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THE EFFECTS OF BURIRAM RAJABHAT UNIVERSITY'S SPORTS SCIENCE PROGRAM ON THE PHYSICAL PERFORMANCE OF SPORTS SCIENCE STUDENTS

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ABSTRACT

To be successful sports science students, it is necessary to have good physical development throughout a four-year undergraduate program. Therefore, the aim of this study was to compare physical performance among all sports science students at Buriram Rajabhat University (BRU), by utilizing the basic knowledge for planning and developing an exercise program. A lot of 236 sports science students, aged between 17-22 years old, were recruited for this study; participants included both male (n=164) and female (n=72) students. The results of the baseline clinical characteristics were determined by body weight, BMI (body mass index), percent (%) of total body fat, WC (waist circumference), HC (hip circumference), SBP (systolic blood pressure), DBP (diastolic blood pressure) and HR (heart rate). Physical performance was investigated through measuring hand grip strength, back strength, leg strength, trunk flexibility, 30 second sit ups, 50 meter sprints, standing long jump, a six-minute walk test (6MWT) and running 1600 meters test.

All parameters of anthropometry and physical performance were tested at the beginning (pre-test) and the end (post-test) of the first semester. The results of anthropometry testing showed no significant difference in participants other than, HR; heart rate of male and female groups decreased significantly ($p<0.01$). However, results of physical performance showed significant increase ($p<0.05$) for both groups in hand grip, back strength, leg strength, trunk flexibility, 30 second sit ups, standing long jump, six-minute walk test (6MWT) and 1600 meters. However, 50 meter sprint showed no significant difference for either group. Overall, both male and female participants showed improvement of physical performance. The present study indicated that teaching techniques of sports science programs were effective in improving the physical performance of all students in the four-year undergraduate sports science program at Buriram Rajabhat University.

KEYWORDS: Physical performance, Sports science student, Buriram Rajabhat University (BRU)

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INTRODUCTION

Better physical performance could contribute to better learning. It is necessary to check the basic physical performance of all students as a database for developing approaches. Exercise approaches could be used for increasing health. The benefits are associated with physical activity, including cardiovascular and muscular fitness, bone health, and psychosocial outcomes (Strong et al., 2005). Physical performance is important for sports science students at the faculty of science: one of the aims of this discipline is to be a leader in physical exercise and fitness, as well as in sports and sports health clubs. Students need to be ready for physical fitness to work out and, at the same time, to test the effectiveness of the curriculum. Physical fitness consists of multiple variables: 1) cardio respiratory fitness, which is the capability of the circulatory system (heart, lungs, and blood vessels) to work slowly and efficiently while a person physically exerts themselves for a long time, and when the body stops working the blood circulation system can return to a normal rate faster than usual; 2) endurance, which is the ability of muscles to function for a long time, perform more work, but become less tired; 3) strength, which is the ability to exert a maximal amount of force for muscle contraction; 4) flexibility, or the coordination between the muscles, flexible membrane and joints while working; and 5) body composition, or proportions of the body (Johnson & Stolberg, 1971). Physical fitness is generally achieved through correct nutrition, exercise, hygiene and rest. Physical fitness has also been defined as a set of attributes or characteristics that people have or achieve relating to the ability to perform physical activity (Magal et al, 2009).

Sports science students study for four years in order to graduate. Thus, physical performance is important to help develop fitness; it is also necessary for students to be in good health and achieve the goals of sports science students at Buriram Rajabhat University.

RESEARCH OBJECTIVE

The present research objective is to compare physical performance of students at the beginning (pre-test) and end (post-test) of the first semester of the sports science program at Buriram Rajabhat University.

RESEARCH QUESTIONS

Can students in the sports science program improve physical performance while studying in school?

RESEARCH METHODOLOGY

1. STUDY POPULATION AND SAMPLE

Study population and sample

The participants are assigned to assignment. Participants included 236 sports science students at Buriram Rajabhat University, studying in the first semester of the academic year in the sport science program curriculum.

