

ผลของโปรแกรมการออกกำลังกายแบบนาฏศิลป์ไทยภาคตะวันออกเฉียงเหนือ "เซ็งอีสาน" ต่อสมรรถภาพทางกายของนักเรียนหญิงในชั้นประถมศึกษา Effects of the Thai Traditional Northeastern Dance "Serng Isan Dance" Exercise Program on Physical Fitness of Female Students in Elementary School

นิพนธ์ฉบับ

Original Article

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บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาผลของโปรแกรมการออกกำลังกายด้วยรำเซ็งอีสาน ที่มีต่อสมรรถภาพทางกายของนักเรียนหญิงในชั้นประถมศึกษา **วิธีการศึกษา:** ตัวอย่างเป็นนักเรียนหญิงของโรงเรียนระดับประถมศึกษาแห่งหนึ่งในจังหวัดอุดรธานีจำนวน 30 คน กลุ่มทดลองได้รับโปรแกรมการออกกำลังกายด้วยรำเซ็งอีสานควบคู่กับกิจกรรมพลศึกษา (15 คน) การฝึกวันละ 60 นาที 3 วันต่อสัปดาห์เป็นเวลา 8 สัปดาห์ ส่วนกลุ่มควบคุมได้รับกิจกรรมพลศึกษาเท่านั้น (15 คน) ประเมินสมรรถภาพทางกายก่อนการฝึกและหลังการฝึก ทดสอบความแตกต่างระหว่างกลุ่มด้วยสถิติ independent t- test และภายในกลุ่มด้วยสถิติ paired t- test กำหนดระดับนัยสำคัญทางสถิติที่ P-value < 0.05 **ผลการศึกษา:** หลังการทดลอง กลุ่มทดลองมีสมรรถภาพทางกายสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติในสามด้านคือ ความยืดหยุ่น ความแข็งแรงและความอดทนของกล้ามเนื้อส่วนล่าง และและความอดทนของระบบหัวใจและหลอดเลือด ส่วนดัชนีมวลกายและความแข็งแรงของกล้ามเนื้อไม่ต่างกัน และในกลุ่มทดลองพบว่าทุกสมรรถนะยกเว้นความแข็งแรงของกล้ามเนื้อที่ดัดขึ้นอย่างมีนัยสำคัญทางสถิติ ส่วนในกลุ่มควบคุมไม่พบการเปลี่ยนแปลงที่มีนัยสำคัญทางสถิติ **สรุป:** โปรแกรมการออกกำลังกายด้วยรำเซ็งอีสาน สามารถพัฒนาความยืดหยุ่นของกล้ามเนื้อ ความแข็งแรง ความอดทนของกล้ามเนื้อส่วนล่าง และความอดทนของระบบไหลเวียนโลหิตของนักเรียนหญิงระดับประถมศึกษาได้

คำสำคัญ: นักเรียนหญิง สมรรถภาพทางกาย โปรแกรมการออกกำลังกายด้วยรำเซ็งอีสาน

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Abstract

Objective: To examine the effects of traditional Thai Northeastern dance "Serng Isan Dance" exercise program on the physical fitness of female students in elementary school. **Methods:** The sample was 30 female students from an elementary school in Udon Thani province. The experimental group (n = 15) was trained with "Serng Isan Dance" exercise program in addition to regular physical education class. Control group (n = 15) attended regular physical education class only. The program session lasted 60 minutes, took 3 sessions per week, for 8 weeks. Students' physical fitness was tested before and after the program. Between-groups differences were tested using independent t-test. Within-group changes were tested using paired t-test. Statistical significance was set at P-value < 0.05. **Results:** After the program, the experimental group had flexibility, lower body muscle strength, and cardiorespiratory endurance significantly higher than the control group. In the experimental group, most fitness measures except hand muscle strength after the program were significantly better than those before the program. **Conclusion:** Traditional Thai northeastern dance "Serng Isan Dance" improved flexibility, muscle strength in lower body, and cardiorespiratory endurance in elementary school female students.

