# WALKING MEDITATION EFFECTS ON DUAL-TASK WALKING PERFORMANCE IN ELDERLY

PICHITCHAI SHUWUTTANAKUL

Graduate School Srinakharinwirot University

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# WALKING MEDITATION EFFECTS ON DUAL-TASK WALKING PERFORMANCE IN ELDERLY

PICHITCHAI SHUWUTTANAKUL

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BY

PICHITCHAI SHUWUTTANAKUL

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---

(Assoc. Prof. Dr. Chatchai Ekpanyaskul, MD.)

Dean of Graduate School

---

ORAL DEFENSE COMMITTEE

..... Major-advisor

(Asst. Prof. Dr.Saitida Lapanantasin)

..... Chair

(Asst. Prof.Parit Wongphaet, M.D.)

..... Committee

(Asst. Prof. Dr.Nithinun Chaikeeree)

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Walking meditation is a mind-body practice combining walking slowly simultaneously with meditation, which can be described as dual-task walking. However, the training effect of walking meditation on dual-task walking performance has yet to be proven. Besides, a dual-task walking is necessary for balance in the daily life of elderly people. Thus, this study aimed to investigate whether walking meditation training can improve dual-task walking performance among elderly people. The methodology included 48 elderly volunteers aged 65.13±0.35 years participated in the study. They were matched by gender and education level block and randomized into control group (CG, n = 24) and walking meditation group (WMG, n = 24). Both groups engaged in practice 30 min/day, three days/week for a total of six weeks. CG received walking exercise with preferred speed, while WMG received walking meditation training. Before and after training, four outcomes were identified: (1) single-task walking time (STT); (2) dual-task walking time (DTT); (3) dual-task cost (DTC); and (4)correct answers of subtraction during dual-task walking (CAS). The training effect, time effect, and training x time interaction were analyzed by two-way ANOVA mixed model and post-hoc tested with Bonferroni. The results were the mixed model ANOVA analysis revealed significant training effect on CAS ($p<0.05$) and the significant effects of time and training x time interaction on all studied outcomes ($p<0.01$). After training, the WMG demonstrated significant improvement in all outcomes compared with before training ($p < 0.001$), and also showed shorter DTT ($p=0.049$) and higher CAS ($p=0.002$) than the CG. Meanwhile, the CG only presented improvements of STT ($p<0.05$) and CAS ($p<0.001$) compared to the baseline. In conclusion, the results demonstrated walking meditation training was able to improve dual-task walking performance of the elderly participants better than preferred-speed walking exercise significantly. Therefore, walking meditation training protocol in this study can be applied as an alternative exercise to promote dual-task walking performance for elderly people.

Keyword : Walking meditation, Balance, Dual-task walking, Dual-task cost, Number subtraction while walking

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# CHAPTER 1
# INTRODUCTION

## Background

According to a report in 2020 of the Foundation of Thai Gerontology Research and Development Institute, the Thai elderly population (aged 60+) was larger than the Thai children population (aged under 15 years). The elderly population in 2020 is 11.6 million people or 17.5% of the entire Thai population. As demographic predictions in 2010, the Northern part of Thailand will have the highest ratio of senior people aged over 60 years to the total population by the year 2020. In addition, according to the prediction, Thailand will have elderly people, around 20% of the total population by the year 2022, and it will be a completely aging society. Then, the proportion of the elderly population is predicted to reach 28%, by the year 2033, which will become to be the superaged society. The increase in the elderly population is a similar trend around the world. At present, the global elderly population is reaching 1,016 million people or 13% of the total world population.(1) As a result, planning ahead of time is critical and a lot of researches involving the elderly have taken place, with the most interesting issue about the risk of falling. In Thailand, fall injuries are one of the most common problems among elderly people, with one in every three 65-year-olds falling each year, and the prevalence will become more than double in the age of 80-year-olds. In 2019, number of the elderly people injured by falls were 141,895 cases, which is up from those in 2016 around 29.5 percent. (2)

One of the factors causing the elderly to fall is a decreased ability to balance as a result of significant deterioration in physical and cognitive functions. Both physical and cognitive changes were discovered to have an impact on the balance ability of the elderly (3), particularly balance performance while walking with a cognitive task (dual-task walking) which is a part of daily activities that the elderly need to do. (4) As a result, older adults are more likely to fall when performing two activities at the same time, such as walking while shopping or walking while talking on the telephone or stepping over obstacles while holding a glass of water. These movements need cognitive, motor, and

sensory functions working together. (5) Therefore, the training of physical and cognitive functions in elderly people will improve or maintain balance performance during dual-task walking as they are getting older. (6)

From the literature review, there are many studies related to a dual-task and multiple-task exercise program in both healthy and cognitively impaired groups. It was found that the dual-task and multiple-task exercise programs improved the ability to do dual-task activities in both motor/balance, and cognitive aspects. The majority of dual-task programs are activities that require motor movement with cognitive activities working together, such as walking along with subtracting numbers, or it could be a popular community exercise activity like Qigong Tai-chi or dancing. (7, 8)

Attention is one of the cognitive functions which is essential to carry out everyday activities (Executive function). (9) The attention can be divided into three categories: sustained attention, selective attention, and alternating attention. Sustained attention is the ability to perceive and focus only on ongoing work in a calm environment. Selective attention refers to the ability to continuously focus on one active task in a distractive environment. Alternating attention denotes the ability to focus on and perform many activities simultaneously, for example, talking while cooking. Hence, attention is important for dual-task performance. In other words, a deteriorative change of cognitive function in elders, particularly attention, will effect-on their dual-task performance which leading to a high risk of falls during dual-task walking.

From literature review, mindfulness practice such as meditation can improve cognitive function (10) and was recommended for elderly exercise program. (11) Moreover, systematic review and meta-analysis studies convinced that physical exercise as walking (12-14), helps promote physical fitness, weight control, good sleep, emotional and mental health, besides, it also prevents dementia and mild cognitive impairments and improves quality of life. As well as decreases mortality in the elders. (15, 16)

Walking meditation is a mind-body practice by slowly walking simultaneously with meditation which seem like dual-task activity. So, in accordance with previous studies

relate to dual-task training program improving both cognition and balance aspects, the walking meditation may be able to improve those aspects as well. Walking meditation has been shown to improve ankle proprioception and functional balance in elderly participants. (17) However, the effect of walking meditation on balance during dual-task walking and cognition has not been proved. Thus, this study is interested in investigation whether walking meditation training able to promote the balance ability while dual-task waking in the elderly.

**Research question**

Can walking meditation improve dual-task walking performance of the elderly?

**Hypothesis**

Walking meditation can improve dual-task walking performance of the elderly.

**Purpose of the research**

The purpose of the study is to examine the effectiveness of walking meditation on dual-task walking performance of the elderly with specific objectives as follows:

To compare dual-task walking performance of the elderly between pre-training and post-training within the walking meditation group (WMG) and within the control group (CG).

To compare dual-task walking performance of the elderly between the WMG and the CG at pre-training and at post-training.

