บทความวิจัย

ผลของการออกกำลังกายรูปแบบใหม่ที่บูรณาการร่วมกับรำแม่บทใหญ่ต่อการควบคุมการทรงตัวของผู้สูงอายุในชุมชน: การวิจัยเชิงปฏิบัติการแบบมีส่วนร่วม

Effects of a New Exercise Model Integrated with Mae Bot Yai Thai Dance on Balance Control in Thai Community-dwelling Older Adults: Participatory Action Research

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อพัฒนารูปแบบใหม่ของการออกกำลังกายที่บูรณาการกับรำแม่บทใหญ่ต่อการควบคุมการทรงตัวของผู้สูงอายุในชุมชน และทดสอบประสิทธิผลของการออกกำลังกาย โดยออกแบบเป็นการวิจัยเชิงปฏิบัติการแบบมีส่วนร่วม เพื่อหวังผลให้เกิดการพัฒนาสุขภาพที่ยั่งยืนของผู้สูงอายุในระยะเตรียมความพร้อม เป็นการพัฒนารูปแบบการออกกำลังกายท่ารำโดยการมีส่วนร่วมของชุมชนในระยะทดสอบประสิทธิผลของรูปแบบการออกกำลังกาย โดยการสุ่มแบ่งผู้เข้าร่วมการศึกษาที่มีอายุตั้งแต่ 60 ปี เป็นต้นไป ตามพื้นที่อยู่อาศัยออกเป็น 2 กลุ่ม คือ กลุ่มทดลองที่ได้รับการออกกำลังกายท่ารำ 12 สัปดาห์ และกลุ่มควบคุม

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ทดสอบความสามารถในการทรงตัว 4 ครั้ง ทั้งสองกลุ่ม ในช่วงเวลาเดียวกัน นำผลการทดสอบมาเปรียบเทียบ พบว่ากลุ่มทดลองมีการเพิ่มขึ้นของความสามารถในการทรงตัว อย่างมีนัยสำคัญทางสถิติทั้งจากการเปรียบเทียบภายในกลุ่มและระหว่างกลุ่ม แสดงให้เห็นว่า การออกกำลังกายท่ารำที่พัฒนาขึ้นใหม่นี้มีประสิทธิผลจริง และสามารถส่งเสริมให้เกิดการพัฒนาสุขภาพที่ยั่งยืนผ่านกระบวนการมีส่วนร่วมของชุมชนตลอดกระบวนการศึกษานี้

คำสำคัญ: รำแม่บทใหญ่ การพัฒนาสุขภาพที่ยั่งยืน การควบคุมการทรงตัว

Abstract

This study was managed as a participatory action research proposed to develop a new exercise model integrated with Mae Bot Yai Thai dance to control balance for seniors in communities, to evaluate the efficacy of the new exercise and to promote sustainable health development. The preparation of communities and the development of Mae Bot exercise were performed with participations of community members in the first stage. A cluster randomized controlled trial was used to separate participants with age sixty and older into two groups of an experimental group (E group) and a control group (C group). In both groups, three balance tests were used to measure participants' balance control four times at the same time points. Mae Bot exercise was applied continuously in E group for twelve weeks, whereas no intervention was done in C group. The results revealed that there were significant improvement of all variables in E group both within group and compared with C group. It found that the experiment group had a significant increase of capacity of balance control both from comparison within and between groups. It indicated that Mae Bot exercise was effectively developed and could encourage sustainable health development through participatory process of community throughout the process.