Keywords: female students, physical fitness, Traditional Thai northeastern dance

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Introduction

In schools all over the world, the idea of a "completed education" is becoming more common. Children can learn the skills and tools necessary to increase their physical fitness by focusing on their social, emotional, and physical well-being at the same time. Adolescence transition has been characterized as a crucial stage with long-term effects on a person's health.¹⁻⁴ However, the most marked declines in physical activity (PA) levels have been evidenced from childhood to early adolescence⁵⁻⁸, or childhood to late adolescence.⁹⁻¹¹ Physical inactivity is a pervasive problem causing both critical health issues and placing a huge cost on the global economy.

Children should be encouraged to engage in a variety of exercises to help them develop their physical fitness, including those that improve their body composition, muscle strength and endurance, flexibility, and cardiorespiratory endurance. However, they should not engage in activities that will make their muscles bigger. They have the potential to be harmful to ligaments, bones, muscles, and joints. From this matter, cycling is considered as a moderate exercise. The recommended amount of daily physical activity is 60 minutes of moderate to vigorous activity like swimming or swift walking. Football, swimming, or any other activities that allows children

to use a lot of energy are suggested as intensive exercises that could exhaust them.

Studying Thai dance helps children develop their body naturally. Thai dance is similar to physical movements like walking, running, and jumping that allow children to move body for both small and large muscles from the rhythm. As a result, children became healthier and got balanced body with active and energetic wellness.³²

Traditional Thai northeastern dance or "Serng Isan dance" is one of Thai people traditional arts and cultures. It is an activity that can be applied as an appropriate gesture for exercising with the music rhythm. Thai dance uses more complex postures, and it mainly focuses on the harmony. Serng Isan traditional dance involves many movements like head and trunk rotations, weight shifts, stepping forward, stepping backward, stepping sideward, and standing with one foot in the front with one leg crossing. It is a form that combines the art of dancing with aerobic exercise based on the healthy exercise principles. This type of exercise has low intensity with constant body movements within a specified period followed by a gradual increase in the exercise intensity. Improved muscle strength to support bones and joints while moving leads to higher maximum oxygen uptake, which lowers the risk of fractures and falls.¹²

The purpose of the current study was to investigate the effects of the traditional Thai dance known as the "Serng Isan Dance" on the physical fitness of female elementary school students. The research suggests that physical fitness can improve after 8 weeks of planned exercise.

Methods

In this experimental study, study population was female students from an elementary school in Udon Thani province in academic year 2021. Study sample was those in the study population who met the eligibility. Participants were randomly selected and equally divided into experimental and control groups (15 participants each). The participants were selected using the pair-matched method for comparable characteristics of the two groups. For the experimental group, participants were trained with the traditional Thai northeastern dance "Serng Isan Dance" exercise program and physical education, while those in the control group participated in regular physical education sessions only.

To be eligible, participants had to be 10 – 12 years old, have a low cardiorespiratory fitness (i.e., less than 123 repetitions based on a 3-minute up and down step³⁰), be able to understand instructions of the traditional Thai northeastern dance "Serng Isan Dance" exercise program, be healthy without cardiovascular disease or any muscle injuries, and be willing to participate in the study. However, individuals with recent fractures, neuromuscular problems, infections of the musculoskeletal system, or severe spinal injuries were excluded from the study.

The sample determination was calculated using the software program G power V3.1. The effect size of 0.7 was based on the effects of Thai traditional dance on balance performance in daily life among older women of Noopud et al.³³ With a type I error of 55, and a power of 85%, a sample size of 21 participants was needed. To compensate for a 40% drop-out rate, a total of 30 participants, i.e., 15 participants for each of the two groups, were required.