Outcome measures

The outcome measures represented a dual-task performance for this study are as follows:

Dual-Task cost (DTC) is a percentage of the time difference between a dual-task walking and a single-task walking to the time use in a single-task walking as the calculating formula presented below. (18)

$$DTC = \frac{(\text{time use in dual-task walking} - \text{time use in single-task walking})}{\text{time use in single-task walking}} \times 100$$

Correct answers of subtraction during dual-task walking (CAS) is defined by number of the correct answer of subtraction by 3 ( or count backward by 3) consecutively during dual-task walking standardized by the time use in dual-task walking as the calculating formula below. (19)

$$CAS = \frac{\text{number of correct answers of consecutive subtraction during dual-task walking}}{\text{time(second) use in dual-task walking}} \times 100$$

**Benefits and application**

1 . If the findings accordance with the hypothesis, walking meditation will be an alternative health promotion activity for the elderly, which can improve their dual-task walking performance.

2. Walking meditation can be applied in clinical practice to promote or, rehab the elderly who have problem with balance and cognitive function during dual-task activity.

3 . The findings of this study can provide evidences for the benefits of walking meditation and for the further studies related to walking meditation.

**Conceptual Framework**

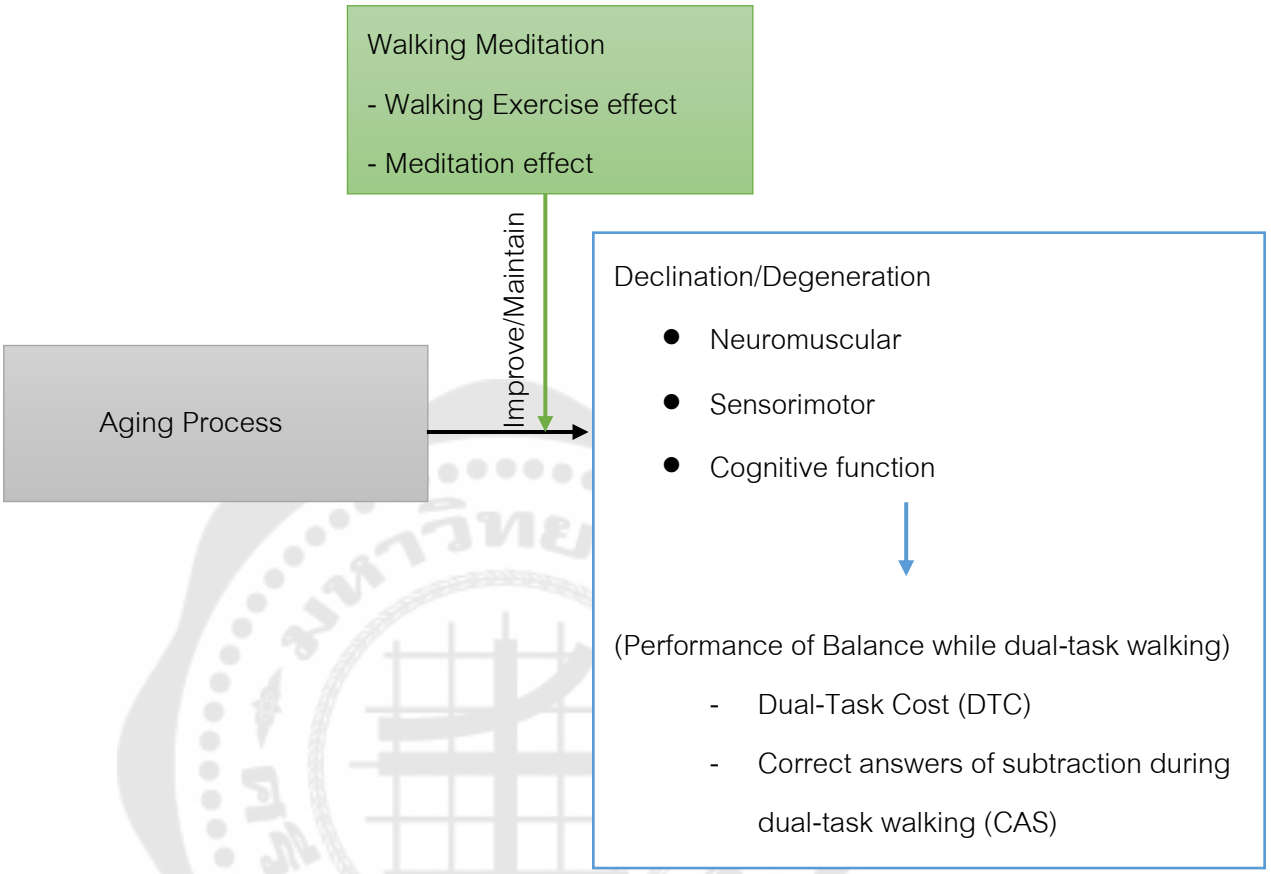


Figure 1. Conceptual framework of the research

# CHAPTER 2

# THE LITERATURE REVIEW

The literature reviews in chapter 2 are related to the following topics:

1. Dual-Task
    - 1.1 Dual-Task theory
    - 1.2 Dual-Task and postural stability and postural control
    - 1.3 Dual-Task testing to predict fall and balance
    - 1.4 Dual-Task training in the elderly
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2. Cognitive function
    - 2.1 Neurocognitive domains of cognitive function
    - 2.2 Cognitive function decline in the elderly
    - 2.3 Cognitive test and cognitive performance in dual-task in the elderly
3. Meditation
    - 3.1 Definition
    - 3.2 Mediation and the elderly
4. Walking in Elderly
    - 4.1 Benefit of walking in the elderly
5. Walking meditation
    - 5.1 Definition
    - 5.2 Benefits of walking meditation
    - 5.3 Related research

## 1.Dual-task

As going through daily lives, most activities are performed two or multiple tasks at the same time defined as dual-task or multi-task respectively. Dual-task and multi-task need a variety of body functions including cognition, sensory, and motor systems. The brain has to process information and divide its functions for working on more than one task so that simultaneous tasks can be completed at the same time.

1.1 Dual-task theory

The decline in motor and cognitive functions commonly occurs in the aging process, both of which are important causes for deterioration of dual-task ability in elderly people, especially postural stability and balance during dual-task walking. Dual-task walking is necessary in daily life, such as walking by taking on the phone, walking across the street while carrying products, walking in the market during shopping, etc.