Keywords: Mae Bot Yai Thai Dance, Sustainable Health Development, Balance Control

Introduction

Nowadays, the number of older adults around the world including in Thailand is increasing dramatically. Ageing effects on declines in functions of several body systems that lead to balance control impairments [1]. Falls in older people are considered the cause of functional diminishment and dependent state of elderly people [2]. Therefore, prevention of falls in the elderly is very outstanding to promote their potential to live independently as long as possible. Exercises are tools for improving the neuromuscular system and reducing risks of falling in older adults [3]. Thus, the preparation of older people and their communities to realize benefits of exercises is very worthwhile. The transformative concepts of health care and health behaviors are very necessary and valuable to achieve sustainable health development [4]. Even now, there are recommended exercises to improve balance control in the elderly such as dancing and tai chi that are foreign-based

exercises [5-6]. The enhancement of exercises to accomplish sustainable health development for older adults in rural areas should be modified to correspond with their cultures, traditions, lifestyles and needs [7]. Thai classical dances are popular and graceful performance coexisted with Thai classical music and varied dance paces. Mae Bot Yai is classified as a kind of Thai classical standard dance consisted of 64 standard dance paces [8]. Each dance pace with complex postures, continuous postural changes and coordination can improve balance control [9]. For these reasons, this study was designed as a participatory action research to develop a new proper exercise model integrated with Mae Bot Yai Thai dance called Mae Bot exercise. The anther main objective was to evaluate the effectiveness of Mae Bot exercise on balance control in Thai community-dwelling older adults. It was also planned to develop sustainable health of the elderly following processes of our participatory action research by transforming their idea and behaviors for well-being and active ageing by the new Mae Bot exercise.

Materials and Methodology

There were three stages in this study; S1 (Preparation), S2 (Evaluation of the intervention) and S3 (Processes of sustainable health development with also adding in all stages and processes). This study was designed as a participatory action research composed of four processes; P1 (Planning), P2 (Acting), P3 (Observing) and P4 (Reflecting).

After this study was approved by the Human Research Ethics Committee of Thaksin University (Number E012/2560 on 22 May 2017), a cluster randomized controlled trial was used to separate population by areas with same natures into two groups, population lived in Tambon Tamot municipality as an experimental group (E group) and population lived in Tambon Khuan Sao Thong municipality as a control group (C group).

In S1 and P1 to P4, the preparation processes of the E group community and the developmental processes of our new exercise model in this participatory action research were performed with participation of community members. Discussion and reflection about different exercise models were fulfilled to conclude which model they preferred. Finally, it was determined that a new exercise model integrated with Mae Bot Yai Thai dance was proper for exercising. Each of 64 Mae Bot Yai dance paces was evaluated the Index of Item-Objective Congruence (IOC) between its posture with types of exercises by five specialists. Eighteen dance paces with IOC over 0.5 were selected to develop a new exercise model called Mae Bot exercise. The processes of P1 to P4 were repeated as a cycle of participatory action research to improve Mae Bot exercise until it was judged to be the most appropriate exercise for them. Next, it was practiced by participants in E group in Stage 2 in order to evaluate its effectiveness on balance control in Thai older adults in communities.

After signing informed consent, participants with age 60 years and older in each group were enrolled according to inclusion criteria of good communication, being able to follow instruction and walking without

walking aid independently. Exclusion criteria were fracture within 6 months or falling within 1 months before this study, Timed Up and Go Test (TUG) > 20 sec, Thai Mental State Examination score (TMSE) for screening cognitive impairment ≤ 23, Oxford Knee Score (OKS) for evaluating the severity of knee osteoarthritis < 20 and Osteoporosis Self-Assessment Tool for Asians (OSTA) < -4.

Intervention

All participants in E group practiced Mae Bot exercise under supervision of trained village health volunteers. Mae Bot exercise contained 5 minutes stretching dance paces to warm up, following with 32 minutes of dance paces exercise period and then 5 minutes of stretching to cool down. The frequency of exercising was once a day, 42 minutes each time, three times a week for 12 weeks as an aerobic exercise protocol. No intervention was performed in C group throughout the 12 weeks of study period.

Outcome measurements

Functional Reach Test (FRT) for evaluating forward stability, Single Leg Stance Test with Eyes Open (SLSEO) for examining static balance and Timed Up and Go Test (TUG) for evaluating agility and dynamic balance were evaluated by blinded and well-trained assessors in both groups four times; before starting Mae Bot exercise (T1), after 4 weeks (T2), after 8 weeks (T3) and after 12 weeks of Mae Bot exercise (T4) [10-12].