The population sample included a total of 236 sports science students, in their first semester, 164 male students and 72 female students, aged between 17-22 years old.

Variables

The independent variable of the study is the first semester curriculum of academic year in the sports science program. The dependent variable is the physical performance of each student after the first semester.

2. RESEARCH DESIGN

This research used quasi-experimental research in humans.

3. STUDY PROTOCOL

3.1 Study theories, concepts, principles, documents and related research.

3.2 Follow the curriculum and learning management.

3.3 Let experts check the curriculum of learning management and physical fitness tests.

3.4 Implement a learning management plan and fitness test to update.

3.5 Teach information and collect the data.

The subjects were divided into four main groups as follows: first year students studying training skills in basketball; second year students studying training skills in swimming; third year students studying basketball techniques, instruction and officiating; and fourth year students studying seminar in sport sciences respectively. All courses were instructed by the researcher. All groups were physically tested during the first week (pre-test) and at the end of the sixteenth week (post-test).

Inclusion criteria

1. Study in the first semester of the school year in the sports science program at Buriram Rajabhat University.

2. Study throughout the four-year undergraduate program.

3. Attend more than 80% of the class.

4. Non-regular smoking or alcohol consumption.

5. No serious illness, such as diabetes mellitus, musculoskeletal disorders and other chronic diseases.

Exclusion criteria

1. Non-study during the first semester of the school year in the sports science program at Buriram Rajabhat University.
2. Graduate sports science program at Buriram Rajabhat University.
3. Attend less than 80% of the class.
4. Regular alcohol smoking or alcohol consumption.
5. History of serious illness, such as diabetes mellitus, musculoskeletal disorders and other chronic diseases.

Informed consent process

Standard informed consent was attained, including purpose and benefits of this study. A research assistant provided information and consent forms for volunteers to read and return. Before making a decision, the researcher explained the information to the assistant and distributed it to the volunteers.

4. RESEARCH INSTRUMENTS

Participants were deemed physically healthy following examination by a physician. They investigated anthropometry and physical performance at the beginning of the first semester (pre-test) and at the end of the first semester (post-test).

Height (cm) is measured with subjects in a free-standing position with their feet together and heels, buttocks and upper parts of the back touching the scale.

Body weight (kg) is measured while subjects are barefoot and wearing as little clothing as possible; subjects stands on the platform of the scale with his/her weight distributed evenly over both feet. The arms hang by the sides of the trunk, with palms facing the thighs. They are instructed to maintain a stable position while the measurement is taken.

Body mass index (BMI) is calculated using height and body weight, using the formula BMI = body mass (kg) / height $(m)^2$. (ACSM, 2009).

Waist circumference (WC) will be measured at the narrowest part of the torso and *hip circumference (HC)* will be measured around the buttocks at the level of maximal extension in a free-standing position. (WHO, 2000)

Physical performance is measured though various strengths. Muscle strength is determined by hand grip strength (kg), 30 second sit ups (number of sit ups), back strength (kg), and leg strength (kg). Flexibility is determined by trunk flexibility (cm) of a sit-and-reach test. Standing long jump (cm) test measures power; speed is determined by a 50 meter sprint (seconds), quickness, and body control in multiple planes of movement. The test also assesses lower extremity control, including the ability to perform plant and cut types of movement correctly (Ortiz et al, 2005). Distance of a six

minute walk test (6 MWT) (meters/min) test and 1600 meter indicates muscle endurance and cardio-pulmonary capacity.

5. DATA COLLECTION

The research sample includes sports science students in the first semester of the academic year at Buriram Rajabhat University. 236 sports science students, both male (N=164) and female (N=72), were physically pre-tested and tested again after 16 weeks of the semester.

6. DATA ANALYSIS

Data was presented as mean ± standard deviation (SD). A paired t-test was used to compare the beginning (pre-test) and end (post-test) tests of the first semester for all sports science students at Buriram Rajabhat University, measuring anthropometry, body composition, and physical fitness. Statistical analyses are made using STATA version 12.0 (StataCorp, College Station, TX). The statistical significance level was set at $p < 0.05$.

