crossover, Explain the technique of passing the posts, the distance between feet, and the route of the back crossover; Five times 30-meter shuttle run, with intervals of 30 seconds per group.(4 sessions)
5. Crazy; The combination of front and back cross turns, the rhythm and point practice of roller skating across the pile; Sliding of lateral resistance belt: five 30-meter groups with intervals of 30 seconds per group; Horizontal one-foot step: five 30-time groups with intervals of 30 seconds per group.(4 sessions)
6. Mary; The direction of the center of gravity of the body and the standing of the front and rear foot wheels; Five groups of 50-meter running with intervals of 2 minutes per group; Horizontal one-foot step: five 45-time groups with intervals of 30 seconds per group.(4 sessions)
7. Vine climbing; Smooth connection of front and back turns and adjustment of the center of gravity of the body; Three groups of 100-meter running with intervals of several minutes; Horizontal box jumping with a single foot: five 15-time groups with intervals of 30 seconds per group.(4 sessions)
8. Crossover; A shift of the center of gravity, crossing footwork, and route; Three groups of 150-meter running with intervals of several minutes; Horizontal box jumping with a single foot: five 20-time groups with intervals of 30 seconds per group.(4 sessions)

Table 3 Teaching contents of the control group

Teaching content		
1. Jump	1. Standing long jump 2. Leaping high jump 3. Jump on one foot 4. Step jump	10 sessions
2. Run	1. Squat 2. 30-meter acceleration run 3. Variable speed running 4. Endurance running	10 sessions
3. Throw	1. Throw softballs 2. Throw the medicine balls	5 sessions
4. Games and tests	1. Fishing 2. Paste sesame seed cake 3. Physical fitness test	5 sessions

2.3 Test Instruments

According to the *National Testing Standards of Students' Physical Health*^[5], this paper mainly studies the influence of teaching roller skating on the test results of students' physical health. The main test items include 50-meter running, 1-minute sit-ups, seated forward bend, standing long jump, height, weight, and vital capacity. The following instruments are used to conduct the physical fitness test.

1. Spirometry instrument: spirometry tester, (Kangfu) mouthpiece. Unit (milliliter) Test process: The tester faces the vital capacity tester, holds the mouthpiece with his hand, takes a deep breath at the same time, aims at the mouthpiece with his mouth, and blows hard for 1-2 times to detect whether the equipment leaks. During the test process, the tester exhales hard and slowly. The final number displayed by the tester is the vital capacity value. Each tester has to take three measurements, with the highest value taken.

2. Measuring instrument for seated forward bend: seated forward bend tester. Unit (cm) Measurement process: The testers put their legs straight on the board of the forward bending tester, sit and stand, with their feet about 10-15 cm apart, and lean their upper body forward. When the body bends forward to the point where it can't move, the data will be recorded. Each person will be measured twice with the best result taken.

3. Height and weight (cm, kg). Test instrument: Height and weight tester (JT-918C battery panel). Test process: Students stand upright on the height and weight tester, with their toes forward, chest out and head up, lower forehead slightly closed, eyes straight ahead, and keep their bodies still when the tester falls.

4. 50-meter running (second). Test instruments: stopwatch, meter ruler, whistle. Test process: Fifty meters are measured from the starting point to the endpoint on the 100-meter track. The testers stand at the starting point of the starting line, and when the coach blows the whistle, four students start running quickly together and cross the endpoint. When their body crosses the line, the timing ends.

5. One-minute sit-ups. Test instruments: whistle, stopwatch. Test process: students will be divided into two groups; one group does sit-ups, and the other group presses their feet. When the teacher whistles the command, timing starts. At the end of whistling, the tester lies on the mat on the back, puts his hands on the ears, bends the knees 90 degrees, touches the whole sole of his feet, presses the top of his feet with both hands, and the effective number of times will be recorded. The effective number of times means that the tester's hands do not leave his ears, the elbow joint touches his thigh once, and the rest are ineffective.

6. Standing long jump (cm). Test instrument: standing long jump tester. Students stand in the position of the take-off line and jump according to the light indication of the instrument. After they jump twice, the data will be recorded according to the instrument induction, with the best result collected.

