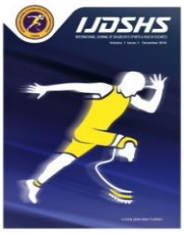

International Journal of
Disabilities Sports and Health Sciences

e-ISSN: 2645-9094

RESEARCH ARTICLE

The Effect of 12-Week Outward-Bound Training on Sports Attitude, Heart Rate and Physical Fitness Among College Students in China

Jianxin GAO[1], Borhannudin Bin ABDULLAH[*1] and Roxana Dev Omar DEV[1]

[1]University Putra Malaysia, Faculty of Educational Studies, Department of Sport Studies, Selangor / Malaysia
*Corresponding author: borhannudin@upm.edu.my

Abstract
Outward-bound training (OBT) originated in the UK as an outdoor survival method during World War II and is an experiential training course that emphasizes shaping teamwork, enhancing and strengthening individual psychological and athletic potential, and promoting organizational growth. However, OBT to improve sports attitude and physical fitness among college students remains unclear. The purpose of this study investigated the effect on sport attitude, heart rate and physical fitness among college students in China. Sixty college students (Aged 18-20, 19.05±0.85y) who were selected from Jiangxi Teachers College took part in this study. Participants were randomly assigned into two groups EG and CG. The EG completed 12 weeks OBT combined normal PE class intervention and the CG only for 12 weeks normal PE class intervention. The result indicated that the EG was statistically significant difference than control group after Paired-samples T test analysis for sports attitude questionnaire score (Male T=-11.515, P=0.001 and Female T=-23.070, P=0.001); HR_{Max} (Male T=-5.755, P=0.001 and Female T=-4.007, P=0.001); HR_{Avg} (Male T=-5.072, P=0.001 and Female T=-4.801, P=0.001); 50m run (Male T=8.085, P=0.001 and Female T=8.413, P=0.001); 800m run (Female T=5.949, P=0.001); 1000m run (Male T=3.722, P=0.001); Standing long jump (Male T=-2.233, P=0.042 and Female T=-5.824, P=0.001); Sit and reach (Male T=-3.872, P=0.002 and Female T=-5.274, P=0.001); Sit-up (Female T=-11.042, P=0.001); Pull-up (Male T=-4.276, P=0.001). Therefore, the conclusion suggested that 12-week OBT intervention was significant to improve sports attitude, heart rate and physical fitness among college students in China.

Keywords
Outward-Bound Training, Physical Education, “Health-First” Concept, College Students, Physical Fitness

INTRODUCTION

Modern school physical education originated from ancient Greece and Rome, the class system of Czech educator Comenius and developed into military physical education in Germany (Matlovičová & Matlovič, 2019). In the 16th to 20th centuries, sports education ideas in various countries around the world flourished, mainly represented by Rousseau's natural sports theory dominated by the United States and Dewey's empirical physical education teaching. The concept of physical education proposed by Chinese thinker, educator, and politician Yan Fu, as well as the sports labor and national defense system of socialist countries represented by the Soviet Union in the 20th century, and the lifelong sports education concept adapted to the development of capitalism…It can be said that the emergence and development of any type of school sports ideology cannot be separated from a strong sense of class and purpose. The above school sports ideology is established to achieve a certain purpose of the ruling class, and its content is to serve the ruling class (Yun et al., 2022).

In the late 20th century, the concept of “Health-first” physical education teaching in schools was first proposed based on the United Nations' advocacy of the concept of health for all mankind (An et al., 2022). In 1989, the latest

Received: 09 January 2024 ; **Revised** ; 18 February 2024 ; **Accepted:** 17 May 2024; **Published:** 25 May 2024

How to cite this article: Gao, J., Abdullah, B.B., and Dev, R.D.O. (2024). The Effect of 12-Week Outward-Bound Training on Sports Attitude, Heart Rate and Physical Fitness Among College Students in China. *Int J Disabil Sports Health Sci*;7(3):663-675.https://doi.org/10.33438/ijdshs.1417223

definition of the concept of health was: “Health is not only the absence of no diseases, but also includes body and mental health, social interaction and moral cultivation” (Smith et al., 2006). The connotation of the “Health first” physical education teaching concept and the concept of health are inseparable. Being a healthy person is not an easy task, because a truly healthy person also means being a fully developed person. This idea fully explains sports rights, puts people first, and aims for the physical and mental health of students. There is no class interest, so it is supported and recognized by the education community around the world. The concept of “Health first” has gradually formed during the development of PE and can be withstanded historical and practical tests.

At the beginning of the 21st century, in response to the spirit and call of UNESCO, the Yangzhou Conference on Physical Education in China established the guiding ideology of “Health first” as the guiding principle of physical education in Chinese schools (Zhou et al., 2022). Under the influence of this guiding ideology, the goals of physical education in China revolve around five fields: sports participation, skill learning, physical and mental health and social interaction. Specific explanations for learning objectives in five fields: (1) Sports participation objective: participating in sports learning and exercise, experiencing sports fun and success; (2) Skills learning objective: to learn sports knowledge, master sports skills and methods, and enhance awareness and prevention ability of safety and health; (3) Physical health objective: master health knowledge, shape body posture, comprehensively develop physical fitness; (4) Mental health objective: cultivate strong willpower and learn methods to regulate emotions; (5) Social adaptation objective: develop a sense of cooperation and ability, and possess good sports ethics (Liang & Hong, 2012). Therefore, in the new round education reform in China, the concept of “Health first” has been established and the “Physical Education and Health Curriculum Standards” have been issued at all levels of schools, which is enough to demonstrate the importance that Chinese college attaches to the concept of “Health first” physical education teaching.

