วารสาร
เทคนิคการแพทย์และกายภาพบำบัด
JOURNAL OF MEDICAL TECHNOLOGY AND PHYSICAL THERAPY

นิพนธ์ต้นฉบับ
ORIGINAL ARTICLE

ผลของโปรแกรมกายภาพบำบัดที่มีผู้รับบริการเป็นศูนย์กลาง ต่อความสามารถในการทรงตัวของผู้สูงอายุ

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บทคัดย่อ

การหกล้มเป็นสาเหตุสำคัญต่อการเสียชีวิตของผู้สูงอายุในวัย 65 ปีขึ้นไป การศึกษาส่วนใหญ่ที่เกี่ยวกับกลยุทธ์การป้องกันการหกล้มมักเกี่ยวข้องกับการออกกำลังกายเพื่อส่งเสริมความแข็งแรงและการทรงตัว อย่างไรก็ตาม โปรแกรมการออกกำลังกายเหล่านี้ถูกออกแบบโดยผู้รักษา ปราศจากการมีส่วนร่วมของผู้สูงอายุในการออกแบบโปรแกรม วัตถุประสงค์ของงานวิจัยนี้ คือ ศึกษาผลของโปรแกรมกายภาพบำบัดที่มีผู้รับบริการเป็นศูนย์กลางต่อความสามารถในการทรงตัวของผู้สูงอายุ ซึ่งประเมินโดย Berg Balance Scale และ Timed Up and Go Test ศึกษาในผู้สูงอายุที่มีความเสี่ยงต่อการหกล้มที่อาศัยในชุมชนสามเหลี่ยม 1 จังหวัดขอนแก่น จำนวน 9 คน (ชาย 2 คน หญิง 7 คน อายุเฉลี่ย 77.4 ± 5.8 ปี) ระยะเวลาศึกษา 12 สัปดาห์ โดยใน 4 สัปดาห์แรก ผู้วิจัยและอาสาสมัครร่วมกันประเมินปัญหาที่เกี่ยวข้องกับความสามารถในการทรงตัวของอาสาสมัครแต่ละราย แล้วร่วมกันออกแบบโปรแกรมกายภาพบำบัดเพื่อเพิ่มความสามารถในการทรงตัวของผู้สูงอายุ จากนั้นให้อาสาสมัครปฏิบัติตามโปรแกรมที่ออกแบบไว้นั้นนาน 8 สัปดาห์ ประเมินความสามารถในการทรงตัวของอาสาสมัครทั้งหมด 4 ครั้ง คือ ก่อนเริ่มการศึกษา และทุกๆ 4 สัปดาห์ต่อมา วิเคราะห์ผลการศึกษาด้วยสถิติ paired t-test ผลการศึกษาพบว่า โปรแกรมกายภาพบำบัดโดยมีผู้รับบริการเป็นศูนย์กลางเพื่อเพิ่มความสามารถในการทรงตัวของผู้สูงอายุทำให้อาสาสมัครมีค่าคะแนน Berg Balance Scale ดีขึ้น ($P < 0.05$) อย่างไรก็ตาม เป็นที่น่าสังเกตว่าการเปลี่ยนแปลงของความสามารถในการทรงตัวของผู้สูงอายุมักได้รับอิทธิพลจากอาการปวดตามส่วนต่างๆของร่างกาย แต่โปรแกรมทางกายภาพบำบัดในการศึกษานี้ไม่ได้เน้นในเรื่องของการลดปวดมากเท่าที่ควร จึงเสนอแนะว่าในการเพิ่มความสามารถในการทรงตัวของผู้สูงอายุ ผู้รักษาควรจะคำนึงถึงปัจจัยอื่นๆ ที่เกี่ยวข้องกับการทรงตัวให้มากที่สุด