Control of the dual-task activity can be described by several cognitive-motor theories. The “Central Bottle Neck Theory” describes how one process might be stopped completely by another process that is more salient interference taking place at the same time. The ability to prioritize several tasks by comparison in the form of their importance, interest, and necessity is defined as “Task Prioritization Model”. The “Attentional Resources Theory” explains that, because individuals have limit attention resources, the effectiveness of working under concurrent will disturb the main task due to mismatched task interests. For example, when the elderlies are calculating while walking, the focus is on the cognitive task (calculating) which leading to disrupt the walking movement, or become less aware of the surroundings. Finally, it may result in a fall. The “U-Shaped Non-Linear Interaction Model”, which describes how individuals maintain balance while concentrating on dual-tasks, they increase usage of motor, cognition, and balance associated with postural control. This is due to the strengthening motor system, sensory system, and balance abilities, as well as muscle co-ordination in dual-task ability. According to “Supra-Postural Task Model”, in addition to motor, sensory, cognition, postural control, and balance, there must also use awareness of dual-tasks with motor tasks and cognitive tasks. (5, 7)

1.2 Dual-task on postural stability and postural control

One of the major problems of falling is postural control impairment. Previous systematic review discussed about programs and social events that can improve dual-task and postural control. Dual-task with postural control has been added to reduce the risk of falling. The review concluded that postural control during performing activities as a dual-task can be applied to specific activity training, clinical balance training, and the

progression of single-task training programs. Motor learning theory convinces that postural control can be improved in healthy elderly people by complex motor skills, walking, and postural stability practices. (20)

The systematic review and meta-analysis related to the effects to Dual-task training on postural control of the finding concluded that Dual-Task training improved postural stability in healthy elderly, the elderly with falling risk and the persons with chronic stroke. Negative results were found in people with other neurological disorders such as multiple sclerosis and who have a history of falls. This means that encouraging activities that improve dual-task ability in the healthy older can improve postural control, and postural stability. (21)

1.3 Dual-task testing to predict fall and balance

Menant, et.al. (2014) conducted a systematic literature review and meta-analysis related to fall predicting in the elderly by using the dual-task ability test compared to the Timed Up and Go test (TUG), a well-known single-task activity based on simple walking speed. The results revealed that there was no significant difference in identifying the Faller and non-Faller. This means that any assessment can be used to predict falls in older people. However, a single-task test, such as TUG, may not cover all fall factors for preliminary screening. (4) Since there are other factors, such as a history of falls, the use of medicines with the potential for falling side effects, and visual problem, the combination with other tests, such as physical performance exams are recommended (e.g., Physiological Profile Assessment, Fall. Risk for Older People in the Community Test, etc.).

The dual-task test differs from the single-task test in that, it involves evaluation of two tasks, such as specific attention and the executive function of posture and walking. Furthermore, the assessment with the dual-task test can check the condition of cognitive functions and motor functions, as well as postural stability and control. Dual-task test is designed specifically for patients with cognitive impairment such as mild cognitive impairment, dementia, Alzheimer's disease, Parkinson's disease, and stroke. Also, the dual-task test aids in fall-risk screening for prevention better than the single-task tests

such as TUG and Functional Reach Test. (22) Thus, in order to aware of good health and fall prevention of the elderly people in community. (4, 22)

1.4 Dual-task training in the elderly

Motor/postural and cognitive impairments in dual-task performance are observed in individuals with TBI, stroke, and cognitive impairment. So, most of research were carried out dual-task training in these individuals. Early findings indicated an importance of the specific task training, which means that one kind of dual-task training (e.g., a motor-motor dual task) inconsistently generalizes to the other kinds of dual-task (e.g., cognitive-motor dual task). Combining of cognitive and motor tasks for a dual-task training is the most popular applications. (23) Progressive complexity and difficulty of multiple task as real-life situations was suggested in order to help individuals improve their ability to perform daily tasks in difficult environments. (8)

1.5 Dual-Task performance

Measures of dual-task performance in a clinical context often incorporate with observation and easily available equipment, such as basic pathways, obstacle courses, stopwatches, things to carry, and lists of cognitive tasks.

Dual-Task Cost (DTC)

DTC the effect of dual-task on gait and cognitive parameters, is evaluated by comparing absolute values for all cognitive and gait indicators between single- and dual-task conditions. The DTC represents ability of motor and cognitive functions under various dual-task situations. (24) The higher DTC indicates poor performance on individual task, whereas the lower DTC suggests improved performance on individual tasks. Meanwhile, the differential difficulty of a cognitive task performance is assessed based on the motor cost of gait speed under the corresponding dual-task situations. (25)

**2. Cognitive function**

2.1 Neurocognitive domain of cognitive function

Cognitive function is a brain process that makes a person aware of their situation, needs, goals, and operations. This process is required for problem-solving strategy in

living. Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition(DSM-5) classified cognitive function into 6 neurocognitive domains as follows. (26)

*2.1.1 Perceptual-motor function*

Perceptual-motor function includes visual perception, visuo-constructional reasoning, perceptual-motor coordination. The Oxford reference (27) has defined perceptual-motor function as any ability or capacity involving the interaction of perception and voluntary movement, typical examples are the abilities to typing, working and playing game.

*2.1.2 Executive function*

Executive function is a cognitive process necessary for cognitive behavior control: to select and successfully monitoring behaviors that make it possible for selected objectives to be achieved. Executive function includes planning, decision-making, working memory, responding to feedback, inhibition, flexibility, and language. (28)

*2.1.3 Language*

Language is one of a human cognitive ability along with perception, attention, memory, motor skills, and visual and spatial processing. Emphasis of language is laid on cognitive semantics that studies the contextual–conceptual nature of meaning. The cognitive function for language includes object naming, word finding, fluency, grammar and syntax, receptive language. (29)

*2.1.4 Learning and memory*

Learning and memory are closely related concepts. Learning is a skill or knowledge acquisition, while memory is the expression of what you have acquired. The speed with which the two things occur is another difference. Learning is a process of acquiring the new skills or knowledge while the memory is an acquisition from learning which taking place instantly. It includes free recall, cued recall, recognition memory, semantic and autobiographical memory, long-term memory, and implicit learning. (30)

*2.1.5 Complex attention*

Attention is a complex process that used in almost all of daily activities. It is the behavioral and cognitive process of selectively concentrating on a discrete aspect of information, either considered subjective or objective information, while ignoring other perceivable information. Complex attention includes a sustained attention (the ability to attend to a stimulus or activity over a long period.), a divided attention (the ability to attend to different stimuli or attention at the same time.), a selective attention (the ability to attend to a specific stimulus or activity processing speed in the presence of other distracting stimuli), a focused attention. (the ability to focus attention on a stimulus) and an alternating attention (the ability to change focus attention between two or more stimuli). (31)

*2.1.6 Social cognition*

Social cognition is focused on how people process, store and implement information on other people and social situations. The cognitive processes play significant role in social interactions. The way individuals think about other people plays an important part in their thought, feeling, and interacting with the world and people around them. It consists of recognition of emotions, theory of mind, and insight. (32)

2.2 Cognitive function Decline in Elderly

Cognitive function declines faster in the elderly which may worsen cognitive deficit. The cognitive decline by aging commonly affects the fluid ability before the crystallized abilities as presented in early dementia. (33) Cognitive aging is also associated with behavioral slowing in everyday tasks and laboratory tasks. Selective attention on the main or important information, while inhibition of irrelevant stimuli or information, increasingly becomes difficult for the elderly. The Cognitive aging is linked to the changes in the frontal lobes as people get older. (34) Some of the cognitive changes associated with normal aging are shown in Table 1. The elderly people commonly have the following cognitive changes: Abstract thinking and mental flexibility. All domains of attention are also declined with difficulties in switching between multiple sensory inputs, for example auditory, taste, smell, etc., paying attention on prolonged

tasks and inputs, and filtering out irrelevant data of for cognition process. Information processing speed in learning is delay and it also needs greater repetitions for learning new skill or information. Language aspects are different, some aspects for example vocabulary or idiom may continue to improve with age, and other aspects showed declines. (35) Long-term memory is the most declination for recall than recognition, while short-term memory is preserved. The visuospatial function in three-dimensional construction and drawing abilities are declined in aging.