RESULTS

Baseline Characteristics

Data of baseline characteristics were measured in both groups of sports science students in age, body weight, height, body mass index (BMI), total body fat, waist circumference (WC), hip circumference (HC), systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) (Table 1). Data collected of the previous measurements found no significant difference form the pre- and post-tests of either sample group, with the exception of heart rate (HR). HR for both groups decreased over the six teen weeks. HR in females decreased significantly from 82.01 ± 11.12 (beats/min) to 78.31 ± 11.94 (beats/min)) and from 76.44 ± 12.30 (beats/min) to 73.79 ± 8.94 (beats/min) in males ($p<0.01$), (Table 2).

Results of physical performance

The results of physical performance from the pre- and post-test period show no significant difference in either group in the 50 meter sprint (Table 4). Alternatively, other physical performances increased significantly ($p<0.05$) along all parameters: physical performance of muscle strength, such as hand grips strength (kg), back strength (kg), leg strength (kg), and flexibility in trunk flexibility, as shown in Table 3. Furthermore, the results of physical performance in both student groups increases significantly in muscle endurance tests, in the 30 second sit up (number of sit ups), muscle power by standing long jump (cm), cardio-pulmonary capacity by distance of the six minute walk test (6 MWT) and running 1600 meter, as shown in (Table 4)

Table 1. Baseline clinical characteristics of sports science students at Buriram Rajabhat University (N=236), during pre-test period.

	Sports science students (N=236)	
	Female (n=72)	Male (n=164)
Age (years)	18.71 ± 3.32	19.02 ± 3.19
Height (cm)	157 ± 12.87	173 ± 12.35
Body weight (kg)	54.79± 10.63	64.73 ± 8.83
BMI (kg/m^2)	22.27 ± 2.96	21.45 ± 2.66
Total body fat (%)	22.41± 4.36	15.21 ± 5.13
WC (inch)	28.72 ± 4.12	29.95 ± 4.75
HC (inch)	35.12 ± 4.78	33.24 ±4.25
SBP (mmHg)	110.49 ± 9.32	115.23 ± 9.87
DBP (mmHg)	72.23 ± 12.35	77.53 ± 10.23
HR (beats/min)	82.01 ± 11.12	76.44 ± 12.30

Data is presented as mean ± SD. Body weight, Body Mass Index (BMI), Percentage (%) of total body fat, Waist Circumference (WC), Hip Circumference (HC), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Heart Rate (HR).

Table 2. Comparative results of anthropometry in sports science students at Buriram Rajabhat University (N=236), between pre- and post-test periods.

Variables	Sports science students (N=236)			
	pre-test		post-test	
	Female (n=72)	Male (n=164)	Female (n=72)	Male (n=164)
Body weight (kg)	54.79± 10.63	64.73 ± 8.83	54.31 ± 9.91	65.00 ± 8.41
BMI (kg/m^2)	22.27 ± 2.96	21.45 ± 2.66	22.17 ± 2.16	21.64 ± 2.68
Total body fat (%)	22.41± 4.36	15.21 ± 5.13	21.22 ± 5.14	15.67 ± 4.91
WC (inch)	28.72 ± 4.12	29.95 ± 4.75	28.81 ± 4.02	29.85 ± 4.23
HC (inch)	35.12 ± 4.78	33.24 ±4.25	35.16 ± 4.24	33.42 ± 4.75
SBP (mmHg)	110.49 ± 9.32	115.23 ± 9.87	112.54 ± 9.23	117.42 ± 9.95
DBP (mmHg)	72.23 ± 12.35	77.53 ± 10.23	74.55 ± 11.45	78.44 ± 11.25
HR (beats/min)	82.01 ± 11.12	76.44 ± 12.30	78.31 ± 11.94**	73.79 ± 8.94**

Data is presented as mean ± SD. Body weight, Body Mass Index (BMI), Percentage (%) of total body fat, Waist Circumference (WC), Hip Circumference (HC), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Heart Rate (HR).