คำสำคัญ : ผู้รับบริการเป็นศูนย์กลาง, ผู้สูงอายุ, การหกล้ม

Introduction

In Thailand, the number of older people aged 60 years and over is about 10.7 million (15.2%) in 2020[(1)]. Older people are more prone to diseases, syndromes, and sickness than other age group of adults. Most of them have age-related changes such as hearing impairment, poor vision, arthritis, hypertension, heart disease, diabetes, and osteoporosis[(2)]. Safe and confident ambulation is an important aspect of their health. Older adults frequently complain of feeling unstable on

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ORIGINAL ARTICLE

Effects of a physical therapy program based on client-centered approach on functional balance in the elderly

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Abstract

Falls are an important cause of death for adults aged 65 years and above. Most preventive strategy studies of falls have involved exercises to promote strength and balance. However, these exercise programs were designed by therapists without the elderly's participation in designing the programs. The objective of this research was to study effects of physical therapy program with client-centered approach on functional balance (Berg Balance Scale and Timed Up and Go Test) in the elderly. A 12-week study was conducted in 9 elders with fall risks (2 men and 7 women, mean age 77.4 ± 5.8 years) of Samliam 1 community, Khon Kaen Province. During the first 4 weeks, specific problems relating to functional balance of each subject were assessed and discussed between the subject and the investigator, after which a physical therapy program with client-centered approach to improve functional balance was cooperatively designed and individually tailored to each elder. The subject was then instructed to perform the program for 8 weeks. The subject's functional balance was assessed at baseline and every 4 weeks until the end of the study, and was analyzed using paired t-test. It was found that the physical therapy program with client-centered approach significantly improved the Berg Balance Scale ($P < 0.05$). However, it was observed that changes in the functional balance scores were frequently influenced by pain at any body part of the subjects but the present study program did not pay much attention on the issue of pain. Therefore, it is suggested that to improve older people' balance, therapists should widen their approaches to cover other factors relating to balance as much as possible.

Keywords : Client-center approach, Elderly, Falls

ambulation. The consequence of postural instability is a fall with concomitant injury.

Falls are an important cause of death for adults aged 65 years and above. Falls can result in medical problem such as fracture, painful bruising, and depression[3]. Most studies assessing efficacy of strategies to prevent falls have involved exercises to promote strength and balance[4-16]. However, these exercise programs were designed by therapists without the elderly's participation in designing the programs.

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In general, health services may be divided into 2 approaches, client-centered and therapist-centered. The former approach focuses on requiring attitudinal changes that reflect a commitment to follow the lead of the client and to support their vital roles[17], and the latter imposes on professional decisions[18]. The client-centered approach provides benefits on health care system by enhancing participation, ownership and independence of the clients in the community[19-22]. This benefit is in line with the National Health Act, 2550 B.E. (equivalent to 2007 A.D.) which has emphasized on people's participation in the health care system of our country.

Because of realizing in the benefit of client-centered service as well as a need for fall prevention in the elderly, the investigator was interested in studying a physical therapy program with client-centered approach to reduce fall risk factors in the community-dwelling elderly. The objective of this study was to evaluate changes in functional balance of the elderly after participating in the physical therapy program based on client-centered approach aimed to promote balance.

Materials and Methods

This study was approved by The Khon Kaen University Ethics Committee for Human Research.

Population

Male and female elders, aged 60 years or older, of Samliam 1 community, Naimuang Sub-district, Muang District, Khon Kaen Province, were recruited. Inclusion criteria were independent ambulation with or without gait aid, being able to verbally communicate, and willing to participate and cooperate with the study procedures. Exclusion criteria were presence of uncontrolled cardiovascular disorders, total blindness, impairment of cognitive function, impairment of neuromuscular function secondary to previously diagnosed neurological diseases, dizziness and vertigo, and limited function and mobility by pain, fractures, joint stiffness, etc.