However, due to various factors such as the national system, socio-economic development level, schools, families, and culture, research has found that according to the statistical results of student physical fitness standards provided by the national education and sports departments over the years, the teaching content is dull and boring, the teaching quality is not high, students' attitudes towards physical education learning are not positive, and students' participation in physical exercise is not high. The most important thing is that the endurance, muscle strength, and lung capacity of college students in the “Chinese National University and College Student Physical Health Standards Test” have been declining for more than 30 consecutive years, while their obesity and myopia are increasing year by year... This situation has seriously affected college students’ development and has become an urgent school sports problem to be solved (Wang, 2022), (O’Brien et al., 2022; Fan & Yu, 2017). These phenomena also directly indicate the problems in college physical education teaching activities in China. Of course, the reasons behind this phenomenon are diverse, complex, and deep-seated, including national systems, socio-economic development, school and family culture, and so on. Of course, in order to solve these problems, physical education teaching and teachers in Chinese universities have an unavoidable responsibility. It is still a long way to go to improve public physical education classes, make college students enjoy physical education classes, improve their physical fitness standards, and achieve the “health first” concept of physical education. Therefore, physical education teaching in universities urgently needs reform (Dong et al., 2023).

Outward-bound training (OBT) is an experiential teaching model proposed by Oxford University teacher Kurt Hahn in the 1930s. OBT originated in the UK. During World War II, the British seamen were attacked by Germany usually, and many sailors were buried at the bottom of the sea. As a result, it was found that the people who escaped were not necessarily physically strong, but they were people with strong willpower and a strong desire to survive. These people had rich survival experience and a spirit of teamwork. OBT refers to a training method in which students participate in outdoor activities, share experiences, reflect on behaviors, enhance awareness, hone willpower, improve personality, and refine teams under the guidance of trainers (Freeman, 2011). In 1941, Cohen trained young sailors and established the first Outward-bound school in the UK. In the 1970s, Massachusetts introduced OBT into school education and has now become an important

component of American school education. Singapore was the first to establish OBT schools, and since then, Hong Kong, Japan, and South Korea have introduced OBT and incorporated it into the school education system. In 1995, OBT teaching was introduced to the Chinese mainland for the first time. At present, OBT schools have been established in major cities such as Beijing and Shanghai. Tsinghua University is the first to introduce OBT into the MBA teaching system (Guanghong, 2017). So far, the teaching concept and methods of OBT have not been widely implemented and applied in college physical education teaching. How to apply OBT to college has become a hot topic in the reform of college physical teaching in China (Mees et al., 2022).

This article verified whether outward bound training (OBT) has a significant impact on the improvement of attitude, heart rate and physical fitness by conducting a 12 weeks intervention among university public sport students in Jiangxi Teachers College, China. To provide theoretical supplements for the specialized outward-bound training (OBT) for public physical education, as well as feasible references for development of college public physical education in China.

MATERIALS AND METHODS

Participants

60 college male and female public sport students were selected from Jiangxi Teachers College took part in this study, (Aged 18-20, 19.00±0.87year, Height: 172.06±5.93cm, Weight: 70.66±7.51 kg) for male students, (Aged 18-20, 19.10±0.84year, Height: 159.00±5.69 cm, Weight: 49.40±8.06 kg) for female students. Those subjects were randomly and reasonably divided into two groups, a control group and an experimental group. In two different groups, each group has 30 students (including 15 male and 15 female). Inclusion criteria in this study: (1) Physically and mentally healthy; (2) Without any illness; (3) No history of body injury within the past month; (4) Freshman from social and natural sciences department or major (non-sports major students); (5) Not trained in the outward-bound training (OBT) systematically; (6) Be able to complete physical fitness tests and actively cooperated with this OBT experimental study. As shown in Table 1.

Table 1. Sample Characteristics (N = 60)

Characteristics	Mean (Standard Deviation)	
	Male students	Female students
Number	30	30
Age (year)	19.00±0.87	19.10±0.84
Height (cm)	172.06±5.93	159.00±5.69
Weight (kg)	70.66±7.51	49.40±8.06

Procedure

Selection of training events content

OBT can be divided into field training events, outdoor training events, and water training events (Zang, 2023). This study excluded some dangerous and difficult events to carry out and time-consuming events when confirming training events content, and selected some events that can be carried out in public physical education classrooms in universities These OBT events are easy to operate, have a short training time, and do not require high physical fitness for students, ensuring the smooth progress of experimental research. In order to improve students' physical fitness standards and the quality of public physical education teaching, this article introduces 12 outdoor expansion training projects in the experimental group students' public physical education class: (1)Rolling wheels, (2)Arbitrary back falls, (3) Fetching water in thorns, (4)Bravely breaking through thunderstorms, (5)Drilling the power grid, (6)Hitting drums and bouncing balls, (7)Two people and three feet, (8)Extreme speed of 60 seconds, (9)Mobile ladders, (10)Joint construction, (11)Traveling thousands of miles in pearls, (12) 100m Orienteering sports. As shown in Figure 1a,b.

Figure 1a. The 12 activities for OBT intervention

Figure 1b. The 12 activities for OBT intervention

Determine the relationship between introduced OBT events and public PE classes

According to classroom routines, time allocation, and student activity and skill mastery in China, a public physical education class is generally divided into 4 parts in 90 minutes: start part, preparation part, basic part and end part (Wei & Liu, 2018). The start part is usually a class routine with a duration of 3-5 minutes, which is not suitable for outdoor expansion training. The preparation part is usually a student warm-up activity, which lasts for 15-20 minutes. In order to increase students' attention and interest in participating in physical education classes, some OBT events can be introduced in this part. The basic part is the core part of physical education class, which lasts for the longest time, about 50 minutes. This part is also a key for students to learn sports skills and knowledge, practice and deepen their mastery. This part also can introduce some OBT events, but it should be noted that it does not affect the learning of college teaching content, the aim is to help students learn skills and enhance their participation and interest. The end section is a stage where students relax and teachers summarize, with a time of about 15 minutes, which can be suitable for carrying out some OBT events too.

Time allocation for OBT events

This study strictly controlled the time of each OBT event, and improved 12 selected OBT events while ensuring the normal development of various links in public physical education classes in universities. For example, the OBT events introduced into the preparation part were controlled at about 15 minutes, and the OBT events introduced into the basic section were controlled at about 20 minutes, the OBT events that will be introduced to the end part will be limited to around 10 minutes. This kind of time allocation and improvement is very necessary. On the one hand, it increases students' interest in participating, it also ensures the normal development and progress of public physical education teaching content, because the purpose of this study is very clear: public physical education classes in universities are primary, while OBT events are secondary. OBT events are a part and play an auxiliary role in public physical education classes.