** $p<0.01$ high statistical significance

Table 3. Comparative results of physical performance in sports science students at Buriram Rajabhat University (N=236), between pre and post-test period.

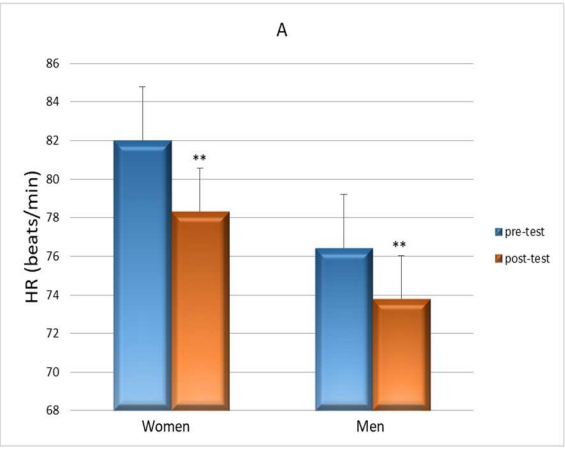
Variables	Sports science students (N=236)			
	pre-test		post-test	
	Female (n=72)	Male (n=164)	Female (n=72)	Male (n=164)
Hand grips (kg)	26.23± 3.89	39.24 ± 7.95	28.20 ± 3.99***	41.63 ± 7.43***
Back strength test (kg)	61.16 ± 16.19	99.69 ± 28.52	65.31 ± 15.62**,1	106.63± 25.80***
Leg strength test (kg)	87.66 ± 33.93	140.78 ± 48.38	97.84 ± 33.14**	156.38 ± 48.27***
Trunk flexibility (cm)	12.56 ± 4.46	12.49± 6.97	115.22 ± 4.79**,1	14.88 ± 6.84***

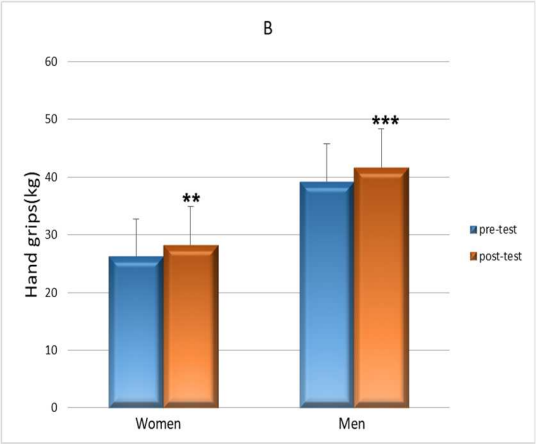
Data is presented as mean ± SD. *** p<0.001 greater statistical significance

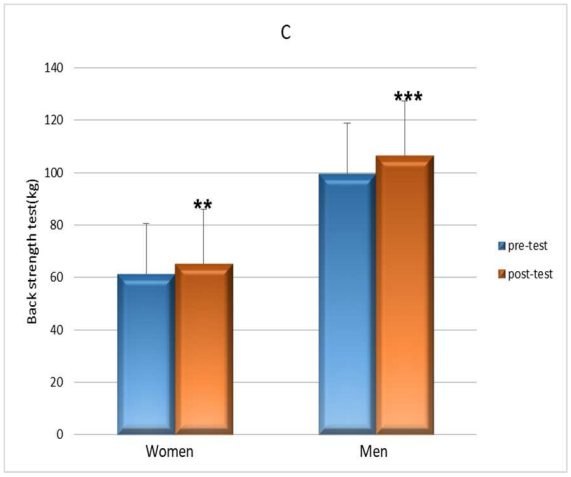
Table 4. Comparative results of physical performance in sports science students at Buriram Rajabhat University (N=236), between pre and post-test period.

