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ORIGINAL ARTICLE

ผลของการฝึกเต้นรองเง็งแบบประยุกต์ต่อการทรงตัวในผู้สูงอายุในชุมชน

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บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาเปรียบเทียบการทรงตัวแบบไดนามิกระหว่างกลุ่มที่ได้รับการรักษาเชิงอนุรักษ์และกลุ่มที่ได้รับการฝึกเต้นรองเง็งแบบประยุกต์ในผู้สูงอายุที่อาศัยอยู่ในชุมชน วิธีการ: ผู้สูงอายุที่อาศัยอยู่ในชุมชนจำนวน 36 คน ได้รับการสุ่มแบ่งออกเป็น 2 กลุ่ม คือ กลุ่มที่ได้รับการรักษาเชิงอนุรักษ์ 18 คน และ อีก 18 คนอยู่ในกลุ่มฝึกเต้นรองเง็งแบบประยุกต์ โดยผู้เข้าร่วมที่ได้รับการฝึกเต้นรองเง็งแบบประยุกต์จะได้รับโปรแกรมท่าเต้นรองเง็งแบบประยุกต์ฝึก 3 ครั้ง/ สัปดาห์ จำนวน 3 สัปดาห์ โดยตัวแปรหลัก คือ timed up and go test และแบบประเมิน dynamic gait index โดยจะวัดที่ก่อนการฝึกและวัดซ้ำอีกครั้งที่ 2 สัปดาห์และที่ 3 สัปดาห์ ผลการศึกษา: จากผลการศึกษาแสดงให้เห็นว่ามีความแตกต่างอย่างมีนัยสำคัญทางสถิติเมื่อเปรียบเทียบระหว่างก่อนและหลังการฝึกที่ 3 สัปดาห์ในทั้งสองกลุ่ม โดยมีการใช้เวลาที่น้อยลงเมื่อประเมินโดยใช้ timed up and go test และมีการเพิ่มขึ้นของคะแนนในแบบประเมิน dynamic gait index ในทั้งสองกลุ่ม แต่อย่างไรก็ตามเมื่อเปรียบเทียบระหว่างกลุ่มก็พบความแตกต่างอย่างมีนัยสำคัญในตัวแปร time up and go test (p-value= 0.015) แต่ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติในตัวแปร dynamic gait index (p-value= 0.607) สรุปการศึกษา: การศึกษานี้แสดงให้เห็นการว่าฝึกเต้นรองเง็งแบบประยุกต์ให้ผลในการปรับปรุงการทรงตัวมากกว่าการฝึกเชิงอนุรักษ์

คำสำคัญ: รองเง็งแบบประยุกต์, ผู้สูงอายุในชุมชน, Dynamic balance, Time up and go test, Dynamic gait index

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ORIGINAL ARTICLE

Effect of modified Ronggeng practice on dynamic balance in community-dwelling elderly people

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Abstract

Objective of this study is to compare the dynamic balance between a conventional group and a modified Ronggeng dance group in community-dwelling elderly people. Thirty-six community-dwelling elderly people were randomized into two groups, 18 elderly people in a conventional group and 18 elderly people in a modified Ronggeng dance group. The modified Ronggeng dance group were additionally given a modified Ronggeng dance program three times per week for 3 weeks. The main outcome measurements were time up and go test and dynamic gait index, all of which were measured before training the program and re-measured at 2 weeks and 3 weeks. The results showed a significant difference between before training and post-training at 3 weeks in both groups. There was a decrease in the timed up and go test and increased scores in the dynamic gait index in both groups. However, when compare between groups, there was a significant difference in timed up and go test (*p*-value = 0.015) but no significant difference in the dynamic gait index (*p*-vaue = 0.607). In conclusion, elderly receiving additional the modified Ronggeng dance in the present study showed more improvement than elderly receiving conventional training.

Keywords: Modified Ronggeng dance, Community-dwelling elderly people, Dynamic balance, Time up and go test, Dynamic gait index

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Introduction

The number of persons over the age of 60 years has increased since the turn of the century which brings to aging society. Based on data from the survey of elderly in Thailand, the number of elderly individuals is estimated to be more than 10.7 million in 2015[1]. This is a result of advances in medical treatment and health policies which result in elderly individuals being both more numerous and more likely to live longer.