Table 1. cognitive changes associated with normal aging(36)

| Cognitive Ability | Changes associated with normal aging? |
|---|---|
| Information Processing Speed | √ |
| Divided Attention | √ |
| Sustained Attention | √ |
| Selective Attention | √ |
| Short-Term memory | √ |
| Long-Term memory | √ |
| Language | √ |
| Visuospatial | √ |
| Abstraction and Mental Flexibility | √ |

2.3 Cognitive test in the elderly

Mini-Cog

The Mini-Cog test (37) is designed to screen for dementia in primary care settings. It consists of a memory test (recall of three unrelated words – total of three scores) and a very simple free-hand version of the clock drawing test (CDT; total of two scores) as a distractor for the memory task. Mini-Cog scores thus range from 0 (worst) to 5 (best). (38, 39) A cut-off of 4 out of 5 provides the best combination of sensitivity (99%) and specificity (96%) for detecting cognitive impairment. In comparison to other cognitive test instruments, such as the MMSE Thai 2002, the Thai version of the Mini-

Cog is both reliable and valid, particularly for practical use in primary care centers. Many studies demonstrated that the Thai version of Mini-Cog is appropriate for cognitive assessment in Thai older elderly people. (39) Especially in primary care, when time is limited and a short cognitive screening approach is necessary.

Montreal Cognitive Assessment (MoCA)

The Montreal Cognitive Assessment has been translated into 36 languages and dialects, including Thai language. It is a validated, reliable and publicly available screening tool for mild cognitive impairment (MCI) detection. The detection of cognitive dysfunction in a wide variety of diseases has been proven to be helpful, including which Huntington disease; Parkinson's disease; Poststroke cognitive impairment, and brain metastases. (40) The internal consistency and criterion validity of Thai-MoCA for diagnosis was explored and compared with the Clinical Dementia Rating (CDR) scale as the gold standard. The internal consistency of Thai-MoCA test were demonstrated to have the Cronbach's alpha coefficient of 0.744. With the cut off score under 24 for person with MCI and under 18 for person with AD, the sensitivity and specificity were 0.70-0.8 and 0.95 respectively. Thai-MoCA and MMSE appeared to have significantly positive correlation with Pearson correlation coefficient at 0.90. The cut-off score for screening patients with early-stage dementia is 24 points or higher. (39, 41, 42)

The Simple Reaction Time test

The Simple Reaction Time test measure's simple reaction time, general alertness, and motor speed through the delivery of a known stimulus to a known location to elicit a known response. The only uncertainty is regarding when the stimulus will occur, by having a variable interval between the trial response and the onset of the stimulus for the next trial. (43) To assess global attention in Alzheimer's disease, a simple reaction time (RT) test was used. (44)

Abbreviated Mental Test (AMT)

The Thai Abbreviated Mental Test (Thai AMT) was translated by the Department of Medical Service, Ministry of Public Health, Thailand, and compared to Hodkinson's original English version of the AMT. (45) The AMT consists of ten questions

that assess time orientation, person and place orientation, attention and current memory, remote memory, and general knowledge. The test administration takes around 3-5 minutes to complete. (46)

Mini-Mental State Examination (MMSE)

The Thai version of the Mini-Mental State Examination (MMSE-Thai 2002) was verified against the original English version of the MMSE. (40) It is a 30-item questionnaire that is widely used to test and screen for cognitive impairment in clinical and research settings. The test takes between 5 and 10 minutes to administer and assess capabilities such as registration, attention and calculation, recollection, language, ability to follow basic orders, and orientation. (46)

**3. Meditation**

3.1 Definition

Meditation is a self-regulation practice which focus on attention and awareness in order to control of the voluntary movement and the mental processes and thus promote common perception, development, and/or specific capacities such as calmness, clarity, and concentration. (47)

Meditation is a practice of mindfulness which has long been used to increase calm and physical relaxation, to improve the psychological balance, to recover and to enhance overall well-being and health. (48) A systematic review showed that people who undergo long-term psychiatric or medical treatment could reduce anxiety, pain, or depression by practice of consciousness meditation for one or six months. (49) The American Heart Association has published a scientific statement that meditation can be a reasonable additional practice to reduce the risk of cardiovascular disease, qualifying that the clinical quality of meditation should be better defined in these disorders. (50)

3.2 Mediation for elderly

Meditation showed potential evidences on either physical or psychological benefits for older adults, including better focus, enhanced calmness, less stress, and improved sleep. The evidences suggested that meditation may help the elderly with bowel syndrome (48), insomnia (51) and cognitive decline. (52) Also, the evidences

indicated that attention and meditation practice can reduce depression and pain and increase emotional well-being. (49) The challenges of aging can even be met by adults. (11)

From previous systematic review on the effects of meditation, in patients suffering from chronic cerebrovascular disease, the majority of whom are elderly showed significant improvement. (53) The finding benefits of meditation were reported into three categories: 1) Raising awareness and accepting everything that happens in tandem with the one's mood, one's feelings, and one's reflection 2) Reducing stress and improving idea management, and 3) Simply and indefinity doing or practicing. There is also effectiveness of meditation for the patient's mental and physical aspects. (54) In addition, the finding was possible to explain the relationship between meditation and cognition. (10)

**4. Walking in the elderly**

4.1 Benefits of walking in the elderly

There have been a lot of discussions on walking as a form of exercise or physical activity amounting from light to moderate level. (14) Among the elderly, it has also begun to use walking exercise in patients with cognitive problems or impairments (13, 15, 16), as well as in the elderly with osteoporosis to reduce a high impact load. (55)

**5. Walking meditation**

5.1 Definition

Walking meditation is a Buddhist practice that combines meditation along with walking. (56) It is characterized by slow, controlled movements. Walking meditation is a simple type of meditation. However, there are many more details that must be understood in order to successfully practice walking meditation. Presenting some little detail from normal walking: it focuses on leg and foot moving while walking slowly. Walking meditation is available to practice in anywhere because there is no need of accessories or equipment. Also, it can be applied for activity daily living simply. (57, 58)

In terms of the current practice of Thai walking meditation, it is a practice that demonstrates that the symptoms differ from the general walking orientation, which is to

be mindful and walk back over it a certain distance. Walking meditation can be classified into two types:

1) Walking meditation in a way that is aware to walk with a regular rhythm but without controlling the rhythm of walking, which is walking in the Buddha Poot-Tor line and thinking about the Buddha's blessing while walking.

