

IMMEDIATE EFFECTS OF THAI MASSAGE ON GAIT SPEEDS AND BALANCE PARAMETERS IN ELDERLY

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ABSTRACT: The purpose of this study was to determine the immediate effects of Thai massage on gait parameters, balance performance, and trunk flexibility in elderly aged 60-80 years. A randomized control trial was used. Sixteen elderly participants (12 females and 4 males) participated. They were divided into a Thai massage group and a control group. Participants in Thai massage group received 1-hour whole body Thai massage while those in the control group were assigned to rest for one-hour. Changes in all parameters after receiving each of the sessions were compared by independent T-test. Within-group comparisons were analyzed by dependent t-test. Significant differences were found for within-group comparison in right gait cycle duration of maximal gait speed (0.0023 s; p -value = 0.0023), single leg stance of left leg with open eye (15.17 s.; p -value = 0.034), and close eye conditions (2.3 s.; p -value = 0.022), and right leg with open eye (12.41 s.; p -value = 0.0294) and close eye conditions (4.06 s.; p -value = 0.0087), and trunk flexibility (2.14 cm.; p -value = 0.0003). However, there are little improvement of gait speed, stride length, gait cycle duration, cadences, and time-up-and-go test. We concluded that one session of Thai massage could provide immediate improvement in some gait parameters, balance performances, and body flexibility.

Keywords: Elderly, Thai massage, Gait, Balance, Flexibility

1. INTRODUCTION

Worldwide, elderly population is increasing faster. Number of elderly people aged 60 years or over in 2000 and 2012 were 607 and 900 million respectively and it is projected to reach 2,092 million in 2050. The world will be turned to ageing society [1]. The health status of elderly people is degenerated by the physical changes in many systems with decrease in performances and capabilities of physiological processes [2]. Moreover, these changes also influence mobility and activities of elderly people that are affected to health problems and considered as fall risk [3].

Exercise is found to help improve gait and balance performance of elderly by improve muscle strength, delivery and extraction of oxygen to the muscle, and joint range of motion [4]. Furthermore, other treatment that also help improve balance and gait were therapeutic massage [5], [6], and foot massage [7].

Lately, Thai massage is a practicable, and cheap traditional treatment for Thai people. There are many benefits of Thai massage including increasing blood flow, skin temperature, and tissue flexibility, and decreasing pain and muscle spasm. In addition, Thai massage may improve arousal or body awareness in elderly that resulted from response of brain activating. Previous study also found that Thai

massage improved walking performances in normal adults [8], improve physical fitness of soccer players [9], improved recovery performance after fatigue of basketball player, [10] decreased spasticity, and improved quality of life and psychological condition in stroke patients [11]. According to previous study, Thai massage may improve walking and balance performances in elderly people but there is no previous study investigate about this topic. Thus, propose of this study was to investigate the immediate effects of Thai massage on gait speed and balance performances in elderly adults compare with resting or control session.

2. METHOD

2.1 Design and setting

A randomized control trial was conducted at Nong Wang Community Health Center, Khon Kaen hospital. The study was approved by the ethical committees of Khon Kaen University, and Khon Kaen Hospital.

Elderly participants were recruited from Khon Kaen province using bulletin boards and oral requests for participants during 2 months period between November and December 2018. Participants who 60-80 years old with ability to

walk equal or more than 10 meters without walking aid and good co-operation were included in this study. They were excluded if they had history of brain injury, acute or unstable chronic illness, uncontrolled hypertension, communicable diseases, osteoporosis, deep vein thrombosis, acute arthritis at upper and lower limb, vestibular, neurological and cardiovascular problem, fracture and dislocation, deformities of lower extremities, pain more than 5/10 on visual analog scale, opened wound at back, upper and lower extremity, and visual problems than could not be solved by glasses.