The elderly have changes in many physiological systems from the degeneration muscle strength and endurance, proprioception, flexibility, control of movement, physical endurance, and vestibular function[2]. So, it can effect to balance that leads to fall.

Falls is one of the main problems of elderly individuals[3]. In Thailand, one study found that almost 20% of elderly individuals had a history of at least one fall in the previous six months[4]. Falling causes injuries and had to be admitted to hospital and died a short time later[5]. Furthermore, elderly people who have had a fall can lose the ability to perform the normal activities of daily living, and the fear of falling can have impacts on not only himself or herself, but his or her family and society[4, 6]. So, falls in the elderly impacted to quality of life who are associated.
Exercise is recommended as one way to help to improve balance and prevent falls in the elderly individuals[7]. There are many types of exercise such as resistance, endurance, balance, aquatic, and feedback training. In the elderly, exercise should focus on balance and coordination training with specific attention to the large muscles in both upper and lower limbs which contract and relax continuously through the day[8], functioning to maintain stability and simultaneously e.g. Ronggeng dance

The Ronggeng dance is a native folk art in southern Thailand which consists of a series of slow, continuous movements of every body part. It involves a step forward, a step backward with one leg stand together with the movement of the arms to the beat of the music at the same time. The Ronggeng dance is a type of non-vigorous and gentle movement. Moreover, Ronggeng movements incorporate elements of strengthening in the upper and lower limbs and trunk, balance, postural alignment, functional coordination of the muscles and nervous system and concentration. However some Ronngeng dance gestures are difficult in the elderly. So, this study applied some gestures to appropriate for the community dwelling elderly. To date there has been no studies on the effects of Ronggeng dance on dynamic balance. Thus, this study was undertaken to study the effects of modified Ronggeng dance on dynamic balance in elderly people.

Materials and methods

Inclusion criteria

Thirty-six people were active volunteers which were recruited from the community of Phattalung in southern Thailand between Septembers and October 2016. The inclusion criteria were: 1) age ranges from 60 to 75 years old, 2) ability to communicate and follow instructions, 3) ability to independently walk without a walking aid, and. A potential participant was excluded if they had any of the following 10 conditions: 1) having had a bone fracture in the previous 6 months, 2) having had a fall in the

previous 6 months, 3) having participated in an exercise program that influences balance, e.g. Tai chi, Chi-gong, or Yoga, and Ronggeng dance in the previous 6 months, 4) dynamic gait index score of less than 19, 5) timed up and go test score of more than 20 seconds, 6) having cognitive impairment as assessed by a Mini Mental State Examination-Thai (MMSE-Thai) score <24, 7) having knee osteoarthritis as assessed by an Oxford Knee Score <20, 8) having a history of vertigo, 9) having osteoporosis or a risk of osteoporosis score <-4, or 10) having visual problem that could not be corrected with eyeglasses. After that, all participants picked up a paper in the sealed envelope which were allocated into either the modified Ronggeng dance (n=18) or the control (n=18) group. This study was approved by the Human Research Ethics Committee of the Faculty of Medicine of Prince of Songkla University (Rec.56-433-11-2). A written description of the study and informed consent was signed before starting the program.

Assessment

All participants were assessed and trained at the Public Health Center, Phattalung, Thailand. Participants completed a health status questionnaire providing information on age, gender, height, weight, marital status, residential status, medical history, current coexisting medical conditions, self-reported history of imbalance, and use of prescription medications. To evaluate the cognitive functions and severity of knee osteoarthritis and/or osteoporosis, we used the Mini–Mental State Examination: Thai version (MMSE–Thai 2002), Oxford Knee Score, and Osteoporosis Self-Assessment Tool for Asians (OSTA) index, respectively. This information was used to characterize the demographics and health status of the subjects participating in the study.

All participants was assessed by community physical therapists who have experienced more than 20 years. Intra-rater in this study of TUG and DGI are 0.98 and 0.97. All participants were assessed using the timed up and go test and the dynamic gait index before starting the program and re-measured at 2 weeks and 3 weeks.

