THE COMPARISON OF BALANCE PERFORMANCE IN THE ELDERLY WITH TRADITIONAL THAI DANCE AND STRETCHING EXERCISE IN CHIANG RAI

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Abstract
The purpose of this study was to compare the balance performance in the elderly with Traditional Thai dance and stretching exercise in Chiang rai. Thirty two healthy volunteers (Heun & Hein) aged 64.35± 3.98 years were recruited. Factor of age, gender and scoring of Mini-Mental State Examination (MMSE-Thai) were used in stratified randomization. They were randomly divided into Traditional Thai dance (n=16) and stretching exercise (n=16). The Traditional Thai dance group performed exercise training program for 30 minutes, whereas the stretching exercise group had stretching exercise only for 30 minutes. Berg balance scale (BBS) and Timed up and go test (TUGT) were measured before and after the 8 weeks exercise training (trained 3 times/wk). Data was statistically analyzed by independent t-Test using SPSS program version 20.0 with p-value of 0.05. The results showed that the effect of Traditional Thai dance exercise on BBS and TUGT under the experimental group had a significant increase after 8-weeks training (p<0.05) and significantly greater than the control group (p<0.05). This study demonstrated that the aerobic Traditional Thai dance exercise had a significant improvement in balance performance greater than the stretching exercise alone. This finding could guide for application in exercise program for improving the balance performance in the elderly.

Keywords: balance performance, elderly, Traditional Thai dance

Introduction:
The world health organization (WHO) defines the elderly in Thailand as people aged over 60 years.(Singh & Bajorek, 2014) In the growing population of older people, falling is a common problem. Approximately 30% of older adults over 65 years of age, experience a fall each year. (Coelho, Fernandes, Santos, Paúl, & Fernandes, 2016) Individuals who require more time to initiate and execute a step to avoid a threat or to recover postural balance, either during walking or performing postural transitions, may be at greater risk of falling.(Lelard & Ahmaidi, 2015) The physical status of the elderly is generally vulnerable and at risk falling and balance impairment due to underlying disease such as hypertension, diabetes mellitus, and osteoporosis. There are several effects of exercise on physical functions, including improvement of disability conditions, 2 reduction of blood pressure and cholesterol levels,3 positive effects on cardiovascular physiology, pain control, quality of life,4–7 and fall prevention.(Hayashi et al., 2012)

Common tasks of daily life such as walking are dependent on both sensorimotor processes and higher level cognitive functions (Lelard & Ahmaidi, 2015).Thus, the accurate foot placement onto a footpath for instance, requires not only the appropriate planning and execution of the movement. It also requires visual scanning, the extraction of visual information from the environment, and cognitive skills related to so-called executive functioning process (Mohapatra & Aruin, 2013). The older adults prone to falling when taught to step into a target location(Mohapatra & Aruin, 2013).

Presently, there are many types of exercise for the elderly; for example aerobic exercise, stretching exercise, tai-chi, and club dancing exercise. Most of these are other nations’
cultural-based exercises. Exercise interventions that incorporate exercise to improve muscle strength and postural control have been often recommended for older adults (Pluchino, Lee, Asfour, Roos, & Signorile, 2012). The enhancement of health and exercise of the elderly should be adjusted according to their lifestyles, their cultural context, traditions, way of living, values, and needs so that the exercise will be included as part of habitual activities performed correctly, individually or as a group, and in a sustainable and suitable manner (Lin, Hwang, Wang, Chang, & Wolf, 2006; Josephs, Pratt, Calk Meadows, Thurmond, & Wagner). A recent review also showed that dancing significantly improves aerobic power, lower body muscle endurance, strength and flexibility, balance, agility, and gait through dancing in the elderly (Sherrington & Tiedemann, 2015). Thai dancing is traditional in the art and culture of the Thai people. It is described as a slow continuous dance with Thai classical music with consistent rhythms. The music and rhythm of Thai dance is quite similar to tai chi, but Thai dance has more complex posture and focuses on coordination. It is considered as an aerobic dance and has small loads on the knees and ankles. Therefore, it may be suitable for the elderly due to slow rhythm and low joint loads on the lower body. Thai dancing can be incorporated into the community’s cultural context, daily life, and the needs of the elderly, which can result in increased/sustained physical capability and quality of life of the elderly. This study evaluated the effects of classical Thai dance on physical ability of the elderly using recently aged adults as subjects.

Methodology:

Participants
The study was designed as a prospective randomized controlled trial and was carried out from January to June 2016. Participants were recruited from Chiang rai, Thailand. The study protocol was approved by the Mae Fah Luang ethics committee (REH-58082). A measurements and training were performed in suitable locations at the community. Thirty-two (68%) out of 47 persons were interested in participating and were assessed for eligibility. Participants were included if they were older than 60 years, had score of at least 22 points on the Mini-Mental State Examination (MMSE) (32), were able to walk for at least six meters with or without the need for a walking aid, and were free of rapidly progressive or terminal illness, they were excluded if a severe impairment of vision would impede to see demonstrator for the intervention and had exercised during the past 2 weeks.