Sample size calculation

The sample size was calculated based on the previous study that improved TUG with the effect size of - 1.12 sec and the standard deviation of 0.62 in the intervention group compared with the control group with 80 % power at alpha level of 0.05 and estimating dropout rate of 20 %, hence 44 participants per group were enrolled [5].

Statistical analysis

Because some variables in this study were non-normal distribution data, n*onparametric* statistics were used and data were presented as a median [Q1, Q3]. Demographic data were compared between two groups by Mann-Whitney U test. Each variable measured at T1, T2, T3 and T4 was compared over time within group by Friedman Test. Wilcoxon Signed Ranks Test was used to compared between T1-T2, T2-T3 and T3-T4 within group, while Mann-Whitney U Test was therefore used to compare between group. Analyses were performed with R and p-value < 0.05 was considered statistically significant.

Results

At the beginning, there were sixty participants assessed for eligibility in each group. In E group, ten participants were excluded because of exclusion criteria and four participants dropped out during study period due to sickness (n=2) and looking after their grandchildren elsewhere (n=2). In C group, eleven participants were excluded because of exclusion criteria and nine participants dropped out during study period due to sickness (n=2), looking after their grandchildren elsewhere (n=3) and being busy (n=4). At the end, data of forty- six participants in E group and forty participants in C group were analyzed.

Eighty-six participants in this study were women with age 60 years and older, being farmers, rubber gardeners and Buddhists. Statistical analysis showed that there were no significant difference between group except BMI that revealed higher significantly in E group (the first degree of obesity) with median of 26.01 [23.94, 28.49] than in C group (overweight) with median of 24.38 [22.35, 26.46]. The median of age in E group was 65.00 [60.00, 69.25] years and in C group was 66.00 [63.00, 68.00] years. The demographic data and baseline characteristics of participants were shown in Table 1.

Table 1 The demographic data and baseline characteristics of participants

Variables	E group	C group	p-value
Age	65.00 [60.00, 69.25]	66.00 [63.00, 68.00]	0.552
BMI	26.01 [23.94, 28.49]	24.38 [22.35, 26.46]	0.025*
TMSE	27.00 [25.00, 29.00]	28.00 [26.25, 30.00]	0.105
OKS	40.00 [32.00, 48.00]	40.00 [36.00, 48.00]	0.331
OSTA	-0.60 [-2.60, 1.00]	-1.70 [-2.61, 1.03]	0.464

Data shown in median [Q1, Q3], Statistical analysis by Mann-Whitney U test, * p-value < 0.05

The comparison of FRT, SLSEO and TUG within E group before (T1) and after 12 weeks (T4) of doing Mae Bot exercise was obvious that there were significant improvements in all variables at P-value < 0.001. At T1, values of FRT, SLSEO and TUG were median of 6.33 [3.83, 9.75] inches, 17.68 [7.92, 33.83] sec and 9.31 [9.00, 11.25] sec, while they improved to median of 13.53 [12.04, 15.50] inches, 50.75 [34.38, 80.00] sec and 7.25 [6.99, 7.68] sec, respectively, at T4. In addition, there were significant advancements of every variable within E group when compared pairs of T1-T2, T2-T3 and T3-T4 at p-value < 0.001 as seen in Table 2.

Table 2 Results of FRT, SLSEO and TUG in E group before starting Mae Bot exercise (T1), after 4 weeks (T2), after 8 weeks (T3) and after 12 weeks of Mae Bot exercise (T4)

Variables	**T1**	**T2**	**T3**	**T4**	**p-value**
FRT (Inches)	6.33	10.17$^{\#}$	11.83$^{\#\#}$	13.53$^{\#\#\#}$	< 0.001***
	[3.83, 9.75]	[5.96, 10.25]	[8.13, 13.75]	[12.04, 15.50]	
SLSEO	17.68	29.00$^{\#}$	34.67$^{\#\#}$	50.75$^{\#\#\#}$	< 0.001***
(Seconds)	[7.92, 33.83]	[15.08, 60.00]	[21.00, 67.50]	[34.38, 80.00]	
TUG	9.31	8.61$^{\#}$	8.00$^{\#\#}$	7.25$^{\#\#\#}$	< 0.001***
(Seconds)	[9.00, 11.25]	[7.50, 9.61]	[7.25, 9.00]	[6.99, 7.68]	

