

Immediate effect of Thai massage on timed-up-and-go test in elderly: a pilot study

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KEYWORDS

Elderly;
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ABSTRACT

The purpose of this study was to determine the immediate effects of Thai massage on Time-up-and-go test (TUGT) in elderly aged 60-80 years. A preliminary comparative study was used. Sixteen elderly participants (12 females and 4 males) participated. They were randomly allocated into a Thai massage group and a control group. Participants in the Thai massage group received 1-hour session of whole-body Thai massage while those in the control group were assigned to rest for one hour. TUGT were measured at the baseline and immediate after the intervention with opal sensors and APDM mobility lab software. Primary outcome from software was TUGT duration. Other outcomes from software were turn angle, turn duration, sit-to-stand duration, sit-to-stand lean angle, stand-to-sit duration, and stand-to-sit lean angle. For parametric data, dependent t-test and independent t-test were used to calculate the within-group and between-group differences, respectively. Wilcoxon signed rank test and Wilcoxon rank sum test were used to compare the outcome difference of within-group and between-group for non-parametric data, independently. A p -value < 0.05 was considered statistically significant. There were no significant differences for both within-group (0.19 s, p -value =0.15) and between-group (0.50 s, p -value =0.55) in the duration of TUGT duration and other parameters. We concluded that one session of Thai massage could not provide immediate effect to improve balance performance.

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Introduction

The elderly global population has been increased every year⁽¹⁾. The health status of older people is declined by physical changes in many systems with a reduction in capabilities of physiological processes⁽²⁾. Furthermore, these physiological changes also affect the balance performances of older people⁽³⁾ that are considered fall risk and affected to health problems⁽⁴⁾.

Exercises were found to be a helpful intervention for improving balance performances of older adults by improving muscle strength, delivery and extraction of oxygen to the muscle, and joint range of motion⁽⁵⁾. A passive intervention like therapeutic massage was also found to improve body balance^(6,7). Theoretically, massage therapy could arouse somatosensory systems by activating the proprioceptors, Golgi tendon organ, joint receptors, and muscle spindle. It was also believed to stimulate the resetting of unproductive reflex actions^(8,9). Moreover, there are many advantages of massage, such as improved blood flow, raised skin temperature, improved tissue flexibility, diminished pain, and muscle spasm⁽¹⁰⁾. It may improve arousal or body awareness by stimulating proprioception resulting from brain activating response^(8,9). By these mechanisms, massage may have a positive effect on balance performance.

Thai massage, a type of deep therapeutic massage, has been commonly practiced for general relaxation. Practically, the massage therapist applied manual or thumb pressure on meridian lines situated along with striated muscles of limbs, back, and neck regions⁽¹¹⁾. It has been found to provide muscle relaxation and reduce muscle pain in patients with myofascial pain syndrome⁽¹²⁾. A previous study also found that Thai massage improved walking performance and balanced performance in older adults using the timed-up-and-go test (TUGT)⁽¹³⁾. However, the immediate effect of Thai massage on subdivision component of dynamic balance has not been verified.

To determine the immediate effect of Thai massage on TUGT in older people, more details of subdivision components of TUGT would be required. The standard TUGT could provide only the sequel total time spent of sitting on a chair to standing, 3-meter walking, turning around, 3-meter walking, and sitting on the chair^(14,15). However, inertial sensor systems have played an essential role in movement analysis, especially the dynamic balance during walking⁽¹⁶⁾. The device with these sensor systems includes the tri-axial accelerometer, triaxial gyroscope, and magnetometer signals⁽¹⁷⁾. It could provide measurement of TUGT with subdivision components analysis during the whole process of TUGT including duration of TUGT, sit-to-stand duration, sit-to-stand lean angle, turn duration, turn angle, stand-to-sit duration, and stand-to-sit lean angle. These movement components are essential for analyzing dynamic balance in patients with movement disorders and older people⁽¹⁸⁾. This preliminary study aimed to explore the immediate effects of one-hour Thai massage on TUGT using an inertial sensor system in older adults aged 60-80 years.

Materials and methods

A preliminary comparative study was conducted at Nong Waeng Community Health Center, Khon Kaen Hospital, Thailand. The study protocol was approved by the ethics committee of Center for Ethics in Human Research, Khon Kaen University, and Khon Kaen Hospital Institute Review Board in Human Research. Elderly participants were recruited from Khon Kaen province using bulletin boards and orals. Sixteen participants, aged between 60 and 80 years, who could walk independently for 10 meters or more and had good co-operation were included. They were not enrolled 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 that could not be solved by glasses.