2.4 Mathematical Statistics Method

The software of SPSS 22.0 is used for statistical analysis of the experimental data, which is expressed as mean \pm standard deviation ($\bar{X} \pm SD$). The data of the control and the

experimental group are compared and analyzed by independent sample T-test in which $P < 0.05$ means a significant difference, and $P < 0.01$ means a very significant difference.

3 Results and Analysis

3.1 Analysis of Students' Weight

Table 4 Weight of Students (Unit: kg)

		P value
Weight	Control group 55.86 ± 9.91	0.47
	Experimental group 54.36 ± 8.38	

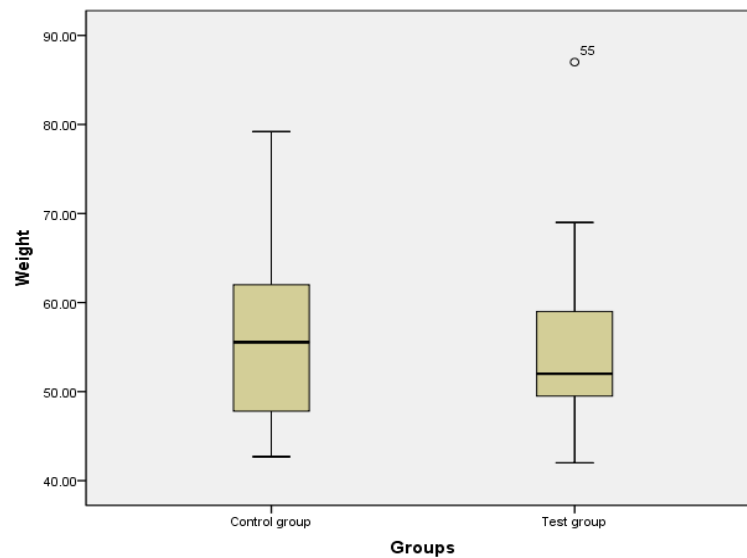


Figure 1 Weight of Students (Unit: kg)

According to Table 4 and Figure 1, compared with the control group, the experimental group's weight shows no statistical difference ($P > 0.05$). The results of the independent sample test between the control group and the experimental group have indicated that compared with the control group, the weight of boys and girls in the experimental group decreases a little.

To sum up, the data suggest that roller skating has little effect on the weight and physical health of boys and girls.

3.2 Analysis of Students' vital capacity

Table 5 Students' vital capacity (unit: ml)

	P value
Vital capacity	0.03
Control group 3760.51 ± 947.07	
Experimental group 4269.38 ± 1086.95	

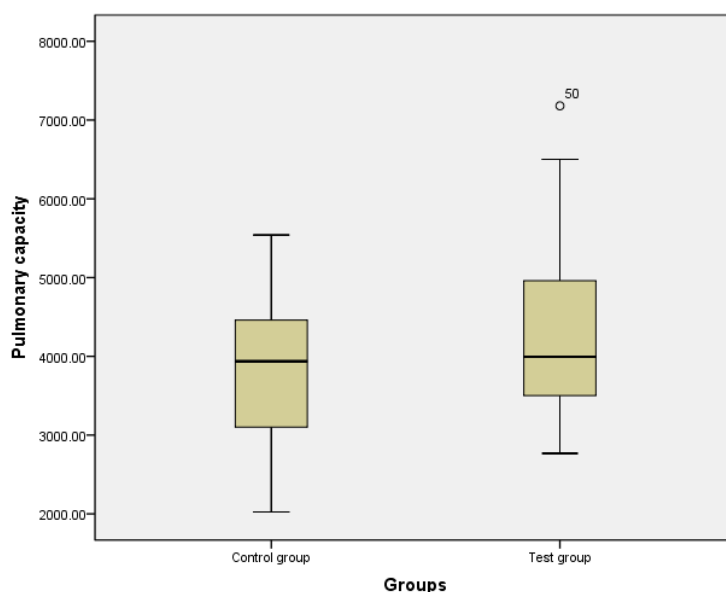


Figure 2 Students' vital capacity (unit: ml)

Table 5 and Figure 2 show that, compared with the control group, the vital capacity of the students in the experimental group has significantly increased, and the paired sample test results before and after the experiment shows significant differences ($P < 0.03$). Based on the above results, it is suggested that the teaching of roller skating plays a key role in promoting college students' vital capacity. At the same time, the results of this experiment indicate that the effect of roller skating is significantly better than the conventional teaching, and roller skating has a positive impact on improving physical function, which conforms to the theory of sports physiology.

