Effect of Pa-kao-ma Dancing Exercise Program on Physical Fitness in the Elderly by applying Self-efficacy theory

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ABSTRACT
This quasi-experimental research was one group pretest-posttest design which aimed to study the effect of Pa-kao-ma dancing exercise program on physical fitness of the elderly by applying self-efficacy theory. The purposive sample consisted of 30 elders residing in Ka-Men Phung-Tai village, Ong-Karak district, Nakhon-Nayok province, Thailand who volunteered to take part of an 8-week exercise session. Data was collected by using senior fitness test (SFT), perceived self-efficacy, outcome expectation, and program satisfaction. In particular, the data was collected before and after program participation. Then, the data was analyzed by using percentage, mean, standard deviation, and paired samples t-test. The results showed that after attending the program, the experimental group had better average score of SFT, perceived self-efficacy, outcome expectation, and program satisfaction at statistically significant level of .01

Keywords:
Pa-Kao Ma Dancing Exercise, Self-efficacy Theory, Physical Fitness, Elderly

INTRODUCTION
Thailand is going to be a fully-fledged complete aged society in 2022 (Foundation of Thai Gerontology Research and Development Institute, 2020). Generally, elderly people come up against difficulties to maintain daily activities due to age-related deterioration of body systems such as cardiovascular, nervous, and musculoskeletal systems. In particular, people usually begin to lose their bonemass after the third decade of life (Eliopoulos, 2018). Besides, their muscle mass and strength gradually decline at the age around 40 (Keller & Engelhardt, 2013). In fact, it was discovered that the decline of muscle fiber begins approximately at the age 50 and continues to the age 80 in which 50 percent of the fiber lost are from limb muscles (Faulkner, Larkin, Claflin, & Brooks, 2007). These factors cause elderly to lose their strength; flexibility, balance, and functional reserve that affect ability to carry out their daily activities.
Maintaining a regular exercise routine to promote muscle strength and endurance is essential for aging adults to keep up and rehabilitate their physical capability. Besides, it also improves cardiopulmonary and cardiovascular efficiency. Furthermore, it directly reduces stress and

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improves emotion (American College of Sports Medicine, 2009; KantaRatanakul, 2017). Generally, there are wide varieties of exercises that are appropriate for elders. One of exercises that can be adapted effectively is aerobic dancing which continuously stimulates whole body movement to improve muscle strength and joints flexibility. Especially, it increases the peak oxygen consumption (VO\textsubscript{2}\text{max}) that improves blood circulation and respiratory system resulting in decreasing blood pressure. As the muscles get stronger, the efficiency of movement and balance are also improved (American College of Sports Medicine, 2018). Above all, exercises key to mitigate age-related diseases such as hypertension, hyperlipidemia, diabetes, and depression which lead to the prevention of disability as well as the improvement of a quality of life (Jerome, 2012).

Clearly, an exercise routine and is an essential activity for elders to maintain their physical fitness. To promote exercise for elders, researchers have developed a Pa-kao-ma dancing exercise program by applying Bandura’s self-efficacy theory (Bandura, 1997) which is concerned with people’s beliefs in their capabilities to produce given attainments. Perceived efficacy plays an influential role on incentive as well as disincentive potential of outcome expectations. In particular, people who have high efficacy expect to gain favorable outcomes through good performance (Bandura, 2009). Besides, self-efficacy and outcome expectation for exercise have been found to be associated with physical performance in Thai older adults (Harnirattisai & Thongtawee, 2006). Similarly, there was a study conducted in Sukhothai Province of Thailand to discover the effect of Pa-kao-ma dancing exercise on the elders by applying self-efficacy theory and found that the subjects had lower average of systolic blood pressure and body mass index as well as waistline after program participation with 0.05 statistical significance. In addition, the average scores on flexibility, limb muscle strength, body endurance, and balance were higher than the scores obtained before trials with 0.05 statistical significance (Wongsangthain, Onsungnoen, &Phusit, 2015).

Pa-kao-ma dancing exercise is an aerobic dancing that adapts a traditional loincloth of Thailand, called Pa-kao-ma, to perform dancing along with continuous movement of all parts of the body. This dancing also includes the activities of leg bending and stretching to build up muscle strength and improve joints flexibility as well as muscle coordination. Besides, the dancing exercise is harmonized with local music which makes it more enjoyable for the elders. Moreover, Pa-kao-ma dancing exercise is not only an exercise designed for elderly people but also a way to conserve traditional culture loincloth in Thailand.