In all, in this article, there is a 12-week outward-bound training (OBT) period and it was divided into two training stages according to difficult OBT events. The experimental group conducted a 12-week experiment for outward-bound training (OBT) intervention plus normal public physical education teaching activity, while the control group conducted 12 weeks normal public physical education teaching activity only. Experimental group trained 1 time/week for public physical education teaching activity and each training time lasted about 10-20 min for different parts of the public physical education class. The first stage is week 1-6, and the second stage is week 7-12. Before the intervention, there was pre-test, post-test was after 12th week for both of the two groups for all dependent variables (sports attitude, heart rate and physical fitness) of all the subjects. The differences in test indicators between the two groups were analyzed and compared. The stage and experimental intervention content is shown in Table 2.

Test protocol

By consulting relevant literature and books for physical education, interviewing 6 experts who have been worked for college sports and education in different university and college in China, and based on the "Chinese National University and College Student Physical Health Standards", it was ultimately determined that the attitude, heart rate and physical fitness test of the subjects of this experiment is reflected in the evaluation OBT on sports attitude, heart rate and physical fitness among college students in China.

This article selected the 3 indexes attitude, heart rate and physical fitness of testing indicators for this experiment. The test indicators and indexes for dependent variables content is shown in Table 3.

Table 2 The stage and content of experimental intervention

Stage	Duration & Frequency	Experimental intervention in two gorups		Repetition (only for EG)	Sets (only for EG)	Recovery (only for EG)
		EG/(OBT)	CG			
Week 1-6	1 Times / Week 10-20 min for OBT only	1. “Rolling wheels” combined Normal PE activity	1.Normal PE activity	1-3	1-2	2min
		2. “Traveling thousands of miles in pearls” combined Normal PE activity	2.Normal PE activity	1-3	1-2	
		3. “Hitting drums and bouncing balls” combined Normal PE activity	3.Normal PE activity	1-5	1-2	
		4. “Drilling the power grid” combined Normal PE activity	4.Normal PE activity	1-5	1-2	
		5. “Bravely breaking through thunderstorms” combined Normal PE activity	5.Normal PE activity	1-5	1-2	
		6. “100m Orienteering sports” combined Normal PE activity	6.Normal PE activity	1	1	
Week 7-12	1 Times / Week 10-20 min for OBT only	7. “Extreme speed of 60 seconds” combined Normal PE activity	7.Normal PE activity	1-3	1-2	
		8. “Arbitrary back falls” combined Normal PE activity	8.Normal PE activity	1-5	1-2	
		9. “Fetching water in thorns” combined Normal PE activity	9.Normal PE activity	1-3	1-2	
		10. “Joint construction” combined Normal PE activity	10.Normal PE activity	1-3	1-2	
		11. “Two people and three feet” combined Normal PE activity	11.Normal PE activity	1-5	1-2	
		12. “Mobile ladders” combined Normal PE activity	12.Normal PE activity	1	1	

Table 3. The test indicators and indexes

Test Variables	Test indexes	Instruments/measured tandards
Attitude (score)	Attitude survey questionnaire (Banville et al., 2021)	Reliability-Intraclass Correlation Coefficient (ICC) is 0.90; Validity: 0.95
	HR HR_{Max} HR_{Avg}	Mobile BENKEN intelligent heart rate detection watch
Physical fitness	50m run, 800m run, standing long jump, sit and reach, sit-up (female), pull-up(male)	“Chinese National University and College Student Physical Health Standards Test Scale, 2023”

Instruments and scale

The attitude survey questionnaire (Banville et al., 2021) (which have a high reliability 0.90 and validity 0.95) was selected for student's attitude testing of college sports education for Jiangxi Teachers college students. The BENKEN intelligent heart rate detection watch produced by Huawei company in China, 2022 was selected for student's average/max heart rate testing in public PE class. Physical fitness of 50m run, 800m run, standing long jump, sit and reach, sit-up (female), pull-up (male) was measured by "Chinese National University and College Student Physical Health Standards Test Scale 2023". Furthermore, new height and weight meters, 400-meter standard track and field, standing long jump tester, sit up tester, sit and reach tester, pull-up tester were selected for anthropometric parameters and physical fitness test (Hu, 2022). As shown in Figure 2.

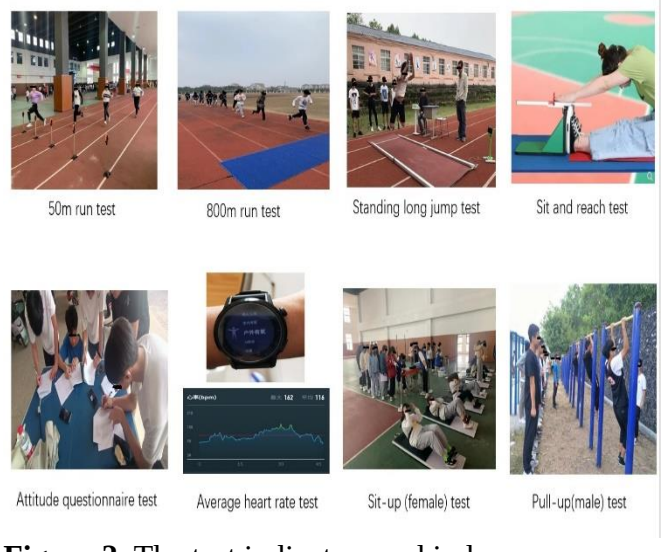

Figure 2. The test indicators and indexes

Data collection

In this study, the index of all dependent variables (Attitude, Average heart rate and Physical fitness) testing indicators for this experiment were measured. In addition, the tester recorded the result of Questionnaire (score), Average/Max heart rate (BPM) in PE class with 4 parts (start, warm, main and relax) 90 min class, Physical fitness with 50m run, 800m run, standing long jump, sit and reach, sit-up (female), pull-up(male) for public college students of EG and the CG respectively for pre and post-test.

Statistical analysis

Results were analyzed both descriptive and inferential Statistics. Descriptively, the mean (M) and standard deviation (SD) were used, as well as the frequency of values and their corresponding percentage. Inductively, the Paired-samples T test was used for analysis of mean different all dependent variables between the study group and the control group, separately, pre-test and post-test. In addition, after each group was isolated, Levene's test of equality of variances was performed to find differences between the pre-test and post-test. The normality of the data was checked using Kolmogorov-Smirnov and Shapiro-Wilk's test ($p>0.05$) IBM SPSS 28 was used to perform the statistical analysis and the significance level was set at 0.05.