Measurement instruments

Functional balance was assessed using the Berg Balance Scale (BBS)[23] and Timed Up and Go Test (TUGT)[24]. The BBS consists of 14 items which require subjects to maintain positions of varying difficulty by diminishing the base of support, changing positions, and performing specific tasks such as turning the trunk, reaching forward while standing, stepping on a stool, and retrieving an object from the floor. Each task is scored on a 5-point scale (0 to 4: 0 = unable to perform, 4 = independent). Fifty-six points are the maximum score of the test. The score of less than 45 indicates high risk for falls[25]. Minimal changes of 6 points on the total BBS score reflects the clinical change in balance[26]. Results of 2 reliability studies of this scale have shown high inter-rater (ICC = 0.98) and intra-rater (ICC = 0.99) reliability[23,27]. For the TUGT, subjects sat comfortably on a chair, then were asked to stand up, walk 3 m., turn around, walk back to the chair and sit down, at their own pace(24). The time taken to perform the test was measured in seconds. Subjects repeated the test 3 sessions with 5 minutes rest between each test, and the average time was used for analysis. The TUGT has good intra- and inter-rater reliability of 0.93 and 0.96, respectively[28] and is correlated highly with scores on the BBS[25].

Procedures

The investigator contacted the Samliam primary care unit to gather database of resident aged 60 and older of Samliam 1 community. The functional balance using the BBS was performed to the elderly who were eligible to the study. Then, the investigator visited individual elderly persons whose BBS scores were less than 45 (indicating the high risk of falling). The participants then attended the first pre-intervention assessment involving functional balance tests (the BBS

and TUGT). These assessments were done at their residences. Information on age, sex, education, marital status, health status, daily activity, and fall history in the past 6 months was recorded through direct interviews. Four weeks later, the BBS and TUGT were repeated again (i.e., the second pre-intervention assessment). During this interval of 4 weeks, the investigator visited the participants at least 5 days/ week. The purposes of each visit were to cooperatively assess and discuss about the specific problems relating to functional balance of each participant. A physical therapy program to improve functional balance was cooperatively designed and individually tailored to each subject. Emphasis was placed on self management and adjustment to health status.

Immediately after finishing the second pre-intervention assessment, the participants were encouraged to practice their physical therapy program for 4 weeks. The investigator kept visiting each participant every 2 weeks to encourage the subject to keep practicing and to offer advice for an advanced program. The BBS and TUGT were re-assessed at the fourth week (i.e., the first post-intervention assessment). The data were fed back to the participants. If necessary, the program could be revised. After that, the participants were asked to keep following the program for 4 more weeks. The investigator visited the elderly once to keep relationship. After the completion of this last month of the study, the participants underwent the second post-intervention assessment for their functional balance (the BBS and TUGT).

Data analysis

Descriptive statistics were drawn up to describe the demographic data. The baseline and post-intervention data for the BBS and TUGT were compared using paired t-tests. Normality of the data set was assessed using the Shaprio-Wilk W test. All analyses in this study were performed using the STATA statistical software package version 9.0. A value of $P < 0.05$ was used to decide the significance for all analyses.

Results

Subject characteristics

Eleven elders who had BBS scores of less than 45 were invited to enroll in the study. However, 2 persons were excluded due to aggravated symptoms of diabetes and gouty arthritis, respectively. Therefore, there were 9 elders participating in the study. The demographic characteristics of 9 participants (2 men and 7 women) are outlined in **Table 1**. Their ages ranged from 67 to 88 years with an average age of 77.4±5.8 years. All subjects had multiple health problems and used multiple medications. The subjects had normal vision (with and without glasses).

Physical Therapy Program

Table 2 summarizes each subject's problems relating to functional balance and physical therapy program to improve balance. It could be summarized from Table 2 that, based on the principle of client-centered approach, the physical therapy program to improve functional balance in the community-dwelling elderly mainly consisted of 1) therapeutic exercises to improve balance and increase muscle strength as well as flexibility of lower extremity, and 2) superficial heat therapy at pain regions. Balance exercises were designed based on the BBS items which were difficult to perform by the subjects such as standing unsupported with feet together, standing unsupported one foot in front, reaching forward with outstretched arm while standing, turning to look behind over left and right shoulders while standing, and placing alternate foot on step or stool while standing unsupported.

Table 1 Demographic characteristics of subjects (n = 9). F = female, M = male.