2.2 Intervention

A whole body of Thai Massage session was used as an intervention in this study. The 1-hour Thai massage protocol consisted of deep pressure massage and stretch on major muscles of the body. Firstly, therapist applied gently and deep thumb pressure massage along the meridian lines that covered neck, back, lower and upper extremities and foot consequently (Fig. 1 – 9). Thumb pressure was maintained at each point on the meridian lines for 5-10 seconds each point and repeated 3 times. The intensity of thumb pressure was not exceeded pressure pain threshold of participants and was adjusted by the therapist. After massage session, the therapist applied gentle stretch for those muscles including calf, hamstring, and quadriceps as shown in Fig. 10 – 12. Participants in control group was assigned to rest on the bed in the same environment as massage group.

3. PROCEDURE

3.1 Randomization

Sixteen participants who met the above inclusion/exclusion criteria were recruited and randomly allocated into one of two groups using block-randomized allocation with block sizes of 2 and 4. The groups were assigned using a pre-generated random assignment scheme enclosed in envelopes, which resulted in a total of 8 participants per group.



Fig.1 Massage lines of neck area



Fig.2. Massage lines of back area.



Fig.3 Massage lines of lower extremity (medial side)



Fig.4 Massage lines of lower extremity (lateral side)



Fig.5 Massage lines of lower extremity (anterior side)



Fig.6 Massage lines of lower extremity (posterior side)



Fig.7 Massage lines of upper extremity (anterior side)



Fig.8 Massage lines of upper extremity (posterior side)



Fig.9 Massage lines of feet



Fig.10 Quadriceps muscle stretching



Fig.11 Hamstrings muscle stretching



Fig.12 Calf muscle stretching

3.2 Treatment

Participants in group A received a session of one-hour Thai massage. Whereas participants in group B took one-hour rest in supine lying position.

In keeping with the recommendation of Khon Kaen University's ethical committee and Board in Human Research Khon Kaen Hospital Institute Review, all participants gave informed consent before participation in the study.

4. ASSESSMENT

On the baseline and immediate session, all outcome measures were assessed by one physical therapist. Details of outcome measures and assessments are described below.

Gait parameters were assessed by walking in preferred gait speed and maximal gait speed on 10-meter walkway. Participants were assigned to wear the Opal sensors of APDM at the sternum, posterior lower back, and both foot while walking. Outcomes consisted of gait speed, stride length, cadences, gait cycle duration of preferred gait speed and maximal gait speed. This test was repeated 3 times and calculated for the average values for each speed.

The Single-leg-stance test (SLS) was assessed static balance over the stance leg. The SLS was measured standing time on each foot in condition of open eyes and close eyes. The assessor started time when participants lifted feet from the floor. Participant were able to balance their body by move hand or body but they were not allowed to touch anything while controlling their body. Time was stopped when they moved their stance feet or other feet touched the floor [12].

The time-up-and-go test (TUG) was measured dynamic balance by timing the 5 sequences of test including standing up from armchair, walking 3-meter distance, turning, walking 3-meter distance back to chair, and sitting down. Using stopwatch to time the tasks of 5 sequences. Time was started

when assessor said “go” and stopped when participants sit and lean to the back rest of chair [13].

A sit-and-reach box was used to measure body flexibility. Participants sat long-sitting to the sit-and-reach box and reached both hands forward as much as possible to the measuring bar. [14]. Participants were allowed to practice in the 1st trial. and they were recorded on the other 2 trials. The value considered as the test result was the best value of 2 trials.

5. STATISTICAL ANALYSES

Changes in all parameters between Thai massage session and control session results were analyzed by independent t-test. Changes between pretest and posttest for both sessions were performed by dependent t-test. All statistical analyses were calculated by Stata 10 software (StataCorp LP, 4905 Lakeway Drive College Station, Texas 77845, USA). A *p*-value of less than 0.05 was considered statistically significant.