RESULTS

In table 4 and 5, the result showed the result for Paired-samples T test for Attitude, Average/Max heart rate and Physical fitness. According the T test, the mean of post-test value of experimental group was statistically significant difference than pre-test value for Questionnaire score (Male T=-11.515, P=0.001 and Female T=-23.070, P=0.001); HRMax (Male T=-5.755, P=0.001 and Female T=-4.007, P=0.001); HRAvg (Male T=-5.072, P=0.001 and Female T=-4.801, P=0.001); 50m run (Male T=8.085, P=0.001 and Female T=8.413, P=0.001); 800m run (Female T=5.949, P=0.001); 1000m run (Male T=3.722, P=0.001); Standing long jump (Male T=-2.233, P=0.042 and Female T=-5.824, P=0.001); Sit and reach (Male T=-3.872, P=0.002 and Female T=-5.274, P=0.001); Sit-up (Female T=-11.042, P=0.001); Pull-up (Male T=-4.276, P=0.001).

Also the results showed that the mean of post-test value of CG was no significant difference than pre-test value (except 50m run (Female), P=0.011) for Questionnaire score (Male T=-1.221, P=0.242 and Female T=-0.417, P=0.683); HRMax (Male T=1.279, P=0.222 and Female T=-1.538, P=0.146); HRAvg (Male T=-0.585, P=0.568 and Female T=0.786, P=0.445); 50m run (Male T=-0.242, P=0.812 and Female T=2.922, P=0.011); 800m run (Female T=-0.736, P=0.474); 1000m run (Male T=-1.240, P=0.235); Standing long jump (Male T=0.489, P=0.626 and Female T=-1.075, P=0.301); Sit and reach (Male T=-2.046, P=0.060 and Female T=-0.854, P=0.408); Sit-up (Female T=0.099, P=0.923); Pull-up (Male T=-0.367, P=0.719). As shown in Table 4 and 5.

Table 4 The Results analysis of paired-samples T test for post-test of EG

Variables	Test item	EG		T Value	P Value Two-sided
		Pre-test	Post-test		
Sports attitude	Questionnaire score (Male)	33.20±5.93	43.47±4.53	-11.515	0.001*
	Questionnaire score (Female)	33.93±4.83	43.86±4.17	-23.070	0.001*
Heart rate	HRMax (BPM) (Male)	168.53±9.66	185.60±6.48	-5.755	0.001*
	HRMax (BPM) (Female)	157.27±8.61	167.07±5.93	-4.007	0.001*
	HRAvg (BPM) (Male)	133.93±9.74	150.73±7.27	-5.072	0.001*
	HRAvg (BPM) (Female)	129.07±10.27	144.87±6.70	-4.801	0.001*
Physical fitness	50m run (s) (Male)	8.01±0.31	7.16±0.36	8.085	0.001*
	50m run (s) (Female)	9.97±0.21	9.14±0.33	8.413	0.001*
	1000m run (s) (Male)	210.20±3.41	200.33±10.2	3.722	0.001*
	800m run (s) (Female)	234.07±5.95	222.33±9.74	5.949	0.001*
	Standing long jump (cm) (Male)	237±7.00	244±10.00	-2.233	0.042*
	Standing long jump (cm) (Female)	184±13.00	202±12.00	-5.824	0.001*
	Sit and reach (cm) (Male)	14.33±8.03	24.07±6.04	-3.872	0.002*
	Sit and reach (cm) (Female)	20.53±14.17	29.07±10.11	-5.274	0.001*
	Sit-up (time/min) (Female)	28.60±7.43	34.60±8.35	-11.042	0.001*
	Pull-up (time) (Male)	6.27±1.91	8.20±1.66	-4.276	0.001*

* P < 0.05 means significant differences

Table 5 The Results analysis of paired-samples T test for post-test of CG

Variables	Test item	CG		T Value	P Value Two-sided
		Pre-test	Post-test		
Sport attitude	Questionnaire score (Male)	32.73±4.56	33.60±4.27	-1.221	0.242
	Questionnaire score (Female)	33.66±3.94	33.86±4.29	-0.417	0.683
Heart rate	HRMax (BPM) (Male)	171.67±9.74	168.47±9.20	1.279	0.222
	HRMax (BPM) (Female)	160.87±8.40	157.73±8.43	1.538	0.146
	HRAvg (BPM) (Male)	128.40±26.8	132.80±8.34	-0.585	0.568
	HRAvg (BPM) (Female)	131.07±9.12	128.93±9.79	0.786	0.445
Physical fitness	50m run (s) (Male)	8.05±0.41	8.08±0.34	-0.242	0.812
	50m run (s) (Female)	10.17±0.33	9.93±0.19	2.922	0.011*
	1000m run (s) (Male)	208.73±3.58	209.67±4.60	-1.240	0.235
	800m run (s) (Female)	232.93±4.93	234.53±8.13	-0.736	0.474
	Standing long jump (cm) (Male)	238±9.00	237±7.00	0.489	0.626
	Standing long jump (cm) (Female)	187±10.00	190±9.00	-1.075	0.301
	Sit and reach (cm) (Male)	14.77±6.85	18.27±4.59	-2.046	0.060
	Sit and reach (cm) (Female)	18.93±3.86	20.40±4.58	-0.854	0.408
	Sit-up (time/min) (Female)	29.27±4.65	29.07±5.57	0.099	0.923
	Pull-up (time) (Male)	6.13±2.45	6.33±2.09	-0.367	0.719

* P < 0.05 means significant differences

Summary of the data analysis results, as consequence, data analysis for independent-samples T test showed that there was a significant effect of experimental group than control group on Attitude, Average/Max heart rate and Physical fitness as the dependent variables testing indicators for this experiment in pre-test and post-test among public physical education students in China.