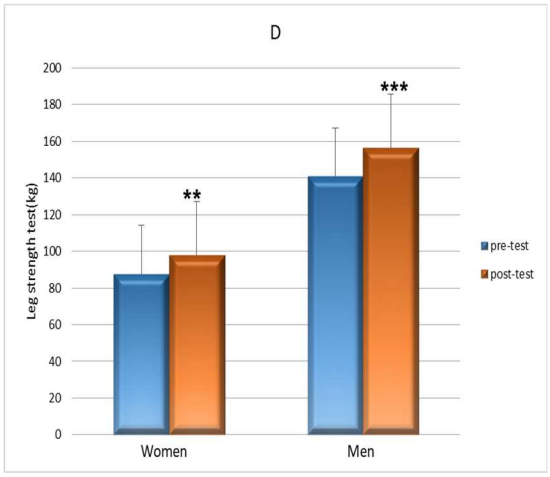
Variables	Sports science students (N=236)			
	pre-test		post-test	
	Female (n=72)	Male (n=164)	Female (n=72)	Male (n=164)
Sit up (times)	19.41±7.93	23.59± 5.00	22.45 ± 4.06**	26.05 ± 4.61***
Speed 50 m (sec)	9.80 ± 3.61	8.46 ± 3.14	9.72 ± 3.81	8.47± 2.69
6 MWT (m)	634.04 ± 108.10	649.65 ± 98.08	665.62 ± 92.57**	683.21 ± 118.92***
Long jump (cm)	168.22 ± 22.58	206.47± 34.13	1172.05 ± 22.39*	210.14 ± 24.79*
1600 m (minute)	11.93± 1.83	9.56 ± 1.64	111.02 ± 1.84***	8.84 ± 1.85***
M mass	29.11 ± 3.80	34.79± 4.97	29.44 ± 3.92**	36.01 ± 3.83***

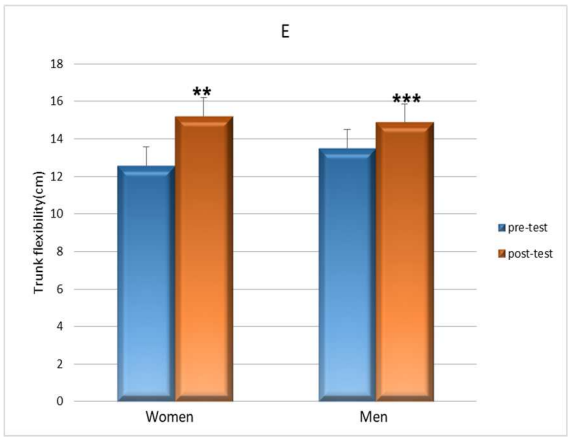
Data is presented as mean ± SD. * p<0.05 statistical significance, ** p<0.01 high statistical significance and *** p<0.001 greater statistical significance

