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Impact of physical activity games for enhancing physical fitness of primary school pupils

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Abstract
This study aims to assess the impact of physical activity games for enhancing physical fitness of primary school pupils. One hundred and fifty four primary school pupils at grade three participated in this study. Subjects were divided into two groups. Experiment group included 78 pupils (40 males and 38 females). Control group included 76 pupils (37 males and 39 females). The intervention was carried out in 12 weeks at three primary schools in Vinh city. After 12 weeks of training with selected physical activity games, physical fitness of experiment group outperformed control group for all physical tests. Physical activity games are vehicle to enhance physical fitness of primary school pupils.

Keywords: Physical activity games, physical fitness, school, pupils

1. Introduction
Regular physical activity helps develop child's movement skills. It also, of course, helps bones become stronger and builds a healthy heart and stronger muscles. Physical activity also helps your child keep a healthy body weight. Furthermore, regular physical activity, active play and sports can be a practical means to achieving numerous health gains, either directly or indirectly through its positive impact on other major risks, in particular high blood pressure, high cholesterol, obesity, tobacco use and stress [1]. Moderate intensity exercise can even help to relieve some chronic pain conditions by maintaining physical function and decreasing fatigue. There is clear evidence that regular physical activity contributes to the primary and secondary prevention of several chronic diseases and is associated with a reduced risk of premature death [2]. Furthermore, exercise is any activity that helps to improve or maintain physical fitness as well as in general. People of all ages, both male and female can benefit from regular exercise [3]. Physical exercise can improve your quality of life [4, 5]. Aside from providing general physical benefits, regular activity can also help ease symptoms of premenstrual syndrome in girls. This is because moderate exercise helps the body produce hormones called endorphins. These natural painkillers can ease abdominal and back pain as well as improve mood.

2. Methods and design
2.1. Participants and protocol
One hundred and fifty four primary school pupils at grade three participated in this study. Subjects were divided into two groups. Experiment group included 78 pupils (40 males and 38 females). Control group included 76 pupils (37 males and 39 females). Exclusion criteria: participants have chronic pediatric diseases or orthopedic condition that would limit to perform exercise. Subjects in experiment group were instructed to do activity games in six months, three times a week out of class time. Each training session lasted 45 minutes contained of 10-minute warm-up, 10-minute cool down and 25-minute main part. Participants in control group were asked not to participate in any new physical program but still followed normal physical lesson at school in class time and remained their daily physical activities. The intervention was carried out in 12 weeks at three primary schools in Vinh city.
Statistical analysis: Independent t test and Anova were performed to analyze the differences between groups. A $p < .05$ was considered to be statistical significant.

2.2. Main outcomes measurements

Physical Fitness Tests used in this research are taken from Decision No.53 of Ministry of Education and Training of Vietnam (METV) [6], includes 6 tests as followed:

- Test 1: Handgrip strength (kg): to measure the maximum isometric strength of the hand and forearm muscles
- Test 2: 30 seconds Sit-ups (times): to measure abdominal muscular strength and endurance of the abdominals and hip-flexors, important in back support and core stability.
- Test 3: Standing long jump (cm): to measure the explosive power of the legs.
- Test 4: 30 meter sprint test (s): to determine acceleration and speed.
- Test 5: 4x10m shuttle running (s): test of speed, body control and the ability to change direction (agility).
- Test 6: Free 5-minute running (m): to measure the endurance.
- Ruffier test is cardiovascular endurance test, which involves measuring heart rate before and after performing 30 squats in 45 seconds. The test was originally developed in 1950s by James-Edward Ruffier [7] and modified by J. Dickson [8], who developed the Ruffier-Dickson index (RDI). From the results of this squat test, cardio-respiratory fitness can be classified.

3. Results

Prior to intervention, physical fitness of study subjects were surveyed. Results of survey on physical fitness between experiment and control groups were equal and there was no significant difference for all physical tests.

3.1. Selected physical activity games for primary school pupils

Table 1: Results of interview for physical activity games

Physical activity games		
Chasing	Rolling ball	Relay long jump standing
Relay passing ball	Throwing ball into the nest	Throwing at target
Tug of war	Dribbling ball	Relay hopscotch
Relay jumping	Passing ball (six people)	Who is stronger
Jump well, jump fast	Moving roller	Dragons and snakes
Relay running	The third person	Group 3, group 7

These 18 physical activity games have been choosen by teachers and experts who work in the field of physical education and sports (table 1).

3.2. Applying physical activity games for primary school pupils

Table 2: Physical fitness of male pupils between experiment and control groups before intervention

Tests	Male pupils					
	Experiment group (n=38)		Control group (n=37)		t	P
	M	SD	M	SD		
Height (cm)	128.79	4.66	129.16	4.87	0.34	>0.05
Weight (kg)	26.34	3.99	25.95	4.34	0.41	>0.05
Cardiovascular endurance	13.99	1.52	14.03	1.66	0.12	>0.05
Handgrip strength (kg)	11.97	2.11	12.05	2.42	0.15	>0.05
Sit up (times/30s)	10.89	1.79	11.08	1.67	0.45	>0.05
Standing long jump (cm)	118.29	8.51	118.03	8.28	0.14	>0.05
30 meter sprint (s)	7.36	0.61	7.37	0.66	0.06	>0.05
4x10m shuttle running (s)	13.98	0.92	13.92	0.86	0.3	>0.05
Free 5-minute running (m)	572.11	104.1	573.5	90.47	0.06	>0.05

Results of table 2 showed that there was no significant differences in all tests of physical fitness of male pupils between experiment group and control group before intervention with p >.05.