6. RESULTS

Twenty potential participants responded to flyers or word-of-mouth; Four were excluded after screening for eligibility. 16 adults who met the inclusion and exclusion criteria were randomly assigned to the treatment group and the control group. A flow chart of participant progression through the trial is presented in Fig.13. The characteristic of the study population is shown in Table 1. There were 12 females and 4 males. The mean age of control group and massage group were 70.63 and 66.91 years. The mean weight of control group and massage group were 65.93 and 69.09 kilograms. The mean height of control group and massage group were 160.64 centimeters and 159.18 centimeters.

Gait cycle duration of maximal gait speed, single-leg-stance test of all conditions and sit and reach test showed significant improvement after Thai massage session. (Table 2)

7. DISCUSSION

This study showed that one session of 1-hour whole body Thai massage could improve walking performance, balance performances and trunk flexibility in elderly on stride lengths of maximal gait speed, gait cycle duration of maximal gait speed, single-leg-stance test, and sit-and-reach test results. Thai massage is to use deep pressure on meridian lines that covers all muscles of the whole body and follow by passive stretching. Possible mechanisms of Thai massage on improving flexibility, gait and balance may base on the neuro-mechanical and mechanical effects. Massage may arouse the proprioceptive nerve endings, adjust

sarcomere length, stretch muscle, tendon, and ligament structures that begin reflex muscle relaxation [15][16]. Mechanical pressure of massage may decrease tissue adhesion by lengthen reduced or adhered connective tissue [17]. Thai massage may help improve flexibility as measured by sit-and-reach test [8]. Furthermore, flexibility may help improve stride length and gait cycle duration [18].

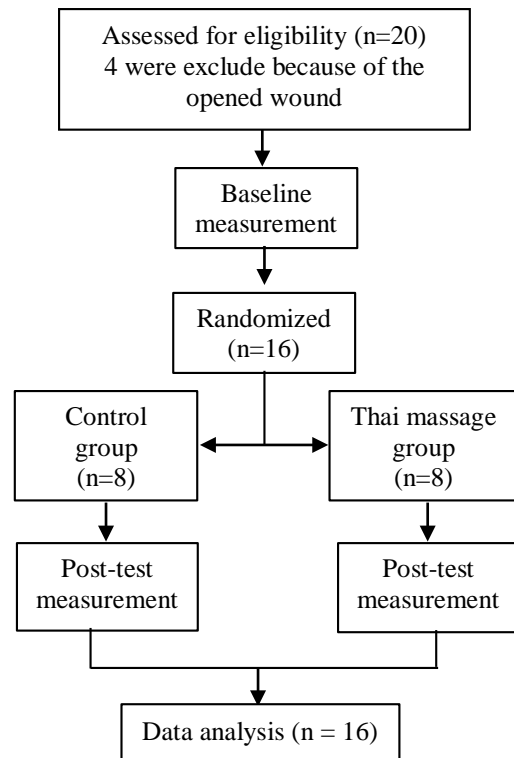


Fig.13 Diagram of study design and participants

Moreover, massage found to affect the somatosensory systems. It may arouse muscle, tendons, joints, and ligaments to provoke the proprioceptors including cutaneous, Golgi tendon organ, joint receptors, and muscle spindles by pressure distribution, muscle tension, changing joint angle, and changing muscle length respectively. Massage methods also activated the resetting of unproductive reflex actions [19]. These effects may help improve balance performance.

In addition, our results were related with earlier studies found that Thai massage could improve gait parameters, balance performances, and trunk flexibility. Thai massage might improve stride length and trunk flexibility in normal adult with hamstring tightness [8]. Thai massage on the lower leg might decreased pain and duration of TUGT in elderly with knee pain [20]. Thai foot massage also found to improve TUGT and Single-leg-stance in diabetes patients with peripheral

Table 1. Characteristics of the study population

Participant Data	Group A	Group B
Gender (female/male)	6/2	6/2
Age (year)	70.63 ± 6.38	66.91 ± 5.52
Weight (kg)	65.93 ± 9.1	69.09 ± 10.94
Height (cm)	160.64 ± 9.48	159.18 ± 8.32

Table 2. Evaluation of outcome measures (Mean±SD). Variables showing a significant interaction effects between groups have been signed with * (*p*-value is less than 0.05).