In EG, the mean and standard deviation of questionnaire score (Male: pre-test=33.20±5.93, post-test=43.47±4.53; Female: pre-test=33.20±5.93, post-test=43.47±4.53); HRMax (Male: pre-test=168.53±9.66, post-

test=185.60±6.48; Female: pre-test=157.27±8.61, post-test=167.07±5.93); HRAvg(Male: pre-test=133.93±9.74, post-test=150.73±7.27; Female: pre-test=129.07±10.27, post-test=144.87±6.70); 50m run (Male: pre-test=8.01±0.31, post-test=7.16±0.36; Female: pre-test=9.97±0.21, post-test=9.14±0.33); 800/1000m run (Male: pre-test=210.20±3.41, post-test=200.33±10.2; Female: pre-test=234.07±5.95, post-test=222.33±9.74); Standing long jump (Male: pre-test=237±7.00, post-test=244±10.00; Female: pre-test=184±13.00, post-test=202±12.00); Sit and reach (Male: pre-test=14.33±8.03, post-test=24.07±6.04; Female: pre-test=20.53±14.17, post-test=29.07±10.11); Sit-up and Pull-up (Male: pre-test=6.27±1.91, post-test=8.20±1.66; Female: pre-test=28.60±7.43, post-test=34.60±8.35).

In CG, the mean and standard deviation of questionnaire score (Male: pre-test=32.73±4.56, post-test=33.60±4.27; Female: pre-test=33.66±3.94, post-test=33.86±4.29); HRMax (Male: pre-test=171.67±9.74, post-test=168.47±9.20; Female: pre-test=160.87±8.40, post-test=157.73±8.43); HRAvg(Male: pre-test=128.40±26.8, post-test=132.80±8.34; Female: pre-test=131.07±9.12, post-test=128.93±9.79); 50m run (Male: pre-test=8.05±0.41, post-test=8.08±0.34; Female: pre-test=10.17±0.33, post-test=9.93±0.19); 800/1000m run (Male: pre-test=208.73±3.58, post-test=209.67±4.60; Female: pre-test=232.93±4.93, post-test=234.53±8.13); Standing long jump (Male: pre-test=238±9.00, post-test=237±7.00; Female: pre-test=187±10.00, post-test=190±9.00); Sit and reach (Male: pre-test=14.77±6.85, post-test=18.27±4.59; Female: pre-test=18.93±3.86, post-test=20.40±4.58); Sit-up and Pull-up (Male: pre-test=6.13±2.45, post-test=6.33±2.09; Female: pre-test=29.27±4.65, post-test=29.07±5.57). As shown in Figure 3-7.