Subject No.	Age (years)	No. of family member	Daily activity	Current health problem	Medication	Gait aid
F1	88	4	1. Walking 15-20 min/day, total 5 m.	1. Both eyes dry 2. Hypertension	1. Amlodipine 2. Artificial tear 3. Vitamin	None
F2	81	5	1. Aerobic exercise 30 min/day, 1 day/week 2. House-keeping 1 hr/day 3. Walking 30 min/day, total 10 m.	1. Both knee joints pain 2. Peptic ulcer	1. Diclofenac 2. Ranitidine	One point cane
F3	80	5	1. House-keeping 1 hr/day 2. Walking 30 min/day, total 10 m.	1. Back and both knee joints pain 2. Diabetes 3. Hypertension 4. Peptic ulcer	1.Amlodipine 2. Glipizide 3. HCTZ 4. Metformin	One point cane
M4	79	6	1. Bicycling 2-3 hr/day 2 Cooking 30 min/day 3. Walking 1 hr/day, total 50 m.	1. Diabetes 2. Hypertension	1. Amlodipine 2. Anapril 5 3. ASA gr 1 4. Glipizide 5. HCTZ 6. Metformin	None
M578	5	1. Gardening 10 min/day 2. Walking 15 min/day, total 5 m.		1. Benign prostatic hypertrophy 2. Dyslipidemia 3. Hypertension 4. Left shoulder joint pain and limitation 5. Peptic ulcer	1. Amlodipine 2. ASA gr. 1 3. Doxazosin 4. Glipizide 5. Simvastatin	None

Subject No.	Age (years)	No. of family member	Daily activity	Current health problem	Medication	Gait aid
F6	76	5	1. House-keeping 10-15 min/day 2. Walking 10 min/day, 5 m.	1. Both knee joints pain 2. Hypertension	1. Amlodipine 2. HCTZ	One point cane
F7	75	3	1. Cooking 30 min/day 2. Walking 30 min/day, total 10 m.	1. Both knee joints pain 2. Cataract of both eyes 3. Diabetes 4. Hypertension	1. Amlodipine 2. Metformin	None
F8	73	6	1. House-keeping 10-15 min/day 2. Walking 10 min/day, total 6 m.	1. Both knee joints pain 2. Diabetes 3. Heart disease 4. Hypertension 5. Right hip pain with radiating to leg and foot	1. ASA gr.1 2. Glipizide 3. HCTZ 4. Prenolol 5. “Yaa Look Klon” (herbal tablets)	One point cane
F9	67	3	1. Aerobic exercise 30 min/day, 2-3 days/week 2. House-keeping 1 hr/day	1. Back pain with radiating to both legs 2 Both knee joints pain 3. Heart disease	1. Mydoclam	None

Table 2 Problems relating to functional balance and physical therapy program to improve balance of each subject (n = 9). F = female, M = male.

Subject No.	Problems relating to functional balance	Physical therapy program
F1	1. Poor functional balance (BBS = 39) 2. Both quadriceps muscles weakness 3. Both calf muscles tightness	1. Balance training 5 times/set, 1 set/day, 1-2 day/week - standing unsupported with feet together - standing unsupported one foot in front - reaching forward with outstretched arm while standing 2. Quadriceps muscle exercise 5 times/set, 1 set/day, 1-2 day/week 3. Calf muscle stretching exercise 4. Massage at calf muscles 5-10 min/set, 1-2 set/day, 2-3 days/week 5. Hot pack at calf muscles 20-30 min/day
F2	1. Poor functional balance (BBS = 37) 2. Both quadriceps muscles weakness 3. Both knee joints pain	1. Balance training 5-10 times/set, 2 sets/day, 2-3 days/week - standing unsupported with feet together - standing unsupported one foot in front - reaching forward with outstretched arm while standing - pick up object from the floor from a standing position - placing alternate foot on step or stool while standing unsupported 2. Quadriceps muscle exercise 5-10 times/set, 2 sets/day, 2-3 days/week 3. Hot pack at both knees 20-30 min/day 4. Consulting health personnel at the primary care unit about knee pain