Parameter	Pre-A	Post-A	Pre-B	Post-B
Maximal gait speed				
	1.42	1.45	1.46	1.51
Gait speed (m/s)	±0.18	±0.16	±0.16	±0.25
Left stride length (m) *	1.25	1.26	1.27	1.3
	±0.11	±0.11	±0.17	±0.17
Right stride length (m) *	1.25	1.25	1.27	1.29
	±0.11	±0.1	±0.17	±0.18
Left cadence (bpm)	125.5	126.4	127.9	130.4
	±11.87	±10.7	±9.27	±10.87
Right cadence (bpm)	125.4	126.2	127.7	130.3
	±11.94	±11.04	±9.51	±11.07
Left gait cycle duration (s)	0.96	0.97	0.94	0.93
	±0.08	±0.06	±0.08	±0.08
Right gait cycle duration (s) *	0.96	0.98	0.95	0.92
	±0.08	±0.06	±0.08	±0.09
Preferred gait speed				
	1.1	1.11	1.07	1.12
Gait speed (m/s)	±0.15	±0.09	±0.14	±0.19
Left stride length (m)	1.12	1.12	1.1	1.12
	±0.09	±3.39	±0.12	±0.11
Right stride length (m)	1.1	1.11	1.09	1.12
	±0.09	±0.07	±0.12	±0.11
Left cadence (bpm)	111.3	109.7	112.6	114.6
	±7.04	±6.23	±6.88	±9.49
Right cadence (bpm)	110.9	109.3	112.5	114.4
	±6.93	±6.34	±6.92	±9.35
Left gait cycle duration (s)	1.1	1.1	1.08	1.07
	±0.08	±0.07	±0.09	±0.09
Right gait cycle duration (s)	1.1	1.1	1.08	1.07
	±0.09	±0.07	±0.09	±0.09
Single-leg-stance test				
Opened eye	23.72	25.87	24.9	40.06
Left side (s) *	±11.02	±12.53	±10.98	±30.17
Opened eye	25.68	25.47	26.16	38.57
Right Side (s) *	±9.95	±10.59	±14.12	±28.27
Closed eye	4.85	6.14	5.12	7.42
Left side (s) *	±2.69	±3.8	±1.81	±3.7
Closed eye	5.48	6.32	4.48	8.55
Right Side (s) *	±3.33	±4.55	±4.85	±4.53
TUG test (s) *	8.81	9.25	8.79	8.26
	±1.44	±1.25	±1.94	±1.92
Sit and Reach (cm) *	1.54	1.45	1.64	3.77
	±9.03	±9.82	±11.02	±10.65

neuropathy [21]. Moreover, many researchers studied the effects of other type of massage which is similar to Thai massage. 15-minute of therapeutic massage might improve gait speed, stride length, and step length in adult with DOMS [22]. 1-hour whole body therapeutic massage might improve balance performance in elderly [5]. 25 minutes of Chinese massage might improve walking speed in elderly with knee osteoarthritis [23]. A small improvement of some gait parameters after 1-hour Thai massage were founded because of a few Thai massage sessions. One session of 1-hour whole body Thai massage could not give a great result. Further study should investigate the multiple sessions with follow-up session on these effects. This study was the pilot study with few participants. Further study also should investigate with proper number of participants.

7. CONCLUSIONS

According to the results of this study, we concluded that 1-hour Thai massage session may provide some immediate improvement of gait parameters, balance performance, and trunk flexibility, especially for stride length of maximal gait speed, gait cycle duration of maximal gait speed, single-leg-stance test, time-up-and-go test, and sit-and-reach test. In a further study, long-term treatment with following up are suggested.

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