3.3 Analysis of Students' 50-meter Run

The 50-meter race mainly examines students' speed and explosive power, which requires a high level of explosive power for students. It is different from any item and can vividly show its current physical explosive power.

Table 6 Students' 50-meter running results (unit: second)

	P value
Control group 8.66 ± 0.99	
50 meter 0.58	
Experimental group 8.53 ± 1.18	

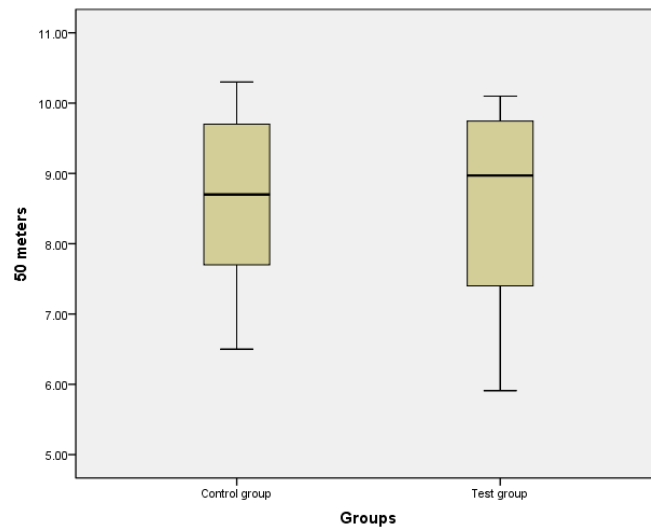


Figure 3 Students' 50-meter running results (unit: second)

Table 6 and Figure 3 reveal that compared with the control group, there is no significant difference in the performance of the students in the experimental group ($P > 0.05$). To sum up, roller skating has little effect on the 50-meter running test for college students.

3.4 Analysis of Students' 1-Minute Sit-ups

The one-minute sit-up is the main index to test students' abdominal muscle endurance and hip muscle endurance.

Table 7 Students' 1-minute sit-up scores (unit: unit)

	P value
Control group 29.86 ± 4.59	
1-minute sit-ups	0.01
Experimental group 37.12 ± 15.62	

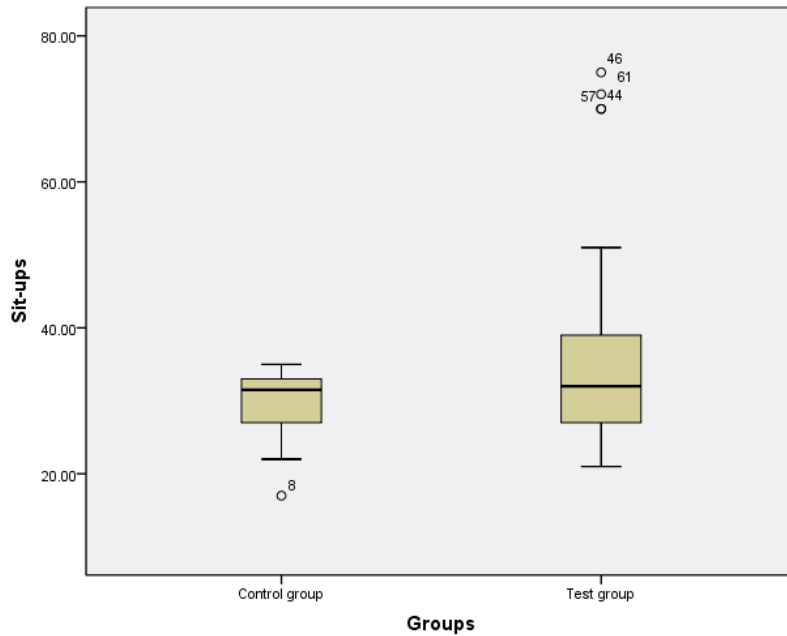


Figure 4 Students' performance of 1-minute sit-ups (unit: piece)

It can be seen from the analysis results in Table 7 and Figure 4 that, compared with the control group, students in the experimental group greatly improve their performance of sit-ups in one minute, with a significant difference ($P < 0.01$). To sum up, roller skating teaching has a good effect on improving students' abdominal muscle endurance and core strength.