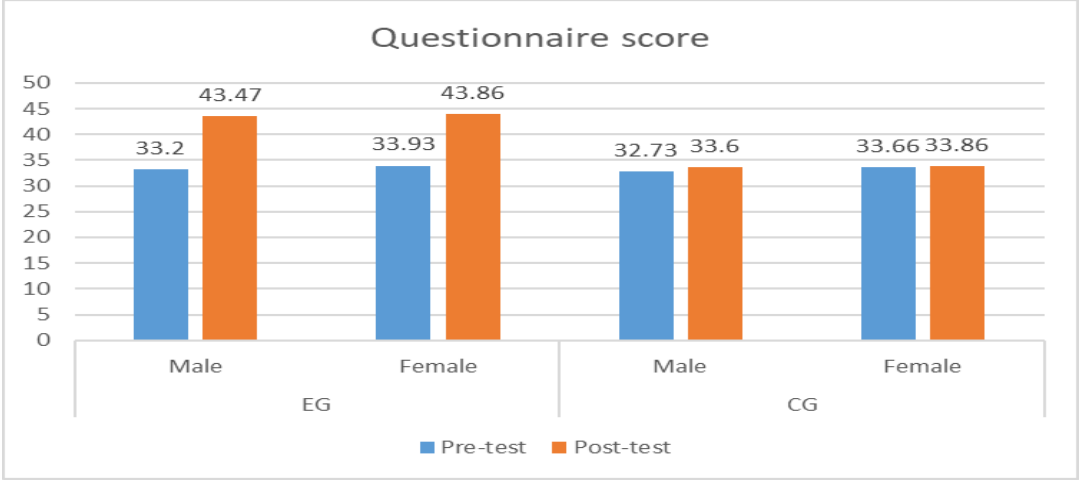

Figure 3. Mean of questionnaire score among all groups in tests times

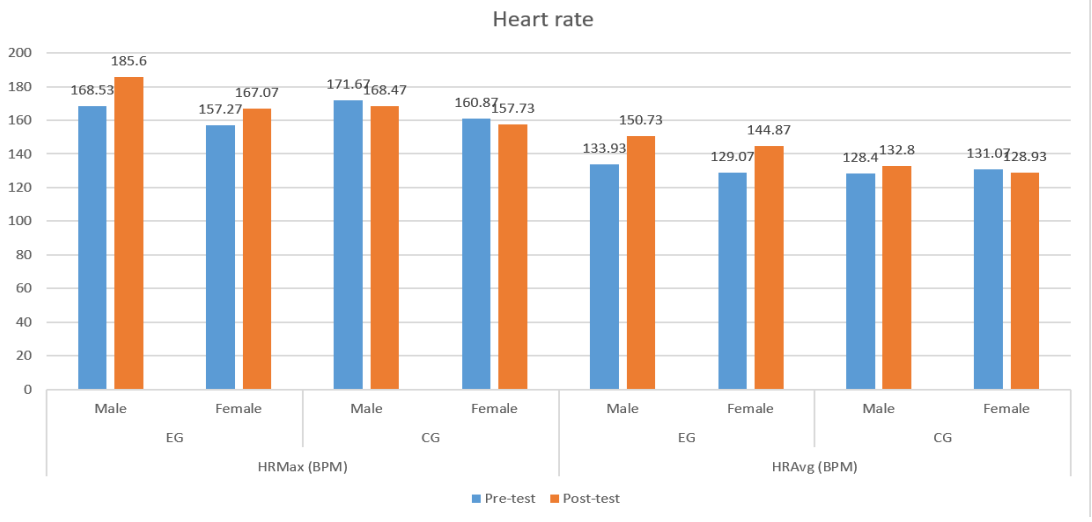

Figure 4. Mean of heart rate among all groups in tests times

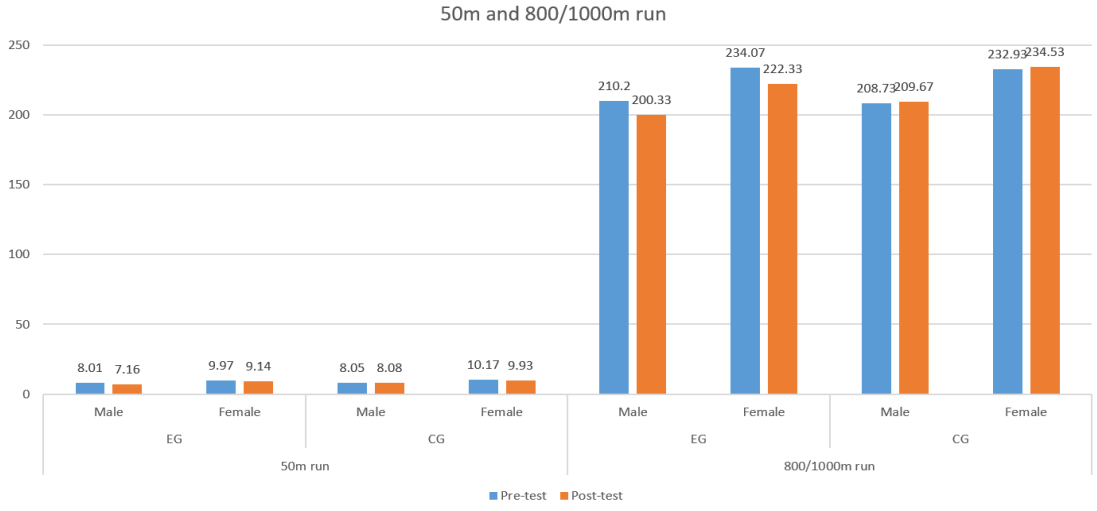

Figure 5. Mean of 50m and 800/1000m run among all groups in tests times

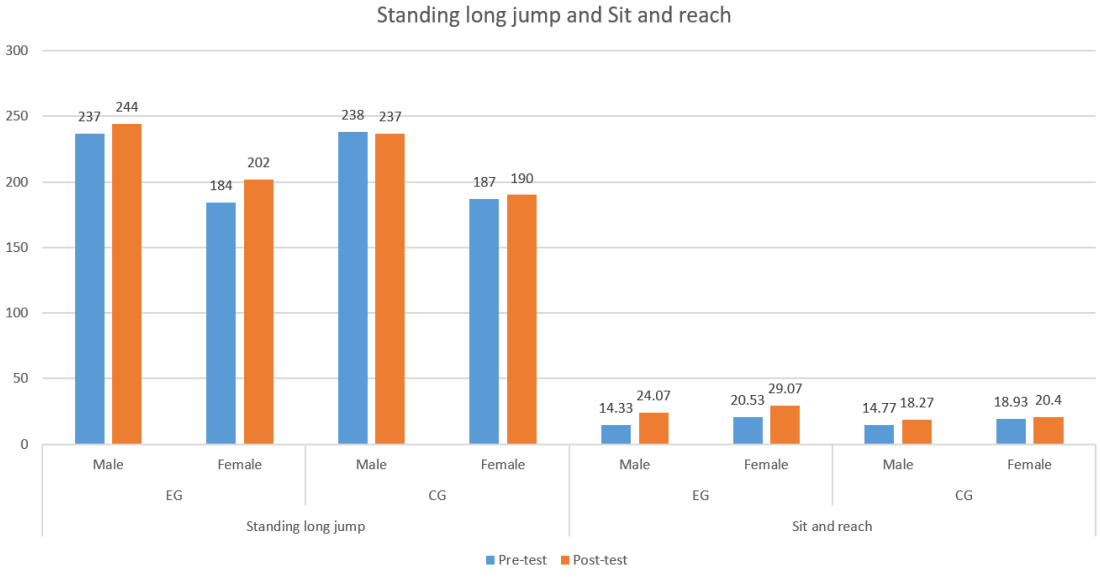

Figure 6. Mean of standing long jump and sit and reach among all groups in tests times

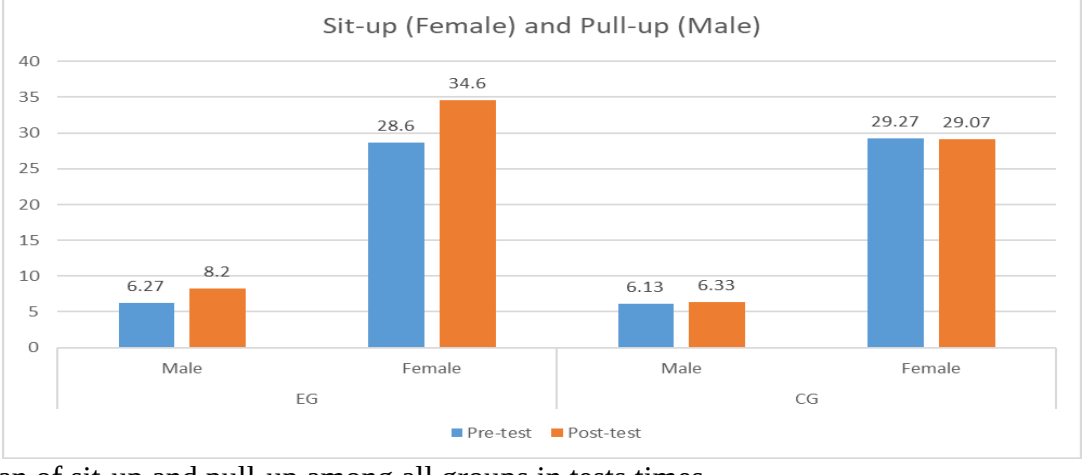

Figure 7. Mean of sit-up and pull-up among all groups in tests times

DISCUSSION

Effects of OBTon sports attitude for college students

In this study, after introducing outdoor expansion training into public physical education classes, through 12 weeks of teaching experiments and survey questionnaires, it was found that the public physical education students in the experimental group showed a significant increase in their interest in physical education classes compared to CG. This indicates that introducing OBT into public physical education teaching activities in universities has a significant effect interest and enthusiasm in physical education classes. In addition, this article found through a survey questionnaire and interviews with experimental group students that they are very interested in the content of outdoor expansion training. Some students are very eager to attend public physical education classes and also strongly agree to introduce more outdoor expansion training content into public physical education. OBT involves the addition of new training content, allowing students to work together to complete tasks and goals, and share the joy of physical education classes. Therefore, through the introduction of outdoor expansion training, public PE class have become increasingly popular among students, and their interest in public PE class courses has significantly increased.