The experimental intervention

The component of the traditional Thai northeastern dance "Serng Isan dance" exercise program. The program lasted 8 weeks and took 3 days a week (Monday, Wednesday, and Friday). The training session started from warm-up (10 minutes), followed by the training program (i.e., head and trunk rotations, weight shifts, step forward, step backward, step sideward, standing with one foot in front and one leg crossing), exercise with intensity of 60 to 70 % HR_{max} (40 minutes), and a cool-down session (10 minutes). All participants lived with ordinary lifestyles and had usual eating behaviors. All parameters were measured both before and after the eight weeks of the program. For the control group participants, they only participated in the regular physical education sessions. All study outcomes were measured before and after the program.

Ethical approval for participants' protection

The study was approved by the Ethics Committee for Human Study of Rajabhat Udon Thani University (approval number: 0622.7/523). The parents had been notified about the voluntary nature of the study and signed a written consent to allow participants to participate in the research project and their personal information was also recorded.

Data collection procedure

The participants were assessed for their physical fitness including body composition, flexibility, muscle strength, muscle endurance and cardiorespiratory endurance. The double-entry data technique was used to measure the data entry process accuracy. The assessment details of each physical fitness measurement are as follows.

A person's mass (weight in kg) and height (in meter) were used to calculate their body mass index as kg/m^2 which was used to determine their body composition.³⁰

Flexibility was examined by sitting and reaching test. The participants were asked to sit on the floor and bend their body forward to a sliding ruler that measured from -20 to 30 centimeters.³⁰

Muscle strength and endurance were examined by two tests. For the hand grip dynamometer test, participants placed their elbow by their side and held the dynamometer in the hand subject to the testing. If necessary, the dynamometer's handle was adjusted so that the base rested on the first metacarpal (the heel of the palm) and the handle rested on the middle of the four fingers. When ready, the subject squeezed the dynamometer isometrically as hard as they could for about five seconds.³⁰ For the standing board jump, participants stood at the edge of the sandpit and leaped as far forward as they could. The assistant counted the distance from the sandpit's edge to its first point of contact. The best distance after performing the test several times was recorded.

Cardiorespiratory endurance was examined by 3-minute up and down step. The test-takers were instructed to get ready while standing with feet that are roughly hip-width apart. They held the waist with both hands. By raising one leg at a time until the knee-high is parallel to the floor (the hip and knee were at a 90-degree angle), while simultaneously raising the other leg. In one repetition, the participants raised their knees up and down while alternating between right and left sides for three minutes. These steps were repeated.³⁰

Data analysis

Descriptive statistics including frequency with percentage and mean with standard deviation (SD) were used to summarize demographic characteristics of the participants and physical fitness variables. Height, weight, and age between the two groups were compared using independent t test or Mann-Whitney U test, as appropriate. Physical fitness

measures between the two groups were compared both at baseline and after the program were compared using independent t test or Mann-Whitney U test, as appropriate. For within-group changes, physical fitness measures before and after were compared using paired t test or Wilcoxon signed rank test, as appropriate. Statistical significance was set a type I error of 5% or P-value < 0.05. All statistical analyses were performed using the software program SPSS version 21.0.

Results

Of the 30 participants in the experimental and control groups (15 each), their age, weight, and height were not different (Table 1).

Table 1 Demographic characteristics (N = 30).

Demographic characteristics	Mean \pm SD		P-value*
	Experimental group (N = 15)	Control group (N = 15)	
Age (years)	11.33 \pm 0.73	11.07 \pm 0.80	0.346
Weight (Kg)	38.81 \pm 1.24	39.87 \pm 1.69	0.061
Height (m)	139.73 \pm 1.58	140.27 \pm 1.67	0.376

* Independent t test.