F3	1. Poor functional balance (BBS = 40) 2. Both quadriceps muscles weakness 3. Back and both knee joints pain	1. Balance training 10 times/set, 1 set/day, 3-5 days/week - standing unsupported with feet together - standing unsupported one foot in front - reaching forward with outstretched arm while standing - turning to look behind over left and right shoulders while standing 2. Quadriceps muscle exercise 10 times/set, 1 set/day, 3-5 days/week 3. Hot pack at back and both knees 20-30 min/day 4. Stretching exercise (knee to chest, trunk rotation 5 times/set, 1 set/day, 2-3 days/week 5. Consulting health personnel at the primary care unit about knee pain
M4	1. Poor functional balance (BBS = 43)	1. Balance training 5 times/set, 1 set/day, 1-2 day/week - standing unsupported with feet together - standing unsupported one foot in front - reaching forward with outstretched arm while standing
M5	1. Poor functional balance (BBS = 42) 2. Both quadriceps muscles weakness 3. Left shoulder joint pain and limitation and pain	1. Balance training 5-10 times/set, 1 set/day, 1-2 day/week - standing unsupported with feet together - standing unsupported one foot in front - pick up object from the floor from a standing position - turning to look behind over left and right shoulders while standing 2. Quadriceps muscle exercise 5-10 times/set, 1 set/day, 1-2 day/week 3. Hot pack at left shoulder 20-30 min/day 4. Left shoulder mobilization by the investigator twice 5. Shoulder exercise (flexion, abduction, internal and external rotation) 5-10 times/set, 1 set/day, 7 days/week 6. Consulting health personnel at the primary care unit about left shoulder pain and limitation

F6	1. Poor functional balance (BBS = 24) 2. Both quadriceps muscles weakness 3. Both knee joints pain	1. Balance training 5-10 times/set, 1 set/day, 1-2 day/week - sitting to standing - standing unsupport - standing unsupported with feet together - standing unsupported one foot in front - turning to look behind over left and right shoulders while standing - placing alternate foot on step or stool while standing unsupported 2. Quadriceps muscle exercise 5-10 times/set, 1 set/day, 1-2 day/week 3. Hot pack at both knees 20-30 min/day 4. Consulting health personnel at the primary care unit about knee pain
F7	1. Poor functional balance (BBS = 41) 2. Both quadriceps muscles weakness 3. Cataract of both eyes	1. Balance training 5-10 times/set, 1 set/day, 2-3 days/week - standing unsupported with feet together - standing unsupported one foot in front - turning to look behind over left and right shoulders while standing - placing alternate foot on step or stool while standing unsupported 2. Quadriceps muscle exercise 5-10 times/set, 1 set/day, 2-3 days/week 3. Consulting health personnel at the primary care unit about cataract
F8	1. Poor functional balance (BBS = 39) 2. Both gluteus and quadriceps muscles weakness 3. Both knee joints pain 4. Right hip pain with radiating to leg and foot	1. Balance training 5-10 times/set, 1 set/day, 1-2 day/week - standing unsupported with feet together - standing unsupported one foot in front - reaching forward with outstretched arm while standing - turning to look behind over left and right shoulders while standing - placing alternate foot on step or stool while standing unsupported

		2. Hip and quadriceps muscle exercise 5-10 times/set, 1 set/day 1-2 day/week 3. Hot pack at both knees 20-30 min/day 4. Consulting health personnel at the primary care unit about hip and knee pain
F9	1. Poor functional balance (BBS = 40) 2. Both gluteus and quadriceps muscles weakness 3. Both knee joints pain 4. Back pain with radiating to both legs	1. Balance training 5-10 times/set, 1 set/day, 2-3 days/week - standing unsupported with feet together - standing unsupported one foot in front - reaching forward with outstretched arm while standing - turning to look behind over left and right shoulders while standing 2. Quadriceps muscle exercise 5-10 times/set, 1 set/day, 2-3 days/week 3. Hot pack at knees 20-30 min/day 4. Consulting health personnel at the primary care unit about back and knee pain 5. Consulting physical therapits at Khon Kaen hospital about back and knee pain