The reason for this is as follows: Firstly, the OBT events are novel. The OBT events selected by the experimental research institute are traditional public physical education courses such as track and field, basketball, football, volleyball, etc., which are basically not carried out in university public physical education classes. These training programs break free from the boring and tasteless physical and ball training content of regular public physical education classes, and the fresh training content attracts students' participation and interest improvement. Secondly, the value of students' physical exercise is reflected. Most of these OBT events require team cooperation to complete, and each student in the team plays an important role. Therefore, it is necessary to require team cooperation and decision-making to solve problems and complete the training. The value of each student's physical exercise can be reflected, making students feel valued, so that they are willing to participate in it, and their interest in learning physical education naturally increases. Thirdly, innovation in physical education teaching methods (Yang et al., 2023).

Effects of OBT on heart rate for college students

The participation of students in sports classes is an important indicator reflecting the effectiveness of public physical education teaching (Guo et al., 2023). The participation of students in public physical education classes can be evaluated from two aspects: one is physiological heart rate indicators, and the other is qualitative analysis, which is to observe the actual activities of students in public physical education. In this study, through a 12-week OBT public physical education teaching experiment, it was found that after introducing OBT in public physical education classes, the HRMax and HRAvg of students in the experimental group in physical education classes were significantly higher than those in the control group, and their participation in public physical education classes was significantly improved. The increase in the average and maximum heart rates of students in public physical education classes can be explained as a direct result of outdoor expansion training intervention. It can be said that the introduction of OBT has played a major role in improving the participation of students in public physical education classes.

The reasons for this are as follows: Heart rate is an important indicator reflecting the intensity of human exercise (Herbert et al., 2020). According to the training intensity of students in public physical education classes, there are 3 level for the relationship between HRAvg and intensity, 120<HRAvg <140 beats per minute, low intensity;140< HRAvg <160 beats per minute, Moderate intensity; HRAvg >160 beats per minute, high intensity (Kim et al., 2022). It can be found that before the experiment, the students' HRAvg were in the range of 120<HRAvg<140 beats per minute in experimental group and control group, which belongs to low intensity. After the experiment, the average heart rate of male students in the experimental group was 150.73 ± 7.27, and that of female students was 144.87 ± 6.70, both reaching over 140 beats per minute, reaching moderate intensity. In addition, with the development of science and technology, wearable devices for detecting heart rate have been widely used in sports training, physical education teaching, and other aspects. If analyzing the improvement of outdoor expansion training in public physical education

students' participation from the perspective of learning attitude and interest is not very comprehensive, then explaining this issue from the perspective of heart rate and data has strong persuasiveness. Wearable devices can constantly detect the state of students' participation in public physical education classes, and the changes in students' heart rate during public physical education classes can reflect their participation in activities.

Effects of OBT on physical fitness for college students

The data of "Chinese National University and College Student Physical Health Standards Test" can directly reflect the quality of public physical education teaching in a university, because students' physical fitness is an external manifestation of physical health, and physical health is an important component of health, which is an important prerequisite for ensuring students' health. Without a good body, there is no way to engage in other teaching and social activities. In this study, after conducting a 12-week OBT experiment, it was found that the physical fitness of college students in the experimental class significantly improved compared to the control group in indicators such as 50m run, 800m run, standing long jump, sit and reach, sit up (female), pull up (male), etc. This directly demonstrates the important impact of introducing OBT on the effectiveness of public physical education teaching in universities

The reason for this is as follows: Physical fitness is a comprehensive reflection of the functions of various organ systems in the human body during muscle work, and is a general term for the strength, endurance, speed, flexibility, sensitivity, and coordination exhibited in sports (Kljajević et al., 2022). Physical fitness is not only influenced by genetic factors, but is largely determined by acquired sports methods, exercise load, selection of exercise content, and exercise habits. The different events of OBT have targeted exercise effects on developing students' general strength, reaction speed, explosive power, endurance, and balance in public physical education classes. For example, the event of Fetching water in thorns for OBT has a good effect on the development of strength and flexibility qualities in college public PE students, while some of these events have a significant improvement effect on balance and agility qualities, but have little effect on strength and endurance qualities; For example, again, 100m Orienteering sports have a very good exercise and improvement effect on the endurance and speed of college students... Therefore, long-term and reasonable arrangement of OBT events that meet the physical and mental development characteristics of students can effectively and comprehensively improve the physical fitness and health level of public PE students.

Conclusions

The experimental group received significant training on sport attitude, heart rate and physical fitness of college students. The OBT compared to normal PE class teaching activities, indicated that OBT has a significant effect on public PE students' attitudes, participation, and effectiveness towards public physical education classes. This study started from the perspective of experiential teaching, drew on the theories of education, psychology, and school sports, and studied the application of outdoor expansion training in public sports in universities. It revealed the problems in public sports teaching in universities and provides research cases for the introduction of teaching methods in public sports in universities, It has important theoretical and practical significance for effectively promoting the reform of public physical education teaching in universities and improving the quality of public physical education teaching.

Introducing the OBT into the teaching of public physical education courses in universities, firstly, has increased public PE students' interest and enthusiasm in public physical education courses, and further enhanced their participation in public physical education courses; Secondly, through OBT, public PE students' willpower and teamwork awareness have been enhanced; Thirdly, it helps public PE students to master various techniques and knowledge of public physical education to a certain extent, and improves their physical fitness significantly. Finally, it has promoted the reform of public physical education teaching and improved the quality of public physical education teaching in universities.