2) Walking meditation in a rhythmic gait, which takes a slower movement to identify the rhythmic gait, may be found in the Buddha Yup Nor-Phong Nor line, which defines the 6-stage gait. (59)

5.2 Benefits of Walking Meditation

According to previous researches, walking meditation can help increase motor and co-ordination, which affects balance, and also increases proprioceptive sense of the ankle in the elderly people. (17) It has also been demonstrated that walking meditation can aid in cognition and quality of life development. (60) It was also discovered that the rate of walking speed as measured by Timed Up and Go test in elderly people with diabetes peripheral neuropathy who participated in walking meditation training showed a significant improvement when compared to those who participated in training with preferred speed walking. (61)

Walking meditation is largely used for therapeutic purposes among patients suffering from various mental health conditions for reducing psychotic symptoms, such as personality disorder, depression, anxiety, schizophrenia, alcoholism, and aid in the withdrawal of drug addiction. (51, 62, 63) The research studies have shown that walking meditation can be used to reduce stress and pain in patients with chronic pain, such as patients with arthritis, cancer, and healthy people who are stress out. (64) Furthermore, walking meditation can decrease the level of blood pressure in patients with high-blood pressure resulting from the relaxation effect of walking meditation. (65) It also aids in the reduction of blood sugar levels and the improves blood vessel function in diabetic patients. (63) Walking meditation effect can be obtained by combining the benefits of meditation and walking, as well as aerobic exercise. (55)

5.3 Related research

This section summarized the data extraction from review of researcher related to investigation of the effects or benefits of walking meditation on the outcome relevant to this study.

*5.3.1 Walking meditation and balance*

In the past, walking meditation isn't yet know in balance training, but now it's made popular in older people who believe in healthy aging and meditation training. There are 3 researches related to walking meditation effects on balance as, the summary of each research is demonstrated in Table 2. (17, 61, 66)

*5.3.2 Walking meditation and cognition*

The simple, meditation and mindfulness could improve attention and the other domain of cognition. The are 3 researches related to walking meditation effects on cognitive function. The summary of each research is presented in Table 3. (64, 67, 68)

*5.3.3 Walking meditation and elderly*

Besides the walking meditation effect on balance and cognition, there were some researches related to giving walking meditation practice to the elderly people. Even though the outcomes measure of those researches were not according to this study, their findings revealed the benefits of walking meditation in the elderly. So, the data extraction of those researches is summarized and shown in Table 4. (51, 60, 62, 65, 69)

Table.2 Summary of researches related to walking meditation effect on balance

| No | Title-1st Author-Year | Study design | Population | Intervention | outcomes | results | conclusions |
|---|---|---|---|---|---|---|---|
| 1 | Suwannawat P.(2007) | RCT | 20 males aged 60+ were randomized into control group (n = 10) and Walking meditation group (n = 10) | 1)Control group: with activities in daily life as usual.<br>2)Experimental group: practiced Walk-Meditation adapted from Dr. Siri Karinchai Program for 1 hour/day, 5 days/week for 8 weeks.<br>Duration: 8 weeks<br>Measure: at baseline, the 4th week, and the 8th week. | 1. Balance scores were tested by Osness Balance Test | At the 4th week and the 8th week of training, the median balance scores of the walking meditation group better than the control group, significantly ($p < 0.05$). In the control group, there was no significant changes in balance score after the 4th, and the 8th week of training ($p < 0.05$). | Walking meditation training (1 hour/day, 5 days/week) for 8th weeks could improve the balance of over 60 years old males. |
| 2 | Chatutain A.(2019) | RCT | 58 Females aged 69.25 ± 6.06 were randomly allocated into control group (n = 29) and Walking meditation group (n = 29) | 1)Control group: engaged in their daily life activiti's as usual.<br>2)Walking meditation group: attended walking meditation training by a Buddhist monk for 30 min per day, 3 days per week.<br>Duration: 8 weeks<br>Measure: at pre-training, 4 weeks, and 8 weeks post-training. | 1. The absolute angular error of the ankle reposition test (AAE): using electro-goniometer.<br>2. The balance performance: using Berg Balance Scale (BBS), Functional Reach Test (FRT), and Timed Up and Go test (TUG). | Post-training, the Walking meditation group showed significant improvements in AAE and the balance performance (BBS & TUG) compared to the control group ($p < 0.001$). | The elderly's balance and ankle proprioceptive sense improved after walking meditation practice. Walking meditation can be used as an alternative training to improve ankle proprioception and balance in the elderly. |
| 3 | Saisathit S.(2020) | RCT | 10 Females and 18 males aged 40-75 years with type2 diabetes. | 1)Control groups (CG): attended a gentle walking with preferred speed (30 minutes/day, 3 days/week, for 4 weeks)<br>2)Walking Meditation (WM) group: attended walking meditation training, for 30 min/day, 3 days/week, for 4 weeks.<br>Duration: 4 weeks.<br>Measure: at baseline and at 4 weeks. | 1. Balance abilities were assessed with Timed Up and Go test (TUG), Functional Reach test in forward, sideward to the left, and the right (FRT-forward, FRT-Lt, and FRT-Rt respectively), and a 30 second standing on a firm surface with eye-opened and eye-closed. | The WM group showed statically significant improvement in TUG better than the CG ($p=0.001$), and demonstrated significantly farther FRT-Lt than the CG ($p=0.017$). The CG showed no significant improvements in all outcomes. | The WM practice at least 4 weeks (30 minutes/day, 3 days/week) can improve balance during walking and FRT-Lt in persons with diabetic peripheral neuropathy. |

Table.3 Summary of researches related to walking meditation effect on cognition

| No | Title-1st Author-Year | Study design | Population | Intervention | outcomes | results | conclusions |
|---|---|---|---|---|---|---|---|
| 1 | Yamwong N. (2015) | RCT | The older adults in Nakhon Nayok province (N = 100), age 55 – 70 years.<br>Male = 48/Female = 52 | 1)Experimental group: walking meditation.<br>2)Control group: was designed to sitting meditation.<br>Duration: 12 weeks.<br>Measure: at 12 weeks. | 1. Physical fitness; dynamic balance level, arm strength, leg strength, aerobic endurance, lower flexibility, upper flexibility, and agility level.<br>2. Short memory: short memory assessment.<br>3. Emotional quotient: emotional quotient test. | The experimental group (walking meditation group) showed significant improvement of the physical fitness, short term memory, and emotional quotient better than those of the control group.($p<0.05$) | The study revealed that walking meditation could improve physical fitness, short memory, and emotional quotient. This study recommended the elderly to keep daily practice of walking meditation for good physical fitness and quality of life. |
| 2 | Kim N. (2017) | RCT | 30 Elderly woman aged 60+ with dementia<br>Training group (TG): N = 15 (Age:67.18 ± 1.35 year)<br>Control group (CG):<br>N = 15 (Age:66.80 ± 1.69 years) | TG: Walking meditation program 12 session<br>First session: Know the meditation, Second Session: Method of meditation and breathing, walking meditation, Session 3 – 4: Meditation also listen to pray music and walking meditation, Session 5 – 6: Physical fitness and walking meditation, Session 7: Walking meditation and Bean bag on his head, Session 8: Meditation walking along a line, Session 9: Meditation to walk free in the auditorium Session 10 – 11: walking meditation, Session 12: decided to conduct a review of the 11 meditation sessions (50 min/day, 3 days/week)<br>CG: Non-program<br>Durations: 12 weeks.<br>Measure: at 12 weeks. | 1. Autonomous nervous systems activity measured by heart rate variability (HRV)<br>2.Cognition descripted by Korean Mini-Mental state Examination (K-MMSE) | 1. HRV: TG > CG, significant ($p < 0.001$); ($p < 0.05$)<br>2. K-MMSE: TG > CG ($p < 0.001$) | meditation such as walking meditation, can maintain and delay of cognition decline in dementia people. The result of meditation components in consideration of these characteristics will help to increase the effectiveness of meditation. |