Differences in physical fitness measures **between the two groups** were as follows. Before the program (baseline), all physical fitness measures between the two groups were not different (Table 2). After the program (post-test), most measures, except body mass index test and hand muscle strength test, were significantly different. When the experimental group compared with the control group, measures of flexibility (15.87 and 8.2 cm., respectively, P-value < 0.001), standing broad jump (95.47 and 67.67 cm., respectively, P-value = 0.001), and cardiorespiratory fitness test (164.33 and 114.27 repetitions, respectively, P-value < 0.001) in the experimental group were significantly higher than those in the control group.

For **within-group comparisons**, no significant changes were found in the control group. On the other hand, the increases in most measures, except hand muscle strength test, in the experimental group were statistically significant.

Table 2 Physical fitness of the participants (N = 30).

Outcomes	(Mean ± SD)		P-value [†]
	Experimental group (n = 15)	Control group (n = 15)	
Body Mass index test (Kg/m²)			
Baseline	19.87 ± 0.68	20.26 ± 0.86	0.326
Post-test	18.83 ± 2.82	21.53 ± 5.44	0.099
P-value [‡]	0.005	0.163	
Flexibility test (cm.)			
Baseline	10.02 ± 9.14	9.34 ± 8.29	0.793
Post-test	15.87 ± 5.30*#	8.02 ± 5.95	< 0.001
P-value [‡]	< 0.001	0.612	
Hand muscle strength test (kg.)			
Baseline	15.08 ± 4.10	15.84 ± 3.87	0.609
Post-test	16.88 ± 4.05	15.45 ± 3.26	0.296
P-value [‡]	0.092	0.650	
Standing broad jump (cm)			
Baseline	67.07 ± 13.54	68.20 ± 9.54	0.834
Post-test	95.47 ± 4.94*#	67.67 ± 7.76	0.001
P-value [‡]	0.029	0.333	
Cardiorespiratory fitness test (repetition)			
Baseline	109.93 ± 12.96	110.33 ± 10.76	0.927
Post-test	164.33 ± 15.32*#	114.27 ± 13.41	< 0.001
P-value [‡]	< 0.001	0.483	

[†] Independent t-test for group difference.

[‡] paired t test for within-group difference.

Discussions and Conclusion

This experimental study examining benefits of the traditional Thai northeastern dance “Serng Isan Dance” exercise program on physical fitness of female elementary school students. After the 8-week program, flexibility, standing broad jump, and cardiorespiratory fitness were higher in the experimental group when compared with the control group (regular physical education classes). On the other hand, body mass and hand muscle strength test in the experimental group were not different from those in the control group.

Body mass index could not be improved by the 8-week program when compared with regular physical education class. This could be because the moderate-intensity exercise performed for 3 days/week for 8 weeks might be insufficient to achieve significant improvements in BMI. This outcome is consistent with most dance research showing that there was no effect on BMI from an exercise of 2 - 3 days per week for 8 – 12 weeks. Hallage et al also demonstrated that step-aerobic exercise performed three days per week for 12 weeks at a heart rate reserve did not improve body composition.¹⁵ Additionally, Chutimakul et al revealed that Khon exercise had no appreciable impact on body composition when moderate-intensity exercise was performed three days per week for a period of 12 weeks.¹⁶

The “Serng Isan Dance” exercise program resulted in a higher level of flexibility than the regular physical education. The program required the participants to flex their arms and legs, and to bend and twist the body. It is the movement of the joints in a full range of motion. The program could thus better the development of muscle flexibility in female students. The movement of the body starts by stretching the muscles, increasing the tightness of the muscles, stimulating the receptors for changes in the length of the Golgi tendon organ to transmit nerve impulses, inhibiting the activity of the alpha motor neuron. As a result, the muscles respond by reducing the tension of the muscle fibers, causing the muscles to grow longer coupled with the constant movement of the joints during exercise, and the tightness and stretching of the muscles around the joints are reduced resulting in increased range of motion of the joint.¹⁷ The Serng Isan dance is a dance posture that has a direction of movement and posture designed according to the principles of stretching, both dynamic and static stretching. Muscles increase the range of motion of the joints so that they can move at a full range of motion and have an increased angle of motion.¹⁸ When the range of motion is fully active, it indicates muscle activity effective space. The results are consistent with Thai dance exercises where twisting, turning, and moving the joints can improve muscle flexibility.^{16,18,21}