OBT is an experiential training course that emphasizes shaping team cooperation, enhancing and strengthening individual psychological qualities and sports potential, and promoting organizational growth. The content of OBT plays an important role in enhancing the interest and enthusiasm of students in public physical education classes in Chinese universities, cultivating students' lifelong sports concepts and social adaptability, and improving the effectiveness of public physical

education teaching in universities. Therefore, this study focused on the application of "experiential teaching" in public physical education classes in Jiangxi Teachers College, China, introduced outdoor expansion training into the teaching of public physical education classes in universities, stimulated the interest and enthusiasm of college students in public physical education classes, increased their participation in physical education classes, and achieved the goal of improving the quality of public physical education teaching, promoted students' physical fitness standards, and improved their psychological and social adaptability.

ACKNOWLEDMENT

We declare that there is no conflict of interest between the authors.

Funding

This research was financially supported by the Teaching Reform Research Project of Jiangxi Provincial Department of Education in China (Grant NO. JXJG-17-47-6).

Conflict of Interest

There is no personal or financial conflict of interest within the scope of the study.

Information on Ethics Committee Permission

Ethics Committee approved the study protocol (Ethics committee approval numbered 03.11.2023).

Author Contributions

Conception and design of the study: JG, BBA and RDOD; Data Collection: JG and RDOD; Analysis and Interpretation of results: JG, BBA and RDOD; Draft manuscript preparation: JG and BBA; Final approval of the version to be published: JG, BBA and RDOD. All authors approved the final version of the manuscript.

REFERENCES

An, Y., Yang, J., Niu, S. J., & Wang, J. (2022). Health First: The Sustainable Development of Physical Education in Chinese Schools. *Sustainability*, 14(5), Article 5. [CrossRef]

Banville, D., Marttinen, R., Kulinna, P. H., & Ferry, M. (2021). Curriculum decisions made by secondary physical education teachers and comparison with students' preferences. *Curriculum Studies in Health and Physical Education*, 12(3), 199–216. [CrossRef]

Dong, X., Huang, F., Starratt, G., & Yang, Z. (2023). Trend in health-related physical fitness for Chinese male first-year college students: 2013–2019. *Frontiers in Public Health*, 11. [PubMed]

Fan, X., & Yu, M. (2017). Changing Trend of University Students' Physical Fitness and the Reform of Teaching Methods. Eurasia *Journal of Mathematics, Science and Technology Education*, 13(12), 8227–8232. [CrossRef]

Freeman, M. (2011). From 'character- training' to 'personal growth': The early history of Outward Bound 1941–1965. *History of Education*, 40(1), 21–43. [CrossRef]

Guanghong, L. (2017). Construction of the outward-bound training mode in university physical education in a development perspective. *Agro Food Industry Hi-Tech*, 28(1), 2458–2462.

Guo, Q., Samsudin, S., Yang, X., Gao, J., Ramlan, M. A., Abdullah, B., & Farizan, N. H. (2023). Relationship between Perceived Teacher Support and Student Engagement in Physical Education: A Systematic Review. *Sustainability*, 15(7), Article 7. [CrossRef]

Herbert, C., Meixner, F., Wiebking, C., & Gilg, V. (2020). Regular Physical Activity, Short-Term Exercise, Mental Health, and Well-Being Among University Students: The Results of an Online and a Laboratory Study. *Frontiers in Psychology*, 11. [PubMed]

Hu, C. (2022). Evaluation of physical education classes in colleges and universities using machine learning. *Soft Computing*, 26(20), 10765–10773. [CrossRef]

Kim, D.-H., Cho, Y.-H., & Seo, T.-B. (2022). Correlation between physical efficiency index using Harvard step test and heart rate variation in college students. *Journal of Exercise Rehabilitation*, 18(6), 389–394. [PubMed]

Kljajević, V., Stanković, M., Đorđević, D., Trkulja-Petković, D., Jovanović, R., Plazibat, K., Oršolić, M., Čurić, M., & Sporiš, G. (2022). Physical Activity and Physical Fitness among University Students—A Systematic Review. *International Journal of Environmental Research and Public Health*, 19(1), Article 1. [PubMed]

Liang, S., & Hong, F. (2012). Historical Review of State Policy for Physical Education in the People's Republic of China. The *International Journal of the History of Sport*, 29(4), 583–600. [CrossRef]

Matlovičová, K., & Matlovič, R. (2019). Geography Education At The Comenius University In Bratislava In The Years Of 1922-1938: Institutionalization, Actors And Study Courses.

Mees, A., Toering, T., & Collins, L. (2022). Exploring the development of judgement and decision making in 'competent' outdoor instructors. *Journal of Adventure Education and Outdoor Learning*, 22(1), 77–91. [CrossRef]

O'Brien, M. W., Shivgulam, M. E., Wojcik, W. R., Barron, B. A., Seaman, R. E., & Fowles, J. R. (2022). 30 Year Trends of Reduced Physical Fitness in Undergraduate Students Studying Human Movement. International *Journal of Environmental Research and Public Health*, 19(21), Article 21. [PubMed]

Smith, B. J., Tang, K. C., & Nutbeam, D. (2006). WHO Health Promotion Glossary: New terms. *Health Promotion International*, 21(4), 340–345. [PubMed]

Wang, J. (2022). Influence Of Physical Training On The Physical Quality Of University Students. *Revista Brasileira de Medicina Do Esporte*, 29, e2022_0184. [CrossRef]

Wei, X., & Liu, Z. (2018). Comprehensive Assessment of the Psychological Burden for Students in Physical Education Classes in Chinese Universities. *Medical Science Monitor Basic Research*, 24, 79–83. [PubMed]

Yang, X., Samsudin, S., Wei, S., Guo, Q., Geork, S., & Yaakob, S. S. N. (2023). The effect of outdoor education intervention to improve leadership among students: A systematic review. *International Journal of Multicultural Education*, 25, 53.

Yun, G., Ravi, R., & Jumani, A. (2022). Analysis of the teaching quality on deep learning-based innovative ideological political education platform. *Progress in Artificial Intelligence*. [CrossRef]

Zang, J. (2023). Smart Sports Outward Bound Training Assistant System Based on WSNs. International Journal of Distributed Systems and Technologies (IJDST), 14(2), 1–11. [CrossRef]

Zhou, Y., Wang, L., Wang, B., & Chen, R. (2022). Physical activity during physical education in elementary school in China: The role of teachers. *Physical Education and Sport Pedagogy*, 27(4), 409–421. [CrossRef]