Table.3 Summary of researches related to walking meditation effect on cognition *(continued)*

| No | Title-1st Author-Year | Study design | Population | Intervention | outcomes | results | conclusions |
|---|---|---|---|---|---|---|---|
| 3 | Yu J. (2021) | RCT | 54 Elderly with mild cognitive impairment (MCI) | Mindfulness awareness program(MAP) = 1) mindfulness of the senses practice— to attend to the different senses (i.e., vision, hearing, touch) to promote focused attention; 2) body scan practice— to develop kinesthesia by focusing their attention on various parts of their body as a relaxation technique, while in a sitting and/or supine position; 3) walking meditation practice— to promote calmness and momentary concentration by walking slowly with mindfulness; 4) 'movement nature meant' practice— to move with awareness for flexibility, strength and confidence; and 5) visuomotor limb tasks that train one's mind-body coordination. (n = 27) and an active control condition.<br>Health Education Program(HEP)= received the health education program (n = 27)<br>Duration: 9 months.<br>Measure: baseline, at 3 months, and 9 months. | 1. Cognition: Semantic fluency test, Color trails test (CTT), Digit span subtests (WAIS-III), Rey Auditory Verbal Learning Test, and Block design test (WAIS-III)<br>2. Cortical thickness: CT scan | The digit span forward score increased and CTT decreased over time, relative to their HEP counterparts in MAP. As expected, none of these significant post-hoc stat results survived the False discovery rate (FDR) correction. | Most of these neurobehavioral changes may require sustained effort across nine months, albeit at a reduced intensity. MAP can remediate certain cognitive impairments and engender neuroplastic effects even among those with MCI. |

Table.4 Summary of researches related to walking meditation effect on various outcomes in elderly people

| No | Title-1st Author-Year | Study design | Population | Intervention | outcomes | results | conclusions |
|---|---|---|---|---|---|---|---|
| 1 | Prakhinkit S. (2014) | RCT | 45 elderly females aged 60–90 years with mild to moderate depressive symptoms | There were 3 groups<br>1)The control group (CON; n = 15)<br>2)The traditional walking exercises training (TWE; n = 15): aerobic walking<br>3)The Buddhism walking meditation (BWM; n = 15): aerobic walking exercise incorporating Buddhist meditations<br>Both exercise groups enrolled into 2 phase. The 1st phase (week 1-6): at mild intensity (20%-39% individually determined heart rate reserve) performed for 20 minutes, 3 times a week.<br>The 2nd phase (week 7-12), at moderate intensity (40%-50% individually determined heart rate reserve) performed for 30 minutes, 3 times a week. | 1. Depression score: measured by using Thai Geriatric Depression Scale (TGDS)<br>2. Functional fitness measures: Inner scan Body Composition Monitor, 6-minute walk test, the heart rate monitor, 30-second arm curl test, 30-second chair-stand test, the back scratch flexibility test, and the timed up-and-go test<br>3. Endothelium-dependent vasodilation: Brachial artery characteristics were assessed with ultrasound equipment<br>4. Blood analyses: erythrocyte and plasma | 1. Depression score decreased only in the Buddhism walking meditation group. ($p < 0.05$)<br>2. Functional fitness measures increased in all groups ($p < 0.05$).<br>3. Endothelium-dependent vasodilation: Significant increase in both exercise groups. ($p < 0.05$)<br>4. Significant reductions in Blood analyses were found in all exercise groups, whereas low-density lipoprotein cholesterol, cortisol, and interleukin-6 concentrations decreased only in the Buddhism walking meditation group. | Walking meditation based on Buddhism that involves arm swinging exercises has been effective in improvement of the functional fitness of depressed people and vascular dysfunction. Walking meditation also reduced depression, plasma cortisol levels, and inflammatory markers, which were not altered by the TWE. These results collectively indicate that a walking meditation exercise can be a novel therapeutic model that may be suitable for improving physical functions for the elderly with mild and moderate depression. |
| 2 | Kim KN. (2014) | RCT | 60 females in the senior welfare center Training group (TG): n=30 Congrol group (CG): n=30 | 1)TG: Mindfulness meditation program Session 1: Eating meditation, Session 2: Walking meditation with Breathing meditation, Session 3: Body scan, Session 4: Breathing meditation, Session 5: Awareness of conscious sensory with walking meditation, Session 6: sitting meditation, Session 7: Awareness in everyday life (sitting meditation) Session 8: loving-kindness meditation, forgiving meditation (8 weeks, 90 min and 1 time/week) by mindfulness meditation expert.<br>2)CG: Wait-list<br>Duration: 8 weeks | 1.Sleep: Korea sleep scale<br>2.Depreesion: Geriatric depression scale (GDS)<br>3.Quality of life: A short self-report measure Quality of life scale | 1. Sleep scale: TG > CG ($p < 0.001$)<br>2. Elderly depression scale: no significant difference ($p = 0.768$)<br>3. Quality of life scale: TG > CG ($p < 0.001$) | According to the results, the Mindfulness Meditation program was useful for improving sleep and quality of life in elderly women. |

Table.4 Summary of researches related to walking meditation effect on various outcomes in elderly people *(continued)*