3.5 Analysis of Students' Seated Forward Bend

Seated forward bend is one of the most frequently examined sports items in the current quality evaluation of college students, as it can directly reflect the overall flexibility of students' bodies, including the extensibility of muscles in the hip, leg, waist, and back.

Table 8 Students' performance in seated forward bend (unit: cm)

	P value
Control group 12.87 ± 8.92	0.02
Seated forward bend	
Experimental group 16.73 ± 5.49	

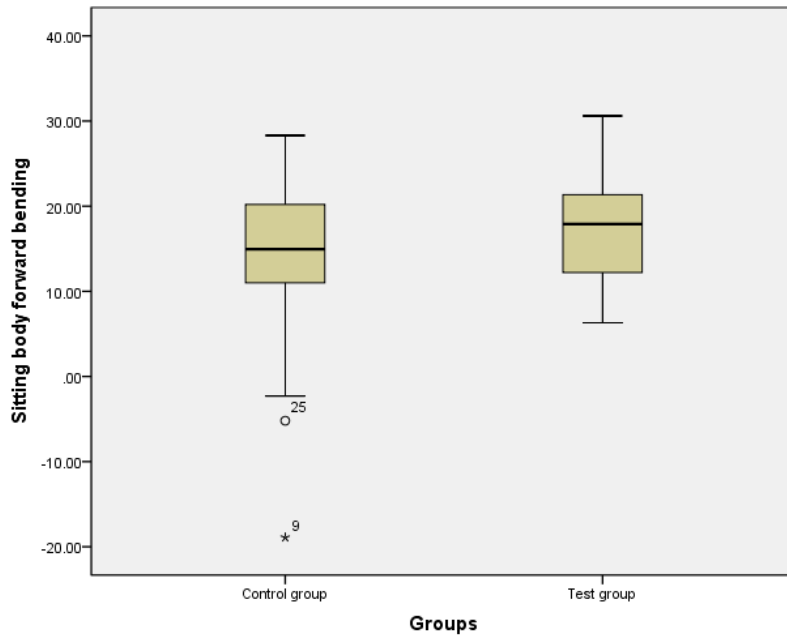


Figure 5 Students' performance in seated forward bend (unit: cm)

According to the analysis in Table 8 and Figure 5, compared with the control group, the students in the experimental group have better performance in seated forward bend, with a significant difference ($P < 0.02$). Based on the above results, roller skating has a great influence on the students' flexibility, indicating a positive impact on the test of seated forward bends.

3.6 Analysis of Students' Standing Long Jump

Table 9 Students' performance of standing long jump (Unit: cm)

	P value
Control group 176.58 ± 36.34	
Standing Long Jump	0.03
Experimental group 193.84 ± 34.99	

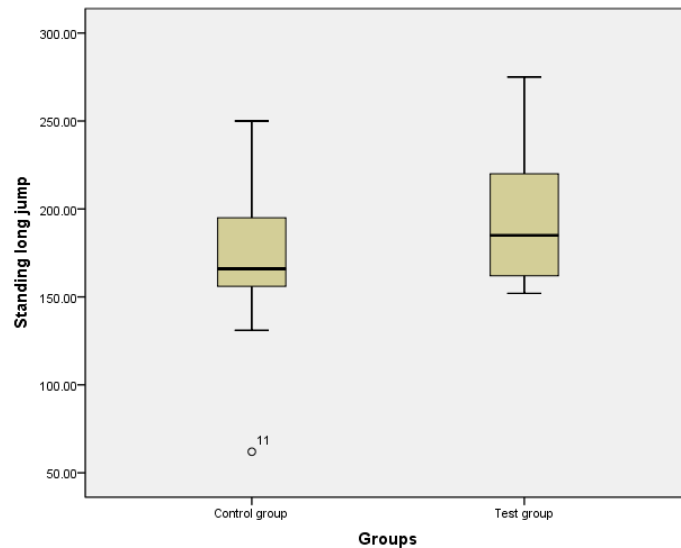


Figure 6 Students' performance of standing long jump (Unit: cm)

The analysis in Table 9 and Figure 6 shows that compared with the control group, the standing long jump performance of the students in the experimental group is better than that of the control group, with a significant difference ($P < 0.03$). Based on the above results, roller skating has a greater impact on students' lower limb explosive force, indicating an impact on the fixed long jump test.