This study used the timed up and go test, which was developed originally as a clinical measure of balance in elderly people. A 3-m distance was marked off on the floor in front of a firm chair with arms, with a large cone placed on a marker at the end of the 3 m. The test began with each participant sitting, back against the chair, arms resting on the lap, and feet just behind the distance-marker on the floor. The participant was instructed as follows: "On the word 'go,' stand up, walk a distance of 3 m, turn, walk back to the chair, and sit down." They were informed that the trial would be timed and the time recorded in seconds. Timing began on the word "go" and ended when the participant's back was resting against the chair upon returning. During the test, the participant wore their routine shoes. No physical assistance was permitted. Data obtained during 3 recorded trials were averaged for use in data analysis.

The dynamic gait index was used to assess balance during various gait functions. A 6-m distance was marked off on the floor. The test has been shown to have a very good intrarater and interrater reliability for single items and total score[9]. It is comprised of 8 different gait tasks including gait on level surface, gait while changing gait velocities, gait with vertical or horizontal head

turns, gait and pivot turns, stepping over and around obstacles, and walking up and down stairs. Each participant's performance of each test item was rated on a four-point ordinal scale, ranging from 0-3 scores with "0" indicating the lowest level of function and "3" the highest level of function. The maximum total score was 24 points. The order of the testing is timed up and go test and followed with dynamic gait index. Participants could rest between testing if tired. This study blinded assessor and participants.

Intervention

The participants in both group were given information about how to prevent falling, general exercise and a logbook to record their normal daily living activities. Whereas, the participants in the modified Ronggeng dance group received additional training modified Ronggeng dance program by researchers for 30 minutes 3 times per week for 3 weeks.

The modified Ronggeng dance program was modified to be suitable for elderly individuals. It began with easily and increase difficulty in every week. The modified Ronggeng dance consists of walking forward 4 steps, walking backward 4 steps, rotating around themself, rotating around another couple, and 12 steps alternating between the two legs. Before and after each training session, the participants underwent a short program of stretching for 10 minutes to loosen the muscles in the back, quadriceps, hamstrings, gluteus maximus, and tensor fascia latae muscles.

Data analysis

The sample size for this study was calculated by the following equation:

$$N = \frac{2(z_\alpha + z_\beta)^2(1+(n-1)\rho)}{n\left[\frac{\mu 1-\mu 2}{\sigma}\right]^2}$$

$$N = \frac{2(1.96+0.842)^2(1+(3-1)0.6)}{3\left[\frac{21-24}{4}\right]^2}$$

$$N = 15$$

Therefore, the sample size of this study was calculated by the dynamic gait index was 15 participants per group. A total of eighteen participants per group was used for the comparisons in the study. However, this was still a small number of participants, so non-parametric statistics were used to compare the variables within and between groups. Statistical significance for all analyses was set at *p*-value <0.05.

All data are given as median and interquartile range (from the 25th to the 75th percentile) except gender variable presents with frequency counts and percentage. Comparisons of demographic and clinical characteristics between groups were analyzed by the Mann-Whitney U test and chi-square test. Repeated measurement ANOVA was used to compare the timed up and go test and dynamic gait index at before training the program and re-measured 2 weeks and 3 weeks within each group. In order to investigate whether the control or the modified Ronggeng dance group was superior, data were compared using the Mann-Whitney U test.

Results

Thirty-six elderly individuals participated in this study. The median age of the control group was 65.0 years, and that of the modified Ronggeng dance group was 65.50 years. The number of male of the control group was 6 people, and that of the modified Ronggeng dance group was 7 people.

The median height, weight, and BMI of the control group were 158.00 cm, 57.50 kg, and 22.67 kg/m^2, respectively, and those of the modified Ronggeng dance group were 155.50 cm, 56.50 kg, and 24.23 kg/m^2. The severity of knee osteoarthritis and/or osteoporosis assessed by oxford knee score, and osteoporosis self-assessment tool for ASIANS index in the control group were 43.50 and -2.00, respectively, and those of the modified Ronggeng dance group were 45.50, -2.40. The control group scored a median of 26.50 points in the Mini – Mental State Examination: Thai version (MMSE– Thai 2002) and the modified Ronggeng dance group scored a median of 28.00 points **(Table 1)**. All values were median and interquartile range except gender shows frequency counts and percentage.