Data shown in median [Q1, Q3], *** p-value < 0.001 by Friedman Test $^{\#}$= Statistical analysis by Wilcoxon Signed Ranks Test p < 0.001, $^{\#}$= Compared T1-T2, $^{\#\#}$= Compared T2-T3, $^{\#\#\#}$= Compared T3-T4

The variables compared between prior and after 12 weeks of study period in C group showed that there were significant deterioration of SLSEO at p = 0.001, FRT at p < 0.001 and TUG at p < 0.001. The detail of data were presented in Table 3.

Table 3 Results of FRT, SLSEO and TUG in C group before and after 12 weeks of study period at the same time point of T1, T2, T3 and T4

Variables	**T1**	**T2**	**T3**	**T4**	**p-value**
FRT (Inches)	10.50	10.50	10.00	10.00	< 0.001***
	[9.08, 12.33]	[8.63, 12.00]	[9.04, 13.50]	[9.00, 12.00]	
SLSEO	20.83	20.50	20.00	20.00	0.001***
(Seconds)	[10.50, 29.00]	[10.37, 29.75]	[10.00, 29.00]	[10.00, 29.00]	
TUG	8.62	8.47	8.45	9.10	< 0.001***
(Seconds)	[7.00, 10.00]	[7.31, 9.86]	[7.50, 10.00]	[7.5, 10.44]	

Data shown in median [Q1, Q3], Statistical analysis by Friedman Test, *** p-value ≤ 0.001

At T1, the results revealed that FRT was significantly better in C group than E group at p-value < 0.001 as well as TUG at p-value = 0.008. There were no significant difference between E group and C group in SLSEO (p-value = 0.71). The outcomes of the same variables in both groups were reevaluated after applying Mae Bot exercise in E group for 4 weeks (T2), 8 weeks (T3) and 12 weeks (T4). The data indicated that there were significant betterment of every variable in E group overtime until they were significantly superior than in C group as seen in Table 4.

Table 4 Results of FRT, SLSEO and TUG compared between E group with C group before starting Mae Bot exercise (T1), after 4 weeks (T2), after 8 weeks (T3) and after 12 weeks of Mae Bot exercise (T4)

Variables	E group	C group	p-value
FRT (Inches)			
T1	6.33 [3.83, 9.75]	10.50 [9.08, 12.33]	< 0.001***
T2	10.17 [5.96, 10.25]	10.50 [8.63, 12.00]	0.347
T3	11.83 [8.13, 13.75]	10.00 [9.04, 13.50]	0.713
T4	13.53 [12.04, 15.50]	10.00 [9.00, 12.00]	< 0.001***
SLSEO (Seconds)			
T1	17.68 [7.92, 33.83]	20.83 [10.50, 29.00]	0.710
T2	29.00 [15.08, 60.00]	20.50 [11.37, 29.75]	0.076
T3	34.67 [21.00, 67.50]	20.00 [10.00, 29.00]	< 0.001***
T4	50.75 [34.38, 80.00]	20.00 [10.00, 29.00]	< 0.001***
TUG (Seconds)			
T1	9.31 [9.00, 11.25]	8.62 [7.00, 10.00]	0.008*
T2	8.61 [7.50, 9.61]	8.47 [7.31, 9.86]	0.690
T3	8.00 [7.25, 9.00]	8.45 [7.50, 10.00]	0.053
T4	7.25 [6.99, 7.68]	9.10 [7.50, 10.44]	< 0.001***

Data shown in median [Q1, Q3], Statistical analysis by Mann Whitney U Test, * p-value < 0.01, *** p-value < 0.001