Sixteen older participants met the criteria and were randomly assigned to either the Thai massage group (TM group) or the control group by using block randomized allocation with block sizes of 2 and 4, which resulted in 8 participants per group. Interventions in this study were Thai massage (TM group) and supine resting (Control group). Participants in TM group received a session of one-hour Thai massage onto the whole body along the ten meridian lines by one massage therapist. Based on principles of traditional Thai massage, including thumb or palm pressure, along the meridian lines, and combined with muscle

stretches at the end of the session, this protocol of Thai massage has been designed by one of the authors who has been a master of Thai massage for 30 years⁽²⁰⁾. The details of the protocol of Thai massage in this study are shown in Figure 1-4. More specifically, Thai massage was to press by thumbs, fingers, or palms, of which the pressure was slowly applied until the participant felt mild discomfort. The pressure was temporarily sustained for 5-10 seconds and repeated five times at each point along the meridian lines⁽²⁰⁾. Following the massage, stretching was performed. Participants in the control group rested in a supine lying position for one hour in the same environment as the TM group.



Figure 1 Back, neck, and arm massage lines.



Figure 2 Leg massage lines.

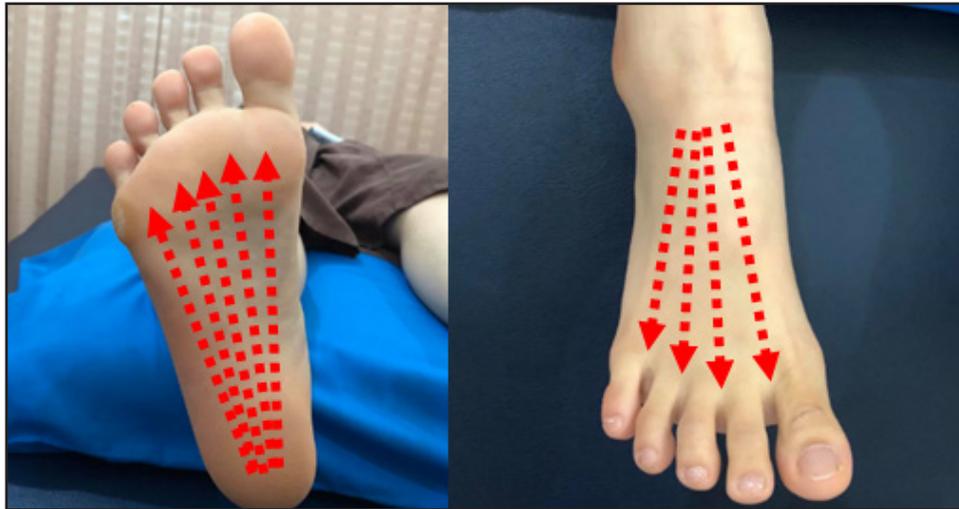


Figure 3 Foot massage lines.



Figure 4 Stretching.

The pre-test and post-test were proceeded on both groups by one physical therapist. The TUGT was measured for dynamic balance by timing five sequences, including standing up from the armchair, walking 3 meters, turning back, walking to the chair, and sitting down with maximal performances^(14,15). Three consecutive trials were performed for TUGT using an inertial sensor system (APDM Inc, <http://apdm.com>). While measuring, the participants wore the APDM Opal sensors: one at the sternum, one at the lower back, and two on both feet (Figure 5). Participants were asked to sit without leaning on backseat. When participants were ready, assessor pressed start and data were recorded in 3 seconds after pressing start. Assessor said “go” in the third second to command participants.

Participants raised body up to do test. Data were stopped capturing when participants sat steady⁽¹⁸⁾. The first trial was a practice trial, whereas the other two trials were recorded. The best value of the two trials was chosen. Reliability of the inertial sensor were reported to be good and excellence in the study Sankarpandi, Baldwin, and Ray in 2017 that TUG test showed good within and between sessions’ reliability with mean intraclass correlation coefficients (ICC) values of 0.81 and 0.69, respectively in patients with vestibular disorder⁽¹⁹⁾ TUGT duration, sit-to-stand duration, stand-to-sit duration, and turn duration from software were reported in seconds. Turn angle, sit-to-stand lean angle, and stand-to-sit lean angle were reported in degrees⁽¹⁸⁾.