Changes in functional balance

Before determining the effects of a physical therapy program on functional balance, the 2 pre-intervention assessment scores was examined. Paired t-tests revealed no significant differences between the first and second pre-intervention assessments for the BBS and TUGT ($P > 0.05$). However, some health incidents were reported at the second pre-intervention assessment of 2 participants (F6 and F9), and might affect their functional balance. Therefore, the average value of the first and second pre-intervention assessments was used as baseline scores for the analysis of changes. The participants' BBS scores at each assessment are demonstrated in **Table 3**. When compared with the mean BBS of the 2 pre-intervention assessments, i.e. 38.4 points, significant increases in the scores were found at the first and second post-intervention assessments ($P = 0.0001$ and 0.03, respectively). However, these improvements in the BBS did not reflect clinical changes in the subject's functional balance as changes in the scores were less than 6 points.The TUGT scores throughout the 12-week study are shown in **Table 4**. The average TUGT value of the first and second pre-intervention assessments was 16.6 seconds. The physical therapy program with client-centered approach did not significantly affect the TUGT.

Table 3 BBS scores. F = female, M = male

Subject No.	Assessments (0-56)			
	1st pre-intervention	2nd pre-intervention	1st post-intervention	2nd post-intervention
F1	39	41	44	36[a]
F2	37	40	46	45[b]
F3	40	39[c]	45	41[d]
M4	43	41[e]	45	48
M5	42	43	50	53
F6	24f	33[g]	34h	37
F7	41	39[i]	41	42
F8	39	38	45	37[j]
F9	40	33[k]	44	47
Median	**40**	**39**	**45**	**42**
Mean	**38.3**	**38.6**	**43.8***	**42.9****
SD	**5.7**	**3.5**	**4.4**	**5.8**

a = The subject was still tired after 2-day hospital admission last 2 weeks because of short breathing.

b = The subject reported increased left knee joint pain because of over walking.

c = The subject reported increased both knee joints pain because of running out pain killer medicine.

d = The subject reported pain at right big toe because of stumbling on a stone.

e = The subject had to see a doctor a few weeks ago because of dizziness.

f = The subject reported body ache because of experiencing a fall last 2 weeks.

g = The subject had much recovered from a recent fall.

h = The subject had both ankle and feet edema because of prolonged sitting.

i = The subject was having a cold.

j = The subject reported increased right hip and leg pain but could not specify a reason.

k = The subject reported increased both hips and legs pain because of over house-keeping activity.

* $P = 0.0001$, compared with the mean of the 2 pre-intervention assessments

** $P = 0.03$, compared with the mean of the 2 pre-intervention assessments

Table 4 TUGT scores. F = female, M = male

Subject No.	Assessments (0-56)			
	1st pre-intervention	2nd pre-intervention	1st post-intervention	2nd post-intervention
F1	24	17	15	17[a]
F2	22	18	20	17[b]
F3	16	10[c]	12	15[d]
M4	12	10[e]	13	13
M5	17	15	15	17
F6	27f	21[g]	27[h]	29
F7	14	18[i]	16	13
F8	13	14	14	17[j]
F9	13	17[k]	17	15
Median	**16**	**17**	**15**	**17**
Mean	**17.6**	**15.6**	**16.6**	**17**
SD	**5.5**	**3.7**	**4.6**	**4.8**

a = The subject was still tired after 2-day hospital admission last 2 weeks because of short breathing.

b = The subject reported increased left knee joint pain because of over walking.

c = The subject reported increased both knee joints pain because of running out pain killer medicine.

d = The subject reported pain at right big toe because of stumbling on a stone.

e = The subject had to see a doctor a few weeks ago because of dizziness.

f = The subject reported body ache because of experiencing a fall last 2 weeks.

g = The subject had much recovered from a recent fall.

h = The subject had both ankle and feet edema because of prolonged sitting.

i = The subject was having a cold.

j = The subject reported increased right hip and leg pain but could not specify a reason.

k = The subject reported increased both hips and legs pain because of over house-keeping activity.