**PURPOSE**

The purpose of this study was to examine the effect of Pa-kao-ma dancing exercise program on the physical fitness of elders by applying self-efficacy theory.
METHODOLOGY
This study was a quasi-experimental research conducted from January to November 2020 in Thailand. The data was collected before and after program participation from a single group of samples.
Participants were 30 volunteer elders residing in the Ban Khamen Fung Tai community, Pho Thaen, Ongkharak district, Nakhon Nayok province, Thailand and were recruited by using Quota sampling which met the following criteria: 1) Aged 60 years and older; 2) Ability to walk without walking aids; 3) Person without dementia; and 4) Capable to participate activities without absences. In fact, the Mini-Mental State Examination (MMSE - Thai 2002) and the Barthel index for activities of daily living (Barthel ADL Index) were used to screen for dementia and functional ability in older adults respectively.

DATA COLLECTION TOOLS
Questionnaires including demographic, perceived self-efficacy, outcome expectation, and program satisfaction were used. The demographic questionnaire was used to collect personal data such as age, gender, marital status, educational level, and employment. In addition, the Perceived Self-efficacy Scale and the Outcome Expectation Scale (Sila, 2003) adapted from Bandura's self-efficacy Theory (1986; 2006) were used to evaluated perceived self-efficacy and outcome expectation in exercise. Moreover, the Program Satisfaction Scale (Sila, 2003) was used to measure participants’ satisfaction.
Health Indicators included blood pressure, heart rate, and body mass index were used to evaluate health status.
Senior fitness test: SFT which was developed by Rikli & Jones (1999; 2002) and revised by the Thai Health Promotion Foundation (2015) was used to assess the physical fitness of elders. In particular, a 30-sec chair stand test and arm curl test was used to evaluate muscular fitness and a 2-minute step in place test was used to evaluate cardio respiratory fitness or aerobic endurance. Sit-and-reach-test and back scratches were used to evaluate flexibility. Lastly, 8-feet up and go were used to evaluate balance and agility.

QUESTIONNAIRE VALIDATION
An Index of consistency: IOC was tested out by 15 elders who possessed similar characteristics as the sample group. The IOC wasreviewed by 5 qualified inspectors who verified the credibility of research equipment. Cronbach’s alpha coefficient of the Perceived Self-efficacy Scale, the Outcome Expectation Scales, and the Program Satisfaction Scales was 0.98, 0.99, and 0.95 respectively.

RIGHTS PROTECTION OF THE SAMPLE GROUP
This study was approved for research ethics from St Theresa International College (No. STIC 013/2020) as the researchers provided a clear purpose and methodology of the research. In addition, the subjects were explained about their rights to decline or accept participation. Besides, all subjects agreed to participate by providing written informed consent. Above all, the researchers would not disclose participant’s identity and would present the results as a whole.
PROCEDURES

Pre-experimental data collection
At the beginning, the participants were assessed for dementia and functional ability by using the MMSE - Thai 2002 and the Barthel ADL Index. Also, they were interviewed for personal demographic and were asked to fill up perceived self-efficacy and outcome expectation form as well as program satisfaction questionnaire. Then, health indicators of individuals were measured. Lastly, they were supervised to perform SFT which consisted of a 30-sec chair stand, arm curl, a 2-minute step, sit-and-reach, back scratch, and 8-feet up and go.

Experiment
The Pa-kao-ma dancing exercise program was 8 weeks long. During weeks 1-3, the elders’ perceived self-efficacy for exercising skills were encouraged and the demonstration videos were provided. During weeks 4-5, participants were supervised to practice Pa-kao-ma dancing exercises under the observation to identify exercise leaders among participants. During weeks 6-8, the recruited leaders were encouraged to lead and run the exercise by themselves. Pa-kao-ma dancing exercise was a 30-minute session each consisting of a 5-minute stretching warms up, a 20-minute Pa-kao-ma dancing, and a 5-minute cool down as suggested on American College of Sports Medicine guideline. In addition, it consisted of a total of 27 exercise moves including 10 moves for the warm-ups, 7 moves of Pa-kao-ma dancing, and 10 moves for cooling down which were the same moves as warm-ups. In particular the exercise program was supervised by nursing instructors and students as follows:

Week 1 - consisted of group relations and recreation, research purpose and methodology explanation, exercise enlightenment, and videos demonstration of Pa-kao-ma dancing.
Week 2 - consisted of recreation, demonstrating and practicing Pa-kao-ma dancing exercises.
Week 3 - consisted of recreation, reviewing and demonstrating 27 exercise moves of Pa-kao-ma dancing exercises by the research team followed by reverse demonstration by the subjects.
Week 4 - consisted of recreation, practicing Pa-kao-ma dancing exercises along with praising and compliments from the research team for motivation, perceived self-efficacy rising by recruiting leaders from each village for a total of 9 leaders to be exercise leaders.
Week 5 - consisted of recreation, leaders and elders practice the 27-moves program along with videos, research team praises, and compliments for motivation.
Week 6-7 - consisted of individual groups practicing at home supervised by leaders and assisted by research team by using tele-video conferences through Line application.
Week 8 - consisted of individual group practicing supervised by leader’s and post-experiment data collecting.

Post-experimental data collection
After program completion, the post-experimental data including perceived self-efficacy and outcome expectation as well as program satisfaction were collected. In addition, post-experimental health indicators of individuals were measured. Then, the physical fitness data of individuals was collected by using SFT: 30-sec chair stand, arm curl, 2-minute step, sit-and-reach, back scratch.
and 8-feet up and go. Above all, the participants were encouraged and motivated to perform the Pa-kao-ma dancing exercise by themselves continuously at home. Finally, gratitude and appreciation were expressed towards the participants.

**DATA ANALYSIS**

Data was analyzed by using statistical analysis software. In particular, personal data was analyzed with descriptive statistics, frequency, percentage, mean, and standard deviation. The differences between means of health indicators and physical fitness obtained before and after the experiment were tested by using paired t-test. Also, the means of perceived self-efficacy, outcome expectation, and program satisfaction collected before and after the experiment were compared by using paired t-test.

**RESEARCH RESULTS**

It was discovered that the majority of members in the sample group were females represented as dominated by 73.30 percent of participants. The average of age was 70.63 years. 53.30 percent were single. 86.70 percent graduated from primary education. 33.30 percent were unemployed. 73.30 percent depended on old age allowance as their main source of income. 80 percent had underlying disease (high blood pressure/diabetes). 50 percent performed a daily exercise routine.

The mean comparison of physical fitness, perceived self-efficacy, outcome expectation, and program satisfaction between before and after intervention were provided in table 1. It was discovered that health indicators and physical fitness scores of subjects were statistically improved with significant at 0.01 (p<.01). In detail, the means of physical fitness data of subjects after completed exercise program in the terms of systolic and diastolic BP, heart rate, and BMI were decreased with statistically significant at 0.01 (p<.01). Besides, the means scores of SFT that indicated cardiorespiratory fitness or aerobic endurance (2-minute step in place), muscular fitness (30-sec chair stand test and arms curl test), and flexibility (sit-and-reach-test and back scratch) were increased with statistically significant at 0.01 (p<.01).

Furthermore, the mean score of balance and agility (8-feet up and go) were decreased with statistically significant at 0.01 (p<.01).

Table 1. Comparison of mean health indicators and physical fitness between before and after the intervention (n = 30)

<table>
<thead>
<tr>
<th>Physical Fitness</th>
<th>Pretest</th>
<th>Posttest</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>SD</td>
<td>X</td>
<td>SD</td>
</tr>
<tr>
<td><strong>1. Body Composition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Blood Pressure: BP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1 Systolic BP</td>
<td>150.80</td>
<td>26.105</td>
<td>139.00</td>
<td>19.445</td>
</tr>
<tr>
<td>1.1.2 Diastolic BP</td>
<td>78.70</td>
<td>12.857</td>
<td>72.93</td>
<td>7.736</td>
</tr>
<tr>
<td>1.2 Heart Rate: HR</td>
<td>80.93</td>
<td>12.108</td>
<td>76.36</td>
<td>8.507</td>
</tr>
<tr>
<td>1.3 Body Mass Index: BMI</td>
<td>24.16</td>
<td>4.125</td>
<td>23.58</td>
<td>4.188</td>
</tr>
<tr>
<td><strong>2. Cardiorespiratory fitness or Aerobic endurance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-minute Step in place</td>
<td>99.93</td>
<td>31.249</td>
<td>120.23</td>
<td>27.236</td>
</tr>
</tbody>
</table>
### 3. Muscular fitness