Figure 5 Participant wore Opal APDM Sensors.

Statistical analysis

The data from sensors were sent to the computer and analyzed by APDM Mobility Lab™ software. All results were analyzed by STATA Version 10. Data distributions were calculated by Shapiro-Wilk test. Descriptive statistics were used to describe the continuous and categorical data, including the number of participants, age, weight, sex, etc. Mean and standard deviations of the values were calculated for each variable. For parametric data, dependent t-tests were used to compare outcome variables at baseline with the immediate result after each group's intervention. An independent T-test was used to compare the outcome between each group. For non-parametric data, Wilcoxon signed-rank test was used to compare outcome variables at baseline with the

immediate result after each group's intervention. Wilcoxon rank-sum test was used to compare the outcome between each group. A difference at the level of p -value < 0.05 was considered statistically significant.

Results

Demographic data of participants are presented in Table 2. Sixteen participants enrolled in this study; 12 were female, and 4 were male. The mean age of the TM group and control group were 64.9 and 71.5 years, respectively. Their mean height was 156.6 centimeters for the TM group and 159 centimeters for the control group. The mean body weight of participants in the TM and control groups was 64.9 and 61.3 kilograms, respectively.

Table 1 Demographic data of participants

Characteristics	TM	Control	Total	p -value
Number of participants (Female/Male)	8 (6/2)	8 (6/2)	16 (12/4)	
Age (years)	64.9 (4.1)	71.5 (5.8)	68.2 (6)	0.04
Weight (kg)	64.5 (11.6)	61.3 (9.7)	62.9 (10.4)	0.47
Height (cm)	156.6 (6.1)	159 (10)	157.8 (8.1)	0.54
Body mass index (kg/m ²)	26.4 (5.3)	24.3 (3.7)	25.6 (4.6)	0.39

Within-group and between-group comparisons of outcome measures in TM and control group are shown in Table 3. No statistically

significant differences were found for both within- and between-group comparisons.

Table 2 Within-group and between-group comparison of outcome measures in the Thai massage and control group

Parameters	Group	Pre-intervention			Post-intervention			Pre- vs Post-Different (Mean, SD)	p-value
		Mean (SD)	Different (95% CI)	p-value	Mean (SD)	Different (95% CI)	p-value		
TUGT duration (s)	TM	9.01 (1.29)	0.31	0.70	8.65 (1.24)	0.50 (-1.40, 2.40)	0.55	0.19 (0.33)	0.15
	Control	9.32 (1.09)	(-1.54, 2.17)		9.15 (1.22)				
Sit-to-stand	TM	0.88 (0.12)	0.05	0.33	0.88 (0.12)	0.04 (-0.04, 0.13)	0.28	0.00 (0.13)	0.96
	Control	0.93 (0.08)	(-0.06, 0.15)		0.93 (0.08)				
Turn	TM	2.00 (0.14)	0.05	0.65	1.96 (0.15)	0.12 (-0.13, 0.37)	0.31	0.07 (0.17)	0.28
	Control	2.05 (0.27)	(-0.18, 0.27)		2.08 (0.40)				
Turn duration (s)	TM	183.50 (7.21)	1.38	0.71	184.88 (6.38)	2.25 (-5.24, 9.74)	0.50	0.88 (4.45)	0.60
	Control	182.13 (3.87)	(-7.03, 9.78)		182.63 (4.60)				
Stand-to-sit	TM	0.73 (0.17)	0.06	0.72	0.76 (0.18)	0.04 (0.13 to 0.21)	0.72	0.02 (0.31)	0.86
	Control	0.79 (0.15)	(-0.14, 0.26)		0.80 (0.12)				
Sit-to-stand	TM	23.10 (21.10, 25.20) ^b	2.60	0.57	23.05 (19.7, 26.6) ^b	4.50 (-19.00, 4.50) ^b	0.21 ^a	0.70	0.92 ^a
	Control	27.05 (19.80, 42.80) ^b	(-22.75, 4.05) ^b		28 (23.2, 38.3) ^b			(-2.90, 2.95) ^b	
Lean angle (deg)	TM	20.90 (15.40, 26.90) ^b	0.65	0.79 ^a	22.7 (15.8, 31.3) ^b	0.70 (-8.43, 9.10) ^b	0.83 ^a	2.65	0.94 ^a
	Control	19.20 (15.50, 37.50) ^b	(-14.95, 10.94) ^b		19.65 (17.75, 38.4) ^b			(-9.82, 11.05) ^b	

Note: ^a Results were calculated by the non-parametric statistic, ^b Results were reported by median and interquartile range.