Discussion and Conclusion

Two pre-intervention assessments were carried out in this study with a time interval of 4 weeks. The purpose for this study design was to ensure that any changes exhibited in the study would be attributable to the intervention. Although the analysis showed no significant differences between the first and second pre-intervention assessments for functional balance variables, some health incidents were reported at the second test of a few participants, and might affect their balance. The average value of the first and second pre-intervention assessments was thus used as the baseline scores for the analysis of changes.

In this study, the physical therapy program with client-centered approach to improve functional balance of the elderly was designed for individual participants, based on the principle of client-centered approach. Tailoring program to each subject's specific problems relating to balance was much considered. According to the older subjects included in the current study, it could be summarized that the physical therapy program with client-centered approach to improve functional balance of the community-dwelling elderly mainly consisted of therapeutic exercises to improve balance and increase muscle strength as well as flexibility of lower extremity, and thermotherapy using hot pack on the painful joint.

After completion of the study, a statistical significance in the BBS score was presented. However, the mean changes in the BBS scores were less than 6 points which did not reach the clinical important level in terms of functional balance[26]. This result may be due to ineffectiveness of the program as it was commented by most participants at the end of the study.

Since the primary outcome of the study was the BBS, the physical therapy program was concentrated on therapeutic exercises to improve balance, leg muscle strength and flexibility. The BBS items which were difficult to perform by the subjects were included in the exercise program. Although the BBS scores were significantly increased at post-intervention assessments, considering data of individual participants revealed that changes in the BBS scores were influenced by pain at any body part of the subjects. The scores seemed to be inversely related to the severity of pain reported by the subjects. Even though pain was a common health problem of most participants in the study, unfortunately the investigator did not draw much attention to pain management for the subjects. Most participants were suggested to reduce their pain only by using hot pack, massage, and consulting health personnel at the primary care unit though they might need an intensive and specific intervention. Only 1 subject (F9) received proper pain management program provided by a physical therapist. This may reflect the investigator's viewpoint that our balance scores would have been improved if we only performed a balance exercise. In fact, balance or postural stability involves the complex organization of multiple sensory systems (somatosensory, visual, and vestibular inputs) that are related, via the central nervous system, to many muscles which are part of a multilinked musculoskeletal system[29]. Any problems in joint and muscle will thus affect balance. As suggested by Poole and colleagues[30], neck pain in the elderly may contribute to some disturbance in balance and gait parameters over and above that which occurs with normal ageing. A recent study has also revealed that musculoskeletal pain in the lower body, especially chronic low back, hip and knee pain, negatively affects the balance ability in the healthy adults[31]. To improve one's balance, therapists need to widen their approach to cover other factors relating to balance as much as possible. From the current study, it could be suggested that to improve the elder's balance, the investigator should pay more

attention on the issue of pain management, apart from exercise program in general.

Besides ineffective procedures to relieve pain, the intensity of exercise program used in the current study may be too low to affect clinical changes in the BBS. Based on a previous study[6], an exercise program to improve functional balance (assessed by the BBS) of the elderly should be at least 5-10 times/set/activity, 1-2 set/day, and 3 days/week. In this study, most subjects exercised only 5 times/set/activity, 1 set/day, and 1 day/week which might not be intense enough to increase the BBS.