Intervention
After the participants signed informed consents, they were randomly divided into a traditional Thai dance group and stretching group. The traditional Thai dance group performed a 30-minutes, three time per week for a total of 8 weeks. The stretching group received instructions on general stretching exercise in daily life and all participants were asked to do these exercises for 8 weeks. Participants were able to withdraw from the study at any time.

Intervention: traditional Thai-dance exercise
The standard traditional Thai dance that was used was composed of songs and postures. Experts in traditional Thai dance trained the volunteers three times per week for a month and then became the traditional Thai dance leader to facilitate the intervention study. The leader and physical therapist took-care all participants during the intervention. All participants performed traditional Thai dance together under observation and care from the leader and physical therapist.

The program for traditional Thai dance included 5 minutes for warming up or stretching of muscle, traditional Thai dance for 20 minutes and then 5 minutes for cooling down. The frequency of exercising was 3 times a week for 8 week, 24 times in total.
Outcomes
The primary outcomes of the study were in balance performance, Berg balance scale (BBS) and Timed up and go test (TUGT). All the tests were conducted by the same physical therapist for each test to obtain test validity. The therapists were blinded to the subject’s group. All measurements were done at baseline and the end of the study. Other measurements were weight, height, body mass index, heart rate (HR) and blood pressure (BP). The measurement of HR and BP was done after 20 minutes of rest in a calm environment. All baseline characteristics were recorded before the study intervention. Details of each physical performance are provided below.

Berg balance scale (BBS)
The BBS consists of 14 items that are scored on a scale of 0 to 4. A score of 0 is given if the participant is unable to do the task, and a score of 4 is given if the participant is able to complete the task based on the criterion that has been assigned to do it. The maximum total score on the test is 56. The items include simple mobility task (eg., transfers, standing unsupported, sit-to-stand) and more difficult tasks (eg., tandem standing, turning 360°, single-leg stance)(Lelard & Ahmaidi, 2015).

Timed Up & Go Test (TUG)
The TUG measures the time it takes a participant to stand up from an armchair, walk a distance of 3 meters, turn, walk back to the chair, and sit down. It was developed originally as a clinical measure of balance in elderly people and was scored on an ordinal scale of 1 to 5 based on an observer’s perception of the performer’s risk of falling during the test. Podsiadlo and Richardson modified the original test by timing the task (rather than scoring it qualitatively) and proposed its use as a short test of basic mobility skills for frail community-dwelling elderly(Lelard & Ahmaidi, 2015; Shumway-Cook, Brauer, & Woollacott, 2000).

Sample size calculation
The primary outcome in this study was the TUG. The sample size was calculated based on a previous study. An 8-week aerobic dance exercise improved balance performance with the effect size of 1.009 and the standard deviation of 5.36 in the intervention group compared with the control group. Aerobic dance exercise may improve the TUG by mean difference of 0.8 (80%) with 80% power at alpha level of 0.05 and a dropout rate of 10%, a sample size of 15, subjects in each group (30 subjects in total). Due to overwhelming responses from the social centers, a total of 32 subjects or 16 subjects per group were enrolled(Thiamwong & Suwanno, 2014).

Ethics approval
This research was approved by the human research Ethics Committee, Mae Fah Luang University based on the Declaration of Helsinki and Good Clinical Practices (ICHGCP) Number (REH-58082).

Statistical analysis
Continuous variables were expressed as mean ± standard deviation (SD). The pair t-test was used to determine all outcome variables between the baseline and the end of study in each group. Analyses were performed with SPSS 20.0. a p-value < 0.05 was considered statistically significant.

Results
A total of 32 participants (mean ± SD) age 63.90±1.55 years) received the full allocated intervention. Detailed information on subjects’ recruitment and reasons for loss are presented in the flow chart (Figure 1). Table 1 shows demographic and clinical characteristics of the sample. No significant difference at baseline, neither in demographic nor in the outcome measurements, were observed between the groups. No subjects manifested a severe cognitive impairment.
**Berg balance scale (BBS)**
A summary of the BBS is provided in Figure 2. The data of 32 participants were collected. Between-group comparisons resulted in greater significant differences of balance performance post-training ($P=0.000$). Within-group comparison result in traditional Thai dance and stretching groups were a significant improvement in total score post-training ($P=0.000$, $P=0.002$)(Table 2).

**Timed Up & Go Test (TUG)**
The data of 32 participants were collected for the TUG. The detailed resulted of the timing of TUG is summarized in Figure 3. Within-group differences in traditional Thai dance and stretching groups were observed in the timing of balance performance ($P=0.009$, $P=0.013$). There was no But not statistically significantly difference between groups (Table 2).