In terms of muscle strength as measured by the standing broad jump, this study found a much higher strength associated with the program. The “Serng Isan Dance” exercise program required the lower extremities movements that the participants need to stand with one leg, thus the increase in the impact force and muscle contraction. Our results showed greater improvements in leg muscle strength from the experimental group. Several studies indicated that an exercise that uses resistance gives pressure on the skeletal muscles.³¹ For skeletal muscles to contract, it needs transforming chemical energy into mechanical energy, which is used to create force, tension, and contraction. This kind of exercise causes the muscles to grow stronger. The outcomes were consistent with aerobic exercise training by applied dance, which was done for 30 minutes, three times per week.

However, arm strength as measured by the hand muscle strength test was not different from that with the regular physical education class even though the “Serng Isan Dance” exercise program involved movements of the arm muscles. It could be because the arm muscle movements in the “Serng

Isan Dance” exercise program were less effective in terms of arm muscle strength and endurance. The strength and endurance of the arm muscles remained unchanged after the experiment, which may be the result of insufficient intensity of the work performed by the muscles to allow for adaptation. Previous research on dance exercise found that while dancing increased the strength of the leg muscles, it had no effect on the arm muscles and leg muscles contract producing more force (or torque) of the leg muscles than arm muscles as a result. So, only the muscles in the legs experience changes in muscle strength.¹⁹⁻²¹

In terms of cardiorespiratory, the “Serng Isan dance” exercise program offered a higher endurance than the regular physical education class. This confirmed that a moderate intensity dance exercise of 30 minutes per session, three sessions per week, for 8 weeks that allows big muscles to work continuously and rhythmically is cardiorespiratory beneficial. Several studies indicated that improved cardiorespiratory endurance is one of the key indicators of the ability to perform activities of daily living. Appropriate exercise allows improvements in the cardiorespiratory system, which helps develop and maintain fitness levels.²² By the mechanism of action of the circulatory and breathing systems that respond to exercise, they begin with the heart pumping blood at a higher compression rate to deliver oxygen to the muscles for the use in the process of generating energy. The carbon dioxide produced by the metabolism of the muscles was eliminated through the veins along with the work of additional lungs breathing and exchanging gas in the alveoli. Oxygen enters the body through the capillaries and transported through the arteries along with the release of carbon dioxide from the veins increased effectiveness of breathing out air.¹⁷ The outcomes were in line with aerobic exercise, such as exercising for 50 minutes at a heart rate of 50 to 70 percent, three times per week, for eight weeks. Other studies also demonstrated that the exercise resulted in significantly better cardiorespiratory endurance.²³⁻²⁹

Elementary school students can benefit from applying Isan dancing exercises because they will develop their physical fitness more effectively with their early development. Isan exercise, a type of activity that has beneficial effects on the body and mind and makes people who exercise feel connected to the local identity of the community, should therefore be promoted as a form of exercise. Isan exercise is

a type of activity that is unique to Thailand's northeastern region.

For practical purposes, elementary school students should be open for exercise options not only this “Serng Isan dance” exercise program. Other exercise programs based on local performing arts should be studied and promoted.

Our study has certain limitations. Since we did not control the two groups to behave comparably regarding dietary habits, sleeping, and other intensive physical activities, these uncontrolled behaviors could confound the study outcomes. Interpretation of the findings should be somewhat cautious.

In conclusion, the 8-week traditional Thai northeastern “Serng Isan dance” exercise program improved lower back flexibility, muscle strength and muscle endurance in the lower body, and cardiorespiratory endurance compared with regular physical education class among elementary school female students.

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