4 Discussion

The concept of physique exists in three fields: physical anthropology, medicine and physical education. The definition of the most authoritative definition of physique is from the 1982 Physical Research Association. Physical fitness is the quality of the human body. It is a comprehensive and relatively stable feature of human body morphology, physiological function and psychological factors on the basis of heredity and acquisition. It can be seen that heredity is the congenital condition for the formation and development of human physique. The personality, body shape and function of human body are closely related to heredity. However, heredity only provides the possibility of the formation and development of physique, and the factors such as human living environment, living conditions, educational labor and physical exercise also have a huge impact on the development of human physique. In addition, the constitution is a relatively stable state of the body's morphological structure, physiological function and psychological factors at a certain stage. Therefore, there are obvious individual differences in the formation and development of human body constitution^[6].

In recent years, on the issue of adolescent physical health, the Ministry of Education, the State Sports General Administration and the Central Committee of the Communist Youth League proposed as early as December 20, 2006 to carry out the types of schools across the country to carry out a wide range of in-depth 'of millions of students sunshine sports' activities, to fully

implement the 'national student physical health standards'. According to the results of the national student physical health monitoring, some physical qualities of Chinese students, especially the levels of explosive power, strength, endurance and vital capacity, continue to decline, and the proportion of overweight and obese students continues to increase. It is equally important to improve students' mental health by increasing the time of physical education and physical exercise, enhancing students' artistic practice and labor education.

Roller skating has absolute entertainment attributes^[7]. At present, most college students think that roller skating is a kind of modern art movement, with high degree of freedom and different aesthetic forms. Whether it is exercise, cultivate sentiment, improve mental state^[8], cultivate hobbies and artistic quality will become a good option^[9]. Therefore, for students, the interesting characteristics of participating in roller skating are much higher than other traditional sports^[10]. When colleges and universities carry out roller skating physical education courses, there must be more students involved. Set up sports clubs, roller skating associations, etc.^[11], and then attract more students to participate in and practice roller skating, and create a good physical exercise environment for college students to develop lifelong sports awareness^[12].

The most important thing in roller skating training is physical efficiency^[13], which is basically based on the individual physical fitness limit of students and will not exceed the load range of college students. Therefore, all the physical training activities carried out in this stage have full participation significance and exercise value^[14]. The compulsory courses of physical education in the university environment are basically two sections a week, which are in line with the characteristics of the sports cycle of students who do not often participate in physical exercise^[15]. In the tripartite guarantee of time, intensity and professionalism, students can improve their physical quality when participating in the early physical improvement training of roller skating, so that students themselves show a more healthy mental outlook^[16].

In roller skating training, if students want to maintain balance or make difficult movements, they must always pay attention to adjusting their breathing rhythm. In the process of continuous exercise, students' vital capacity can continue to improve. Among the indicators of physical skills, vital capacity is an extremely important one. Therefore, when the students' vital capacity can continue in a healthier state, the functional characteristics of the cardiovascular system of college students are more stable. At the same time, the human respiratory system is upgraded while maintaining rhythm and relaxation. Therefore, students' participation in roller skating can improve the functional stability of their respiratory system.

Roller skating can not only exercise the physical function of students^[17], but also improve the flexibility of their limbs in order to maintain their ability to complete complex movements in a balanced state when they are in the training process^[18]. When the students' roller skating skills are upgraded to a certain extent, the flexibility of the limbs will be fully improved in the training process^[19]. And the exercise of limb flexibility is an inevitable result. Students do not even need deliberate training, but only need to seriously complete each roller skating learning task. It can be judged that roller skating has the practical characteristics of improving the physical health of college students^[20].

5 Conclusion

Roller skating can improve the physical health of college students.

Project: 1. Discipline Co-construction Project of Social Science Planning of Guangdong Province in 2022: Research on the Strategy of Building a Strong Province of Mass Sports in Guangdong during the 14th Five-Year Plan Period (GD22XTY10)

2. Research on the CIPP Evaluation Model of Public Physical Education Courses in Colleges and Universities in the Guangdong-Hong Kong-Macao Greater Bay Area (22GQN02)

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