| No | Title-1[a] Author-Year | Study design | Population | Intervention | outcomes | results | conclusions |
|---|---|---|---|---|---|---|---|
| 3 | Natalia E. (2009) | RCT | 40 community -dwelling older adults with moderate low back pain. | Mind-Body Program group (N = 20):<br>1) the body scan, wherein a lying position, the participant is guided<br>to place their attention nonjudgmentally on each area of the body from the toes to the top of<br>the head; 2) sitting practice, where the participant is guided to focus their attention on breathing<br>while sitting on a chair; and 3) walking meditation, where the participant is guided in mindful slow walking with focused attention on body sensation and/or breathing.<br>Control group (N = 20) : the 8-week health education program. The health education curriculum involved lectures, group discussions, and homework assignments based on the health topics discussed.<br>Measure: before and at 8 weeks and 4 months follow-up<br>Duration: 1 hour/time, 5 times/weeks during the 4 months | 1. Disability was assessed with the Roland and Morris Disability Questionnaire<br>(RMDQ).<br>2. Pain intensity was assessed with two measures: the Short-Form McGill Pain.<br>Questionnaire (SF-MPQ)<br>3. Self-efficacy was assessed with the Chronic Pain Self-Efficacy Scale.<br>4. Quality of life was measured with the SF-36 Health Status Inventory<br>5. Mindfulness was assessed with the Mindful Attention Awareness Scale (MAAS) | Both the walking meditation and control groups improved on measures of disability, pain, Quality of life, and psychological function, both at program completion and 4-month follow-up. No differences between the two groups was found. | Both the intervention group and the education control group improved on outcome measures suggesting both programs had a beneficial effect. Participants continued to meditate on a 4-month follow-up. The control program was feasible but not innert. Piloting the control program in mind-body research can inform the design of larger clinical trials. |
| 4 | Jacobs C A.(2021) | RCT | 16 participants (age 45+) with OA knee (n=8 per group) | 1)Experiential group: modifications of GetActive-OA.<br>GetActive-OA Proposed Modifications<br>Session 1: quota-based activity pacing; gratitude<br>Session 2: Deep breathing<br>Session 3: walking meditation<br>Session 4: adaptive thinking; acceptance-based skills<br>Session 5: adapted for meditation<br>Session 6: Loving-kindness meditation<br>Session 7: a meditation on acceptance versus change<br>Session 8: an overview of resiliency skills<br>2)Control group: the GetActive-OA program and will follow the format of the Health Education Program(HEP)<br>Measurement: before and at 8 weeks<br>Duration:90 min/ 2 time/week, 8 weeks | 1. Demographics: Age, gender, body mass index (BMI), race, nationality, ethnicity, education detail, social status, occupation, income, marital status, mental health history, current psychotropic/pain medication intake, comorbid medical conditions, history of depression or other mental health conditions.<br>2. Pain: Numerical Rating Scale (NRS), analgesics, daily self-report log, Concomitant pain treatment.<br>3. Physical Function: Self-reported(Knee injury and Osteoarthritis Outcome Score -KOOS)<br>4. Physical Activity: Objective and self-report: Accelerometer and Physical Activity Scale for persons with a physical disability (PASPD)<br>5. Physical Function: Performance-based: 40 m Self-Paced Walk Test<br>6. Emotional Function: PROMIS depression and PROMIS anxiety. | Significant improvement of outcomes after training compared to before training in both groups. ($p < 0.05$), but no difference between two groups. | These results will inform a GetActive-OA fully powered RCT versus control to test its efficiency, biological, psychological, and mechanical pathway mechanisms for improvement. Through, the GetActive-OA program can decrease pain, depression, and obesity, these factors lead to improved knee health and quality of life. |

Table.4 Summary of researches related to walking meditation effect on various outcomes in elderly people *(continued)*

| No | Title-1st Author-Year | Study design | Population | Intervention | outcomes | results | conclusions |
|---|---|---|---|---|---|---|---|
| 5 | Srisoongnern S.(2021) | RCT | 48 patients with heart disease (New York Heart Association functional Class, NYHA of II and III) mean age is 65 years. . | 1)Buddhist walking meditation group (n = 24): the walking meditation while rhythmically swinging legs; at the same time, they used the quiet, the mental label "left" on left-leg upward swings, and "right" on right-leg upward swings. 2)Aerobic exercise group (n = 24): moderate type exercise in 30 minutes Duration: 3 times per week during the 6 weeks. Measure: before and at 6 weeks . | 1. Exercise capacity: six-minute walk test (6MWT) 2. Quality of life: The Minnesota Living with Heart Failure Questionnaire (MLHFQ) - Thai version 3. Hemodynamic response: BP and HR by GE Dina map ProCare V100 4. Frequency of self-practice (adherence), and intensity of training sessions: logbook entries | - No significant improvement in Exercise capacity of the walking-meditation group at the 6-week, whereas a significant change was evident for the aerobic exercise group (p, 0.001). - The intention-to-treat analyses showed no statistical changes for all domains of the Quality of life within the two groups, and no statistical differences between the groups. - No significant change in Hemodynamic response of the walking-meditation group over the 6 weeks, Hemodynamic response of the aerobic-exercise group saw a significant decline (p, 0.025). | There was no evidence in exercise capacity, quality of life, and most hemodynamic differences between walking meditation and aerobic exercise responses for NYHA class II and III heart failure. At this stage, a 6-week program of walking meditation has not been proven effective in improving the exercise capacity of Heart Failure patients, while compared with an aerobic exercise program. |

# CHAPTER 3
# METHODS

The chapter describes about the details of methodology included research design, sample size, inclusion and exclusion criteria of the participants, and the procedure as follows.

**1.Research design**

This study was a randomized controlled trial with single-blinded of the outcome assessor.

1.1 Participants

The study's participants were recruited from the Kohkha's elderly club, Kohkha, Lampang province Thailand. All members of the clubs were invited to enroll the study by the researcher. Only the members who volunteer to participate the study were screened accordance with the inclusion and exclusion criteria as mentioned below. Then, the elderly volunteers who meet the criteria were simple randomly allocated into two groups: a walking meditation group (n = 24) and a control group (n=24)

1.2 Inclusion and exclusion criteria

The inclusion criteria are as follows:

- Age 60-69 years with a low to moderate level of physical activity evaluated by Global Physical Activity Questionnaire (GPAQ-Thai Version). (70)
- The evaluated score by MoCA test > 24 points (Normal). (41)
- Never practiced walking meditation before.
- Able to walk without gait aid independently.
- Sign an informed consent to attend the study by themselves.

The exclusion criteria are as follows:

- Body Mass Index (BMI) is greater than 30 $kg/m^2$ or less than 18.5 $kg/m^2$.
- There is a chronic pain in the back or legs while standing or walking with a pain intensity level of more than 6 points as assessed by the Visual Analog Scale (3).
- Neurological and/or cardiovascular problems that are still uncontrollable, such as after recent surgery or neurological treatment, acute myocardial infarction,

acute cardiac arrhythmias, untreated phlebitis and thromboembolism, and untreated neurological/cardiovascular diseases, etc.

- Some diseases evaluated by a doctor or physical therapist, those are a contraindication to exercise, such as severe and acute kidney disease, uncontrolled asthma and acute exacerbation of COPD, etc.

- Unable to do backward counting of number by 3, or number subtraction by 3, correctly for three counts in five consecutive counts.

- Drinking alcoholic beverages everyday as a behavior or within one day before attend the study

1.3 Sample size calculation

The purpose of this clinical trial is to look into the effects of walking meditation on balance ability while dual-tasking walking in healthy aging by comparison between walking meditation and control groups. As a result, the sample size for this study were determined with formula for testing two independent means by used mean and standard deviations of the data from the previous study which investigated the effects of a walking meditation program on balance performance in older women. (17) The means and standard deviations of control and experimental groups found in the previous study are 11.2+2.7 and 9.2+1.6 respectively. Researcher used the n4Studies application (71) to calculate the sample size, which was calculated by setting Alpha(a) = 0.05 and Beta (B) = 0.20. The sample size from calculation is 40 persons ( n = 20/group), as shown in Figure 2. In case of drop-out reservation, researcher estimated for 20% drop-out rate. Thus, the total sample size included 20% drop-out rate as 48 persons (n=24/group).