Discussion

This study showed that one session of 1-hour whole body Thai massage could improve TUGT, despite not statistically significant. Thai massage was characterized by pressing and holding by manual deep pressure along ten meridian lines that cover the whole body and combining with muscle stretching at the end of the session. The massage was believed to increase blood circulation, increase temperature, buffer blood pH of muscle, and remove waste products. These help improve performance and recovery of muscle⁽²¹⁾. The possible mechanisms of Thai massage were included neuro-mechanical and mechanical effects.

Older people normally had decreased flexibility and limited range of motion. This affected balance performance by decreasing the activation of muscle spindle and amplitude of stretch reflex which are the important components of proprioception senses⁽²²⁾. Massage may provoke proprioceptive nerve endings, change sarcomere length, stretch muscle, tendon, and ligament structures that originate reflex of muscle relaxation^(23,24). Mechanical pressure of massage helped reduce tissue adhesion by lengthening decreased or adhered connective tissue that gave rise of body flexibility⁽²⁵⁾ as measured by the range of motion⁽²⁶⁾. Thai massage was also found to improve trunk flexibility in the normal adult with the tightness of hamstrings⁽²⁷⁾ and older adults⁽²⁸⁾. Moreover, massage was found to arouse the proprioceptors on cutaneous, Golgi tendon organ, joint receptors, and muscle spindles. Massage also stimulated the readjustment of unproductive reflex works that was affected to improve somatosensory information and balance performance⁽²⁹⁾.

Unexpectedly, the results of this study could not support the findings of previous studies that Thai massage could improve balance performance. Thai massage on the lower leg was found to decrease the duration of TUGT in elderly with knee pain⁽³⁰⁾. Moreover, many researchers studied the effects of other types of massage that is similar to Thai massage. One-hour whole-body therapeutic massage might improve balance performance in the elderly⁽⁶⁾.

Negative results found in the current study could be due to either too short duration (single session) of exposure to Thai massage or small sample size. TUGT is one of the fall predictors for older adults. The TUGT of equal or more than 13.5 seconds was used to identify persons at higher risk of falling⁽³¹⁾. Mancini et al. in 2016 compared turning mobility between older adults who were non-faller, single fall, and recurrent falls. The results found that the turn duration of older adults who had recurrent falls was significantly higher than that of older adults who were non-faller. Moreover, mean peak speed of turn and mean turn angle of older adults who had the recurrent falls were lower than those of older adults who were non-faller⁽³²⁾. In this study, the turn duration of Thai massage group was slightly decreased and turn angle of Thai massage group was slightly increased immediately after intervention.

Meanwhile, the control group was somewhat improved only for turn angle. This could be believed that Thai massage may modestly improve balance in the elderly by these parameters. Further study with larger sample size is recommended to verify its effect.

Moreover, there were no significant differences in sit-to-stand and stand-to-sit parameters. This could be because we used only one session of one-hour Thai massage. The future study should investigate for the multiple sessions and long-term result.

Furthermore, older participants in Thai massage group were significantly younger than control group as mean age of Thai massage and control group were 64.9 and 71.5 years, respectively. The TUGT duration of Thai massage group was also lower than control group at baseline. Previous study was established the TUGT normative data among community dwelling older adults, stratified base on cognitive status, gender, and age groups. It was found that TUGT duration was increased by aged⁽³³⁾ and it was consistent with our baseline result. Thus, this could be the limitation of this study that could not possibly detect the large effects by ceiling effects of healthy participants' performances. Further study should allocate participants to each group with

stratification of sampling by age and other factors that are related to balance performance.

As the immediate results of TUGT were not improved after one session of 1-hour whole body Thai massage. Further study on multiple sessions of Thai massage on TUGT should be investigated.

Conclusion

According to the results of this preliminary comparative study, we concluded that one session of 1-hour Thai massage session could not provide immediate improvement of TUGT parameters. In further study, long-term treatment with follow-up are suggested.

Take home messages

One session of one-hour Thai massage may not improve dynamic balance in older adults as measured by the timed-up-and-go test.

Conflicts of interest

The authors declare no conflict of interest.

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