Table 1. Clinical characteristics of the participants

Variables/ group	Control group (n=18)	Modified Ronggeng practice group (n=18)	*p*-value
Age[a]	65.00 (63.00, 72.25)	65.50 (61.50, 70.00)	0.423
Gender (male)[b]	6 (33.33)	7 (38.89)	0.877
Height[a]	158.00 (154.50, 160.50)	155.50 (149.88, 157.25)	0.215
Weight[a]	57.50 (54.00, 59.75)	56.50 (53.00, 60.25)	0.821
BMI[a]	22.67 (21.04, 23.92)	24.23 (22.96, 25.49)	0.418
Oxford knee score[a]	43.50 (41.25, 47.00)	45.50 (44.75, 47.00)	0.058
OSTA[a]	-2.00 (-3.60, -1.10)	-2.40 (-3.30, -0.70)	0.765
MMSE[a]	26.50 (24.75, 29.00)	28.00 (24.00, 28.00)	0.991

[a]Median (first to third quartile), test statistically by the Mann-Whitney U test [b]Frequency counts (percentage), test statically by the Chi-square test

Table 2. Comparisons of timed up and go test and dynamic gait index scores at before training and re-measured 2 week and 3 weeks in the control and modified Ronggeng dance groups

Variables/ group	Control group (n=18)			Modified Ronggeng dance group (n=18)		
	Before	2nd week	3rd week	Before	2nd week	3rd week
Timed up and Go test (seconds)	8.70 (7.40, 9.45)	8.72 (7.36, 9.65)	8.58 (7.54, 9.10)	8.09 (7.62, 8.69)	7.31** (6.79, 7.91)	6.57** (6.91, 7.58)
Dynamic gait index (score)	19.00 (19.00,19.25)	19.00 (19.00, 21.00)	20.00** (19.00,21.00)	19.00 (19.00, 20.00)	22.00 ** (21.00,23.00)	23.00 ** (23.00,23.00)

Median (first to third quartile), ***p*<0.01 test statistically by repeated measurement ANOVA

Table 2 presents comparisons of the timed up and go test and dynamic gait index score before training and re-measured at 2 weeks and 3 weeks. The control group demonstrated no improvement in the timed up and go test at 2 weeks (p=0.647) and 3 weeks (p=0.351) but partial improvement in the dynamic gait index score at 3 weeks (p=0.003). There was significant improvement ($p < 0.05$) in both timed up and go test at 2 weeks (p=0.010) and 3 weeks (p=0.001) and dynamic gait index at 2 weeks (p=0.001) and at 3 weeks (p=0.001) in the modified Ronggeng dance group.

Table 3: Comparisons of timed up and go test and dynamic gait index scores between the control and modified Ronggeng dance groups at before training and re-measured 2 weeks and 3 week

Variables/ training	Timed up and go test (seconds)			Dynamic gait index (scores)		
	Control group (n=18)	Modified Ronggeng dance group (n=18)	*p*-value	Control group (n=18)	Modified Ronggeng dance group (n=18)	*p*-value
Before	8.70 (7.40, 9.45)	8.09 (7.62, 8.69)	0.257	19.00 (19.00, 19.25)	19.00 (19.00, 20.00)	0.326
2nd week	8.72 (7.36, 9.65)**	7.31 (6.79, 7.91)	0.006**	19.00 (19.00, 21.00)**	22.00 (21.00, 23.00)	0.001**
3rd week	8.58 (7.54, 9.10)**	6.57 (6.91, 7.58)	0.001**	20.00 (19.00, 21.00)**	23.00 (23.00, 23.00)	0.001**

Median (first to third quartile), *p<0.05, **p<0.01 test statistically by Mann-Whittney U test

Table 3 presents comparisons of the timed up and go test and dynamic gait index scores between the control and the modified Ronggeng dance groups. The results show significant differences in the timed up and go test (p=0.006) and dynamic gait index (p=0.001) scores at re-measured 2 weeks, and significant differences in both timed up and go test (p=0.001) and dynamic gait index scores (p=0.001) at re-measured 3 weeks.