Table 3: Physical fitness of female pupils between experiment and control groups before intervention

Tests	Female pupils					
	Experiment group (n=40)		Control group (n=39)		t	P
	M	SD	M	SD		
Height (cm)	127.38	6.09	126.87	6.11	0.37	>0.05
Weight (kg)	25.55	3.6	25.62	4.06	0.07	>0.05
Cardiovascular endurance	13.41	1.39	13.44	1.56	0.09	>0.05
Handgrip strength (kg)	10.33	2.53	10.44	2.89	0.18	>0.05
Sit up (times/30s)	8.98	2.43	8.95	2.75	0.05	>0.05
Standing long jump (cm)	108.9	13.35	105.69	15.35	1.0	>0.05
30 meter sprint (s)	7.87	1.09	7.92	1.17	0.2	>0.05
4x10m shuttle running (s)	14.95	1.33	14.97	1.36	0.08	>0.05
Free 5-minute running (m)	475.7	98.27	470.82	95.88	0.22	>0.05

Results of table 3 showed that there was no significant differences in all tests of physical fitness of female pupils between experiment group and control group before intervention with p >.05.

Table 4: Physical fitness of male pupils between experiment and control groups after intervention

Tests	Experiment group (n=38)		Control group (n=37)		t	P
	M	SD	M	SD		
Height (cm)	129.45	4.5	130.19	4.67	0.70	>0.05
Weight (kg)	27.03	3.52	27.09	3.78	0.07	>0.05
Cardiovascular endurance	13.92	1.54	13.88	1.51	0.11	>0.05
Handgrip strength (kg)	12.79	1.91	13.65	1.6	2.12	<0.05
Sit up (times/30s)	11.55	1.25	12.41	1.53	2.64	<0.05
Standing long jump (cm)	120.26	8.37	123.46	4.9	2.03	<0.05
30 meter sprint (s)	7.03	0.48	6.88	0.53	1.31	>0.05
4x10m shuttle running (s)	13.74	0.95	13.26	1.08	2.04	<0.05
Free 5-minute running (m)	569.84	106.9	654.86	121.7	2.19	<0.05

Table 4 indicated that there are no significant changes in *height, weight, cardiovascular endurance* and *30 meter sprint* tests with p>.05 for male pupils. Whereas, there are significant differences in *handgrip strength, sit up, standing long jump, 4x10m shuttle running* and *free 5-minute running* tests with *p*<.05 for male pupils, respectively.

Table 5: Physical fitness of female pupils between experiment and control groups after intervention

Tests	Experiment group (n=40)		Control group (n=39)		t	P
	M	SD	M	SD		
Height (cm)	127.84	5.46	127.09	5.96	0.61	>0.05
Weight (kg)	26.18	3.2	26.23	3.78	0.06	>0.05
Cardiovascular endurance	13.28	1.25	13.14	1.43	0.46	>0.05
Handgrip strength (kg)	10.44	2.54	12.12	3.34	2.6	<0.01
Sit up (times/30s)	9.23	2.45	10.52	3.16	2.1	<0.05
Standing long jump (cm)	111.68	13.64	115.67	18.3	1.1	>0.05
30 meter sprint (s)	7.77	1.09	7.21	1.37	2.02	<0.05
4x10m shuttle running (s)	14.67	1.31	14.05	1.33	2.11	<0.05
Free 5-minute running (m)	474.37	116.3	526.71	99.9	2.23	<0.05

Table 5 indicated that there are no significant changes in *height, weight, cardiovascular endurance* and *standing long jump* tests with p>.05 for male pupils. Whereas, there are significant differences in *handgrip strength, sit up, 30 meter sprint, 4x10m shuttle running* and *free 5-minute running* tests with *p*<.05 for male pupils, respectively.

4. Discussion

This study indicated that after 12 weeks training with physical activity games, participants in experiment group outperformed the control group in physical fitness for almost physical tests. Study of William suggested that school-age youth should participate daily in 60 minutes or more of moderate to vigorous physical activity that is develop mentally appropriate, enjoyable, and involves a variety of activities [9]. Previous findings also suggested that physical activity plays an important role in maintaining and promoting lifestyle and health of individuals [10]. Scientific studies in children showed that physical activity can increase their growth and reduce their health problems [11]. The result of this study is also in accordance with the results suggested regular participation in play, games, and other physical activities, both in school and during free time, is essential for the healthy development of every young person [1]; and physical activity and exercise as a vehicle for improving health [12]; increases cardiovascular performance and respiratory fitness [13]. It is consistent with the result of study which proved that some invasion games appear to be an effective way for improving physical fitness in primary school children [14].

5. Conclusion

This study aims to assess the impact of physical activity games for enhancing physical fitness of primary school pupils. After 12 weeks of training with selected physical activity games, physical fitness of experiment group outperformed control group for all physical tests. Physical activity games are vehicles to enhance physical fitness of primary school pupils.

6. References

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