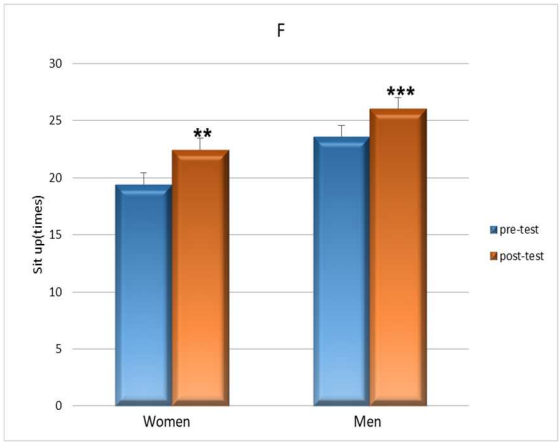


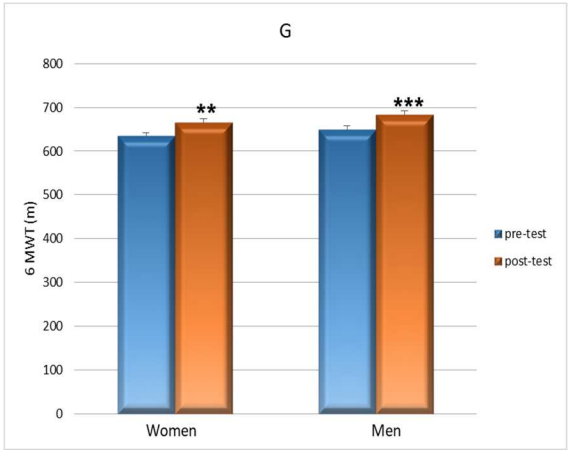


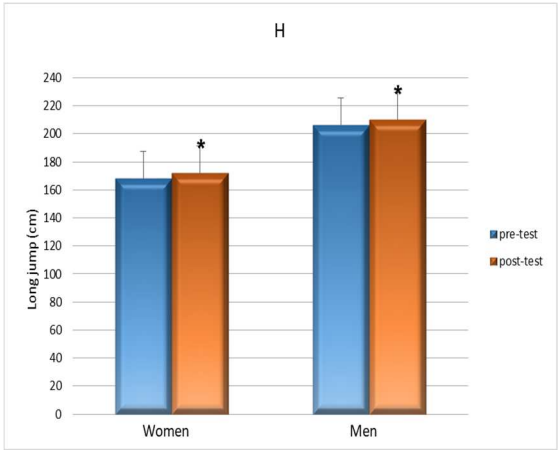

C
Back strength test(kg)
140
120
100
80
60
40
20
0
**
***
Women
Men
pre-test
post-test


D
Leg strength test(kg)
200
180
160
140
120
100
80
60
40
20
0
**
***
Women
Men
pre-test
post-test


E
Trunk flexibility(cm)
18
16
14
12
10
8
6
4
2
0
**
***
Women
Men
pre-test
post-test


F
Sit up(times)
30
25
20
15
10
5
0
**
***
Women
Men
pre-test
post-test


G
6 MWT (m)
800
700
600
500
400
300
200
100
0
**
***
Women
Men
pre-test
post-test


H
Long jump (cm)
240
220
200
180
160
140
120
100
80
60
40
20
0
*
*
Women
Men
pre-test
post-test

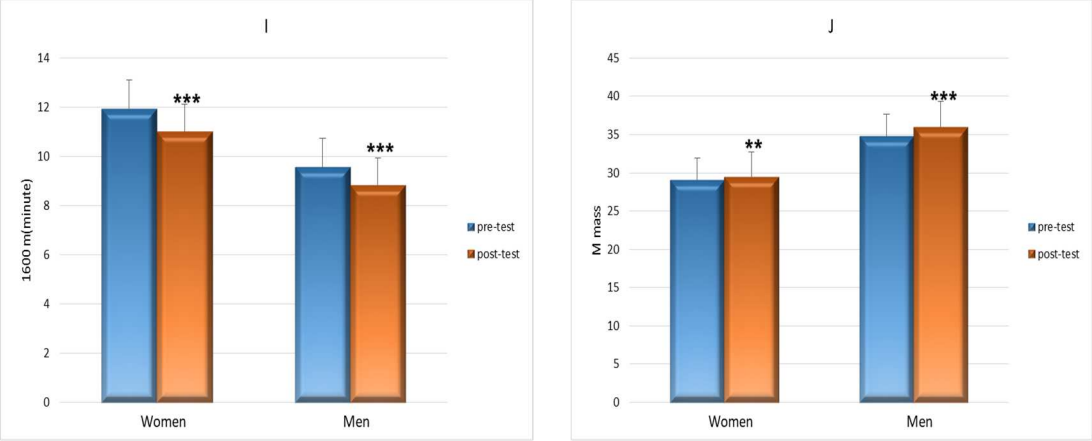


Figure 1 The measurements of (A) Heart rate, (B) Hand grips, (C) Back strength test, (D) Leg strength test, (E) Trunk flexibility, (F) Sit-up, (G) 6 MWT, (H) Long jump, (I) 1600 m and (J) Muscle mass during pre-test and post-test after the first semester in the academic year of the sports science program (N=236): female (n=72) and male (n=164).