Discussion

The present study sought to investigate the effects of 3 weeks of modified Ronggeng dance training on dynamic balance in community-dwelling elderly people by using functional evaluation tools. According to the results, the control group showed significant improvement only in dynamic gait index scores, while the modified Ronggeng dance group showed significant improvement in both timed up and go test and the dynamic gait index. Comparisons of the timed up and go test and scores between the two groups showed significant differences in dynamic gait index scores at both re-measured 2 weeks and 3 weeks.

The timed up and go test is widely used for assessing balance and risk of falls in community dwelling older people [10]. A study by Shummway Cook [11] found that a cut off score of falls was 13.5 seconds. In the present study, all participants used less than 13.5 seconds. Thus, the participants in this study tended to fall less frequently than elderly individuals. Although the participants didn't significantly improve in the control group, they still tended to show improved balance after

their education, indicating that even an educational program about preventing falling and the usefulness of general exercise is beneficial for these individuals. In addition, the participants enrolled in this study were active volunteer individuals. Furthermore, the timed up and go test increased at re-measured 2 weeks in the modified Ronggeng dance group. This improvement was probably due to the difficulty of the modified Ronngeng dance. The modified Ronngeng dance, the participants needed to stay upright with continuous movements of the legs, sometimes standing on one leg only, and with continuous movement of the upper limbs at the same time. This kind of exercise can help improved both coordination and dynamic balance. These results are consistent with the results of a study conducted by Roberson and colleagues [12] who reported that 15 healthy elderly people who performed Tai chi for 60 minutes at a time, 2 times per week for 10 weeks, had improved health-related quality of life, functional mobility, and balance performance. Furthermore, a study by Konig and colleagues [13] found 27 elderly people who trained in Tai chi one hour per session 2 sessions per week for 6 months had improved timed up and go test and berg balance scale scores. They concluded that tai chi practice can improve balance in elderly people.

Dynamic gait index is used to evaluate an individual's ability to dynamically balance while walking in the presence of external demands. In our study, although there was improvement in total score in both group, the control group demonstrated an average improvement from before training to re-measure of training 1.5 points on the dynamic gait index, while the modified Ronngeng practice group had a change of about 4 points (a change of 2.9 is considered the minimum detectable change) [14]. The control group demonstrated no change in clinic but a quantifiable statistical change, while the modified Ronggeng dance group demonstrated change both statistically and clinically. The clinical change in the control group because of the program in control group cannot challenge and improper to improving dynamic balance. The changing dynamic gait index in the modified Ronggeng dance group was caused by modified Ronggeng dance associated with balance and confidence to do the activity. Furthermore, some Ronggeng gestures are similar to some items in the dynamic gait index test, e.g. self-rotation. Therefore, it may help to improve score of dynamic gait index. These results are consistent with the results of a study conducted by Li and colleague [15] who studied 256 physically inactive older adults. After tai chi training for 40 -50 minutes for 6 months, they found that the tai chi group demonstrated more improvement than a stretching group in berg balance scale, dynamic gait index, and functional reach.

To the authors' knowledge, this is the first study about a modified Ronggeng dance which proved to improve dynamic balance. The results indicate that modified Ronggeng practice could be a useful option for improving balance and functional mobility in elderly individuals. It also has the advantage of not requiring specialized equipment or advanced specialist training for the instructor. Furthermore, participants in the modified Ronggeng dance group showed increased attention during their exercise, decreased postural sway, and less fear of falling after their training,.

Further studies are now recommended to examine other factors which play a role in the effectiveness of this type of intervention for elderly individuals. In addition, other parameters should be investigated, such as muscle strength, muscle endurance, cardiovascular fitness, static balance, and quality of life. Additionally, such a study should include comparing the effectiveness of modified Ronggeng with other exercise-type training such as tai-chi or strength or aerobic training.

This study demonstrated that 3 weeks of modified Ronggeng dance can improve dynamic balance in elderly people. None of the participants experienced a fall during the training program, indicating that the study protocol was safe and effective for community dwelling individuals

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