Most participants informed that they did not regularly perform their physical therapy programs because of various reasons such as pain at some body part, being lazy and bored. This may imply that the program is not interesting enough although attention was paid specifically to ensure that the subjects would greatly benefit from the program which was designed by them with the investigator's facilitation. To follow the principle of a client-centered approach, the investigator paid much attention on tailoring the physical therapy program to each subject's problems relating to balance by means of discussion with the subjects. However, the investigator observed that some subjects were rarely expressed their ideas and opinions regarding their programs. They were likely to rely on the investigator's judgment. This may be due to a typically urban Thai culture that a person tends to respect professional suggestion rather than their own ideas. The subjects might adopt a passive role because they got used to that culture. The other possible explanation of a low level of participation in developing the physical therapy program observed in some subjects is that they are not ready to participate in health services in a client-centered manner, probably due to old age, poor health condition, or negative attitude to illness. The investigator then had to facilitate these subjects as much as possible to involve in developing their programs. However, such facilitation may be inadequate because of the limitations on time and skill as well as experience in community work of the investigator. Thus, some subject's physical therapy programs were rather influenced by the investigator's suggestion, leading to a small sense of ownership of the programs in these subjects. The attraction of the programs may not be great enough for the subjects to perform the programs throughout the study period. Therefore, it could be suggested for further study that therapists should endeavor to engage clients in decision-making. They should evaluate a client's level of readiness and tailor interventions for participation accordingly. Matching an intervention to a client's level of readiness to engage in an activity should be more effective than the universal application of one particular intervention.

Motivating elders, who mostly have health problems, to adhere to an activity program is a major challenge. As presented by Yardley and her colleagues[32, 33], the positive identity (e.g. interest, enjoyment) of a training program is a factor for the elderly to undertake the program. The current study's findings may indicate that it is necessary for unhealthy elders for having someone to motivate them to follow a therapy program. In this study, the investigator visited the participants twice a month to encourage them to perform their programs. Such visit's frequency may not be adequate to affect clinical changes. In real situation, however, it may not be possible for a community physical therapist to visit all clients every week. Participation of family member or caregiver in a therapy program for the elderly may be necessary. This claim could be supported by Tepdara and co-workers[34] who demonstrated that lack of the caregiver's participation in rehabilitation teams was a cause of the inadequate rehabilitation services for stroke patients.

The current study failed to show a significant

change in the TUGT. A possible explanation for this finding is that more walking exercise has not been added in any participant's physical therapy program. This may be a consequence of the particular emphasis only on balance exercise of the investigator, as discussed above. Although walking was a daily activity of most participants, its intensity and duration were a little light. It was also observed that, similar to the BBS, the TUGT scores were frequently influenced by the severity of pain at any body part of the participants. Furthermore, the participants may be worry that they might fall if they walked fast, thus resulting in a non-significant change in TUGT score.

Because of the limitation on time, subjects in this study were recruited only from Samliam 1 community. This resulted in a sample size of 9 elders participating in the study. This small sample size may be a cause of non-significantly statistical and/or clinical results even though the intervention effects could be available. Nonetheless, it should be kept in mind that interpretation of the findings only via statistical means may conceal some beneficial aspects of the study and should be cautious. Considering data of each participant may provide another useful aspect of the findings. As mentioned earlier, the BBS score of less than 45 indicates high risk for falls[25]. Minimal change of 6 points on the total BBS score reflects the genuine change in functional balance[26]. All elders enrolled in the current study were the high risk of falling group (BBS<45). After completion of the first month of physical therapy program, an interesting finding was revealed. Five participants (F2, F3, M4, M5 and F8) improved their total BBS scores to be 45 or more, indicating a decrease in risks of falling. A 6-point or more change in the BBS was presented in 5 subjects (F2, F3, M5, F8 and F9). These subjects expressed that they had tried to follow all items of their physical therapy programs.

At the final post-intervention assessment, the BBS scores of some subjects were decreased. This may be coincidental with an increased pain and sickness. The participants whose BBS improved from the previous assessment informed that they always kept exercising as much as they could. At the end of the study, fall risks of 4 subjects (F2, M4, M5 and F9) were less as their BBS scores were greater than 45.

In conclusion, the physical therapy program with client-centered approach on functional balance in the elderly significantly improved the BBS of the elderly. However, it was observed that changes in the functional balance scores were frequently influenced by pain at any body part of the subjects but the physical therapy program did not pay much attention on the issue of pain. Therefore, it is suggested that to improve older people's balance, therapists should widen their approach to cover other factors relating to balance as much as possible.

Acknowledgements

This work was supported by Graduate School and Faculty of Associated Medical Sciences, Khon Kaen University. The most sincere thanks are expressed to all participants and the staff in the Samliam primary care unit.

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