**Figure 1** The study flow chart.

47 Participants

Enrolled and randomized n=38

Baseline measurement
Age, weight, height and MMSE

Group 1: Traditional Thai dance (n=19)

Group 2: Stretching exercise (n=19)

Pre-training measurement
- Berg balance scale
- Time Up & Go Test

Training program
3 time3/wk, 8 weeks both groups

Post-training measurement
- Berg balance scale
- Time Up & Go Test

Withdrawal from training program
Group 1: Traditional Thai dance (n=3)
Group 2: Stretching exercise (n=3)

(They could not perform training program more than 80% of training in 8 weeks.)
Table 1 Baseline characteristics of subjects (mean ± standard deviation)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Traditional Thai Dance Group (n=16)</th>
<th>Stretching Group (n=16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>63.56±0.89</td>
<td>64.25±2.21</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>53.67±4.11</td>
<td>55.21±1.25</td>
</tr>
<tr>
<td>Height (m)</td>
<td>1.51±0.05</td>
<td>1.54±0.13</td>
</tr>
<tr>
<td>BMI</td>
<td>19.15±2.49</td>
<td>19.21±2.46</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>128.13±9.98</td>
<td>135.50±9.25</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>85.88±6.5</td>
<td>86.63±8.08</td>
</tr>
</tbody>
</table>

Figure 2 Berg balance scale of traditional Thai dance group and stretching group compare between pre and post training 8 weeks.

The symbol # represents statistically significant difference (P<0.05) between pre and post training. * represents statistically significant difference (P=0.000) between the two groups.

Figure 3 Time Up & Go Test of traditional Thai dance group and stretching group compare between pre and post training 8 weeks.

The symbol # represents statistically significant difference (P<0.05) between pre and post training.
Discussion and Conclusion:
This trial was designed to test whether an eight-week traditional Thai dance, that included a warm up period, exercise period, and cool down period would lead to greater changes in measures of balance performance in elderly, compared to stretching exercise alone. Although both groups attained improvements in balance performance and were able to reduce their concerns about falling, the results suggested positive effects in favor of the traditional Thai dance. The finding of this study supports the notion that it is advantageous to combine physical training and traditional culture in to clinical practice. The combination seems to have a positive influence on older adult’s movement abilities especially walking and turn around in comparison to more general exercise forms(Cruz-Díaz et al., 2015; Sherrington & Tiedemann, 2015).
The most prominent differences between the training groups were observable in the timing of TUG. Demonstrated significant positive within-group changes of several timing of walking. This merely confirms findings from a systematic review that a strength and balance exercise regimen is able to preserve or improve walking abilities, even in advanced age.(Lelard & Ahmaidi, 2015) The goal of this study, however, was to improve balance performance for walking in community. The results of previous studies with similar groups, which were performing Tai-chi exercise training complemented with functional balance exercise, revealed improvement of balance performance on both variable (BBS,TUG). (Barcelos-Ferreira, Yoshio Nakano, Steffens, & Bottino, 2013). Daily activities pose high cognitive demands and safe walking should be practicable also under cognitive distractive or otherwise challenging conditions. The results of the BBG show significant positive within-group differences for most gait step also in the stepping up to stair and turning around conditions normal cog and fastcog, thus confirming finding from previous studies with similar results for dual task related costs (de Souza Santos, Dantas, & Moreira, 2011). Furthermore, significant between-group differences in the traditional Thai dance were observed for balance performance. In the present study, the positive effect on timing of TUG was found in the traditional Thai dance group. Thus this substantiates the hypothesis that an additional traditional Thai dance challenge should be preferably part of a training program aiming to improve physical functioning in older adults, especially under dynamic standing balance condition.
The reason to use a traditional Thai dance in general, is mainly based on the findings of a systematic review (Lelard & Ahmaidi, 2015). It is, however, also related to the numerous advantages attributed to such a tool. As known from the principles of motor learning, repetition is important for both motor learning and the cortical changes that initiate it (Pluchino et al., 2012). The repeated practice must be linked to incremental success at some task or goal. The traditional Thai dance is provide participant repetitive practice, feedback about performance and motivation to endure practice(Pluchino et al., 2012). Especially in the older peoples it is difficult to maintain high adherence to training programs.
The high acceptance of the traditional Thai dance used in our study seems at variance with reports of elderly being rather skeptical towards using commercially available games in a community setting.
Conclusions
In conclusion, our results demonstrated that the aerobic Traditional Thai dance exercise had a significant improvement in balance performance greater than the stretching exercise alone. This finding could guide for application in exercise program for improving the balance performance in the elderly.

Acknowledgements
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References