Discussion

The outcomes of this study presented evidences for efficacy of Mae Bot exercise on balance control in Thai community-dwelling older adults. The results indicated significant improvements of E group participants in all variables. In each age group, there were norms of parameters that referred to normal values with no risks of falling. There were cut-point values that alluded to have risks of falling if someone received scores less than cut-point values too [10-12]. The baseline data of E group at T1 demonstrated values lower than norms of their age group (age range 65-69 years old) and lower than cut-point values for assessing the risk of falling. They were FRT with median of 6.33 [3.83, 9.75] inches (norms = 13.8 inches, cut-point values for moderate fall risks = 6-10 inches) and SLSEO with median of 17.68 [7.92, 33.83] sec (norms = 27.0 sec, cut-point values < 30 sec). TUG was showed taking longer time than norms but shorter time than cut-point values with median of 9.31 [9.00, 11.25] sec (norms = 8.1 sec, cut-point values for moderate fall risks = 11-20 sec). After doing Mae Bot

exercise, all variables continued improving over time significantly, and could achieve the values better than norms with no risk of falls as seen in Table 2. Our outcomes were comparable with a previous study of Thai dance that presented TUG decreased from 10.21 ± 1.72 sec to 8.58 ± 1.37 sec ($p = 0.001$) and FRT increased from 23.68 ± 5.53 cm to 29.45 ± 5.77 cm or 9.32 ± 2.18 inches to 11.59 ± 2.27 inches ($p = 0.001$) [7]. Therefore, these results supported the effectiveness of Thai dance on balance in Thai older adults as well as our study. Our results concurred with the other former study about effects of three-month dance on TUG with decreasing -0.58 ± 0.95 sec significantly in older people [5]. These issues still agreed with the study of ten-week tai chi program on balance in the elderly that showed significant influence on TUG at 6.58 ± 1.04 to 6.10 ± 0.88 sec, OLS (SLSEO in our study) 15.52 ± 21.06 to 32.90 ± 21.92 sec and reaching longer distances of FRT 30.33 ± 2.13 to 32.38 ± 3.19 inches with no significant difference [6]. Moreover, the results in our study seemed to be superior than in the previous studies. The first noticeable point was the period of doing exercise, the past study of Thai dance exercise took 6 weeks to significantly improve TUG and FRT [7]. The dance study spent 12 weeks to improve TUG, while tai chi used 10 weeks to effect on TUG and OLS [5-6]. On the other hand, Mae Bot exercise took only the least period of 4 weeks to achieve significant enchantment in FRT, SLSEO and TUG. The second was the value changed in each variable, the 12 weeks of dance were comparable with this study [5]. The dance exercise reduced TUG of 0.58 sec, nevertheless Mae Bot exercise decreased TUG of 2.06 sec. Consequently, these data suggested that Mae Bot exercise might be more beneficial for improvements of balance control in older adults in their communities.

There were several reasons for better results of Mae Bot exercise in this study. Firstly, our study was managed to be a participatory action research that made researchers and communities work together with good relationship to develop a new exercise model. Thus, sustainable health development of the elderly in the communities could be established following these processes. In addition, Thai dance was cultural lifestyles in communities and was familiar to everyone for a long period of time. The participants in E group were happy and willing to continue doing Mae Bot exercise regularly, hence a dropout rate was low. Secondly, Mae Bot exercise was developed by integrating Mae Bot Yai Thai dance with the knowledge of exercise theory and aimed to be suitable and effective for improvements of balance control. According to its complex postures in each dance pace, changing postures and positions with limbs moving alternately or simultaneously, transferring weight in each walking step could promote balance control. However, there were some limitations in our study. The first, all participants in E group were female because of the greater number of senior women than senior men in E group communities. In addition, there were Muslims who could not join to do Mae Bot exercise on account of Islamic

provisions. There was no group of receiving other intervention in this study too. Further studies designed properly for elderly men and Muslims will be meaningful as well as comparing Mae Bot exercise with other exercises.

In conclusion, the results of this study contribute evidences that Mae Bot Exercise are effective on improving balance control in Thai community-dwelling older adults. The results indicate that the elderly should continue doing Mae Bot exercise 12 weeks, once a day, 42 minutes each time, 3 times per week to achieve its benefits on balance control. Following the processes of this participatory action research with participation of community members, we can promote sustainable health development of the elderly in communities too.

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