<table>
<thead>
<tr>
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<th>Pretest</th>
<th>Posttest</th>
<th>t</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 30-sec Chair stand test</td>
<td>12.73</td>
<td>3.750</td>
<td>14.68</td>
<td>.005</td>
</tr>
<tr>
<td>3.2 Arms Curl Test</td>
<td>16.70</td>
<td>3.825</td>
<td>20.13</td>
<td>.000</td>
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</table>

### 4. Flexibility

<table>
<thead>
<tr>
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<th>Pretest</th>
<th>Posttest</th>
<th>t</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Sit-and-reach-test</td>
<td>1.11</td>
<td>2.393</td>
<td>2.81</td>
<td>.002</td>
</tr>
<tr>
<td>4.2 Back scratch</td>
<td>-2.35</td>
<td>4.331</td>
<td>.503</td>
<td>.002</td>
</tr>
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</table>

### 5. Balance and Agility

<table>
<thead>
<tr>
<th>Test</th>
<th>Pretest</th>
<th>Posttest</th>
<th>t</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-feet up and go</td>
<td>6.12</td>
<td>1.410</td>
<td>5.70</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table 2. Comparison of average perceived self-efficacy, outcome expectation, and program satisfaction between before and after the experiment (n = 30)

P < 0.01

Regarding table 2, after program completion, the average scores on perceived self-efficacy, outcome expectation, and program satisfaction were increased with a statistically significant at 0.01 (p<0.01).

**DISCUSSION**

After attending Pa-kao-ma dancing exercise program, an applied aerobic exercise with traditional culture loincloth, which included 30-minute exercise sessions, took place 3 times per week for a total of 8 weeks. It was discovered that the body composition and physical fitness of subjects were improved statistically with significance level of .01. The effectiveness of Pa-kao-ma dancing exercises was discussed in detail as follows.

**Body composition improvement:** after practicing this exercise at least 3 times a week, the average systolic BP, diastolic BP, heart rate, and BMI were decreased statistically with significance (p-value = .000, .001, .000, and .000 respectively). Since the Pa-kao-ma dancing exercise was a form of aerobic exercise which performed continuous movement of body under medium intensity, it could improve circulatory system, strengthen cardiac muscles, decelerate heart rate, increase flexible blood vessels, lower blood pressure, and increase metabolic rate, and decrease body weight and BMI (American College of Sports Medicine, 2018).

**Cardio-respiratory fitness or aerobic endurance:** the study revealed that cardio-respiratory fitness of elders improved statistically after attending the exercise program with significance (p-value = .000). Therefore, Pa-kao-ma dancing exercise would help to increase strength of cardiac muscles which led to the increasing volume of blood pumped by the heart per minute. Besides, the increase of blood circulation in the limb muscle during physical exertion would increase endurance for a
longer period of time (Sport Science Bureau, 2020). These results conformed with the study done by Wongsangthain et al. (2015) which discovered the decreasing of diastolic BP, body weight, waist circumference, and BMI after attending exercise experiment with a statistically significant of .05.

Muscular fitness and flexibility: the study disclosed that after completing the exercise program the upper and lower muscle strength of subjects increased with statistically significant (p-value = .000 and .000 respectively) and the flexibility of lower and upper body increased with statistically significant (p-value = .002 and .002 respectively). Pa-kao-ma dancing exercise could improve lower muscle strength and flexibility since it consisted of moves required to bend the knees, stand on the toes, and continuous foot treading. It could improve upper muscle strength and flexibility because it performed dance moves which involved isometric contractions, specifically in the shoulders and arms. In addition, the dance moves also exercised the muscles in the upper body including shoulders, arms, and back. The results were consistent with the study on the effectiveness of the applied folk-art loincloth of the elderly exercise program which also discovered that after attending the experiment leg muscles and flexibility of the lower body were increased with statistically significant of .05 (Wongsangthain et al., 2015). Similarly, the study on the effects of exercise program with fabric on balance and movement in the elderly also revealed the increasing of arms muscles strength after participating the experiment with statistically significant of .05 (Seaburin, &Ruamkid, 2019). Likewise, the study on effects of northern Thailand’s (Isaan) traditional dance on physical performance in elderly Thais unveiled the increasing flexibility of subjects in the intervention group compared to the control group, with a statistical significance level of 0.05 (Sriraksa et al., 2018).