Data is presented as mean ± SD. * $p<0.05$ statistical significance, ** $p<0.01$ high statistical significance and *** $p<0.001$ greater statistical significance in pre-versus post- test by paired t-test.

CONCLUSION

This study compared anthropometry and physical performance for sports science students before and after 16 weeks of study. All parameters of anthropometry and physical performance were tested at the beginning (pre-test) and the end (post-test) of the first semester. The results of anthropometry testing showed significant difference in only heart rate (HR) across both groups of participants, heart rate decreased significantly. Furthermore, results of physical performance showed significant increase in hand grip strength, back strength, leg strength, trunk flexibility, 30 second sit ups, standing long jump, distance of the six-minute walk test (6MWT) and running 1600 meters in both groups. The 50 meter sprint was the only metric that showed no significant difference in either group.

This study found that all sports science students increase muscle strength in hand grips, back strength, leg strength, muscle power by standing long jump, and 30 second sit ups, improving core body and cardio-pulmonary capacity by distance of 6MWT in both groups. Conversely, the 50 meter sprint had no change. The research indicated that the teaching techniques of the sports science program was effective in improving physical performance of all students in the four-year undergraduate sports science program at Buriram Rajabhat University. Therefore, they should receive basic knowledge about good exercise for fitness, including exercise techniques to improve speed.

DISCUSSION

Analysis of the physical performance parameters at the beginning (pre-test) and the end (post-test) of the first semester of physical performance for all student in the four-year undergraduate sports science program at Buriram Rajabhat University showed that all skills in sports science improved students' basic knowledge in exercise skills and physical performance. The study investigated anthropometry and physical performance, such as hand grip strength, back strength, leg strength, trunk flexibility, 30 second sit ups, 50 meter sprint, standing long jump and distance of the six-minute walk test (6MWT) and running 1600 meter. The results of anthropometry showed no significant difference in either group of participants. However, results of physical performance showed significant increase ($p<0.05$) in hand grip strength, back strength, leg strength, muscle strength of core body, distance of 6MWT and 1600 meter in both groups.

This study showed that study in sports science can increase muscle strength, muscle endurance, muscle power and cardio-pulmonary capacity. Muscle strength is a factor of physical performance parameters. The regular exercise in cardiorespiratory, flexibility, and resistance exercise training can improve health and physical fitness important for most adults (Garber et al., 2011). Maximum force can be exerted by muscle contraction. Strength is defined as the ability of a muscle group to develop maximal contractile force against a resistance in a single contraction (Pathare, Haskvitz and Selleck, 2013). This is also similar to the study by Delextrat & Cohen (2009) on the title of *Strength, Power, Speed and Agility of Women Basketball Player According to Playing Position*. Specifically, Point Guard and Center require the most agility. Moreover, Latin et al. (1994) studied physical and performance characteristics of male basketball player in the NCAA division. They found that each position requires strength, power, speed, and agility. Other studies found muscle strength increased in the training group ($p < 0.01$) while, lean body mass was unchanged. Exercise capacity and six-min walk test improved in the training group (Osbak et al., 2012).

From the results of this study, it was found that most physical performances of all subjects indicated that they had good capacity in leg muscle strength and power, quickness and body control, including muscle endurance and cardio-pulmonary capacity in long distance running test. However, the present study indicated a problem in speed. Therefore, all students in the sports science program at Buriram Rajabhat University should practice or develop exercise techniques to improve speed.

SUGGESTIONS

1. Suggestions for the application of research results

It should improve physical performance, especially in developing speed skills.

2. Suggestions for the future research

2.1 It should compare physical performance between faculties for developing healthy approaches of Buriram Rajabhat University students.

2.2 The next study may investigate other psychological performances to check students' mental well-being

2.3 For further studies, physical performance should assess the population in Buriram city, for planning and developing a healthy sports city.

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