Balance and agility: the result of the study showed that the balance and agility of subjects were improved after participating in the program with statistically significant (p-value=.000). Pa-kao-ma dancing exercise could improve balance and agility since it incorporated knee-bending and standing on the toes that were done on the warm-ups and cool-down. Besides, big muscles such as the hips, thighs, shoulders, and back were exercised while performing dancing which could also improve balance and agility. The results were consistent with the study on effects of Isaan dance on physical performance in elderly Thais that discovered the increasing of agility and balance in the intervention group compared to the control group with a statistical significance level of 0.05 (Sriraksa et al., 2018).

Perceived self-efficacy and outcome expectation: it was discovered that the average score of perceived self-efficacy, outcome expectation, and program satisfaction after the experiment were higher than that before the experiment with statistical significance (p-value=.000 and .001 respectively). According to the concept, belief in an individual’s abilities influences their actions and behavior. Lectures, video demonstration, example demonstration, and chance to practice would help to gain confidence of participants. In addition, positive stimuli including encouragement, admiration, correct instruction, and fitness assessment would raise perceived self-efficacy, and outcome expectation. This is consistent with the study about the effectiveness of the applied folk-art loincloth of the elderly exercise program which also discovered that after attending
the program, the experimental group had better average score of perceived self-efficacy and outcome expectation at statistically significant level of .05 (Wongsangthain et al., 2015).

Program satisfaction: the result showed that the participants were pleased with the exercise program as the scores of program satisfaction increased after completion. These outturns would be acquired by various factors. Firstly, the Pa-kao-ma dancing exercise program could be considered as Thai culture preservation since it adapted dance moves from Thai traditional dance along with traditional music from the north eastern region of Thailand (Iaan) which had a fun and enjoyable rhythm. Secondly, the exercise took place in a multipurpose building of a sub district health promotion hospital which was suitable for group exercise as it was spacious, high ceiling, adequate lighting, and good ventilation. Lastly, the research team and staff of the sub district health promotion hospital paid attention to program as they joined and encouraged participants in every exercise session. This is consistent with the study on the effect of the Iaan dance exercise program which applied the self-efficacy theory among the elderly. The study discovered after the experiment that the average scores of program satisfaction are in the high range (Sila, 2003).

CONCLUSION

This quasi-experimental study was one group pretest-posttest design which aimed to study the effect of Pa-kao-ma dancing exercise program on physical fitness of the elders. There were 30 volunteer elders recruited to participate in an 8-week Pa-kao-ma dancing exercise program. Data was collected before and after program participation by using health indicators, senior fitness test (SFT), perceived self-efficacy, outcome expectation, and program satisfaction. Then, the data was analyzed by using percentage, mean, standard deviation, and paired samples t-test. The results showed that after program completion, the experimental group had better health indicators, average score of SFT, perceived self-efficacy, outcome expectation, and program satisfaction at a statistically significant level of .01. The results of the study could be provided as the following.

The Pa-kao-madancing exercise program achieved a set of objectives in the terms of health and physical fitness of elders. After attending exercise program, the improvement was found on systolic BP, diastolic BP, heart rate, and BMI, muscular strength of upper and lower body, cardio respiratory fitness, flexibility of upper and lower body, as well as balance and agility with statistically significant at 0.01. The exercise program also achieved a set of objectives that conformed to self-efficacy theory. The results indicated that the average scores of perceived self-efficacy and outcome expectation after experiment were higher than before the experiment with statistically significant at 0.01.

Regarding program satisfaction, the elements of satisfaction that were evaluated included exercise comprehension, Pa-kao-ma dancing moves, background music, physical fitness evaluation, location, atmosphere, surrounding people, as well as consultation and support provided by the research team. It was discovered that the average scores on satisfaction after the experiment were better than before the experiment with statistically significant at 0.01.

RECOMMENDATIONS

1. The efficiency of the Pa-kao-ma dancing exercise sin the long run should be conducted in order to get more consistent data.
2. The effect of exercise leadership should be investigated as a factor to promote sustainable health of elders in the community.

3. Further study to compare the effect of Pa-kao-ma dancing exercise between groups of healthy elderly and elderly with chronic diseases should be set up.

**REFERENCE**


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