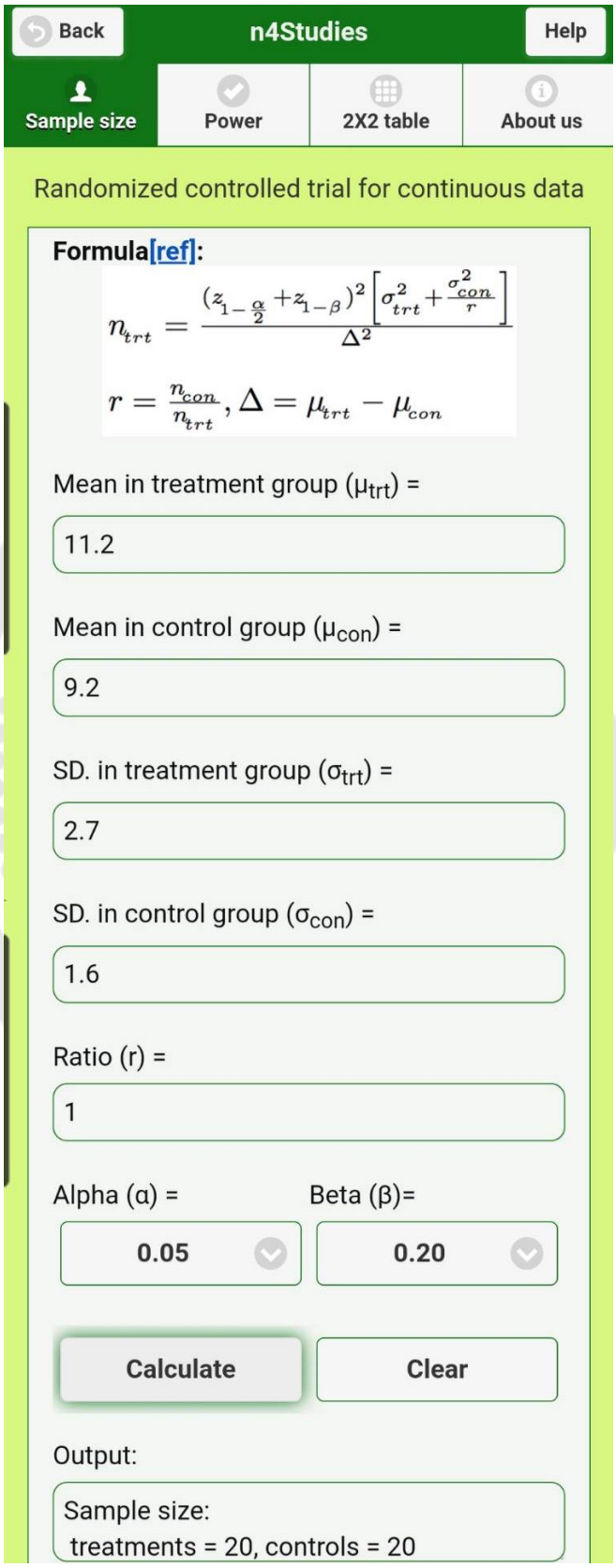



Figure 2. Sample size calculation by the n4Studies application

**2. Research procedure**

The study procedure carried out in the followed steps. The elders who volunteer to participate in the study screened according to the inclusion and exclusion criteria by a physical therapist (researcher no.1). Then, the elderly volunteers who had passed the screened informed about the purpose, benefits, and procedures of the study, and also signed the consent form if they agreed to enroll in the study.

Before group allocation, the participants were matched by blocked with sex and educational level, in order to reduce the effects of the confounded factors on the studied outcomes. [72] Then participants were simple allocated from the matched block with the random number generator excel computer program into 2 groups equally: 1) the walking meditation group (WMG), and 2) the control group (CG) by researcher no.1. At the first time of attended, both groups were educated how to live a healthy lifestyle and exercise.

At pre-training, the participants were assessed their dual-task performance by a physical therapist (researcher no.2) whom blinded from the group allocation of the participants. The Dual-Task performance assessment consists of 2 steps: 1) single-task walking test by Time Up and Go Test (TUG) for 2 trials, and 2) dual-task walking test by TUG along with number subtraction by 3 consecutively for 2 trials. The time use for single-task walking test and that for dual-task walking test recorded and averaged from the 2 trials. Before the dual-task walking test, the participants have to practice single cognitive task of number subtraction by 3 consecutively in sitting position for 30 seconds in order to understand how to do the subtraction.

The WMG received a walking meditation training protocol. The protocol starts with a 5 minutes warm-up by stretching the back muscles, leg muscles, and the sole. (See more detail for stretching activity in Appendix A.) Each muscle group stretched 3 times, and hold the stretch for 10 seconds/time. After that, the participants were practice walking meditation for 30 minutes and end with a cool-down by stretching same as the warm-up. The walking meditation practice were be divided into 3 intervals of 10 minutes each, and there is a 2-minute break between the intervals in order to prevent symptoms of fatigue. The participants in WMG attended the protocol 3 days a week, for 6 weeks. In

addition, the walking meditation practice were be progressed each week from phase 1 to phase 6 as mentioned in the walking meditation protocol.

The CG received a warm-up and cool-down by stretching similar to the WMG. After a warm-up, instead of practicing walking meditation, the participants of the CG practiced walking at the preferred speed for 30 minutes. The preferred speed walking for 30 minutes and divided into 3 intervals of 10 minutes each, with a 2-minute break between intervals in order to prevent symptoms of fatigue. The participants of the CG enrolled in the practice with preferred speed walking, 3 days a week for a period of 6 weeks.

The researcher was trained the participants how to perform the exercise program of their group once a week and let them perform the exercise by themselves at home twice a week. The participants were received a leaflet and videos to watch while practice at home. The researcher was also following up each participant once a week by a report form, whether they can perform their assigned program correctly or have any difficulty/adverse symptoms during practice. After 6 weeks of the training program, all participants re-assessed same as the pre-training. Then, the outcome measures data was be statistically analyzed. The participants who practice the protocol of their group less than 12 sessions from 18 sessions, or less than 67% of the total practice within six weeks excluded from the data analysis. (73) Also, the participants who attend the practice training by the physical therapist (researcher no.1) less than six times excluded from the data analysis.

**Walking meditation protocol**

Walking meditation involves subtle attention concentrating on leg and foot movements while walking slowly. The walking meditation protocol of this study followed the six phases, progression of walking meditation by Wat Borom Sathon Sri Sutthi Sophon Rangsan (Wat Don), which are as follows (61):

Phase 1: Paying attention to foot movement while slowly walking with simultaneously saying “Right pedal–Left pedal” in every left and right step alternately.

Phase 2: Paying close attention to the more delicate foot movement while slowly walking with simultaneously saying “Raise foot up–Pedal” in every single walking step.

Phase 3: Paying close attention to the more delicate foot movement while slowly walking with simultaneously saying “Raise foot up–Pedal–Tread” in every single walking step.

Phase 4: Paying close attention to the more delicate foot movement while slowly walking with simultaneously saying “Heel raise–Foot raise–Pedal–Tread” in every single walking step.

Phase 5: Paying close attention to the more delicate foot movement while slowly walking with simultaneously saying “Heel raise–Foot raise–Pedal–Place down–Tread” in every single walking step.

Phase 6: Paying attention to the more delicate foot movement while slowly walking with simultaneously saying "Heel raise–Foot raise–Pedal–Place down–Floor contact–Tread” in every single walking step.

Each phase practiced by slowly walking back and forth in a path of 8-12 paces for 3 0 minutes per day, three days a week. As a result, it took 18 days or 6 weeks to complete all six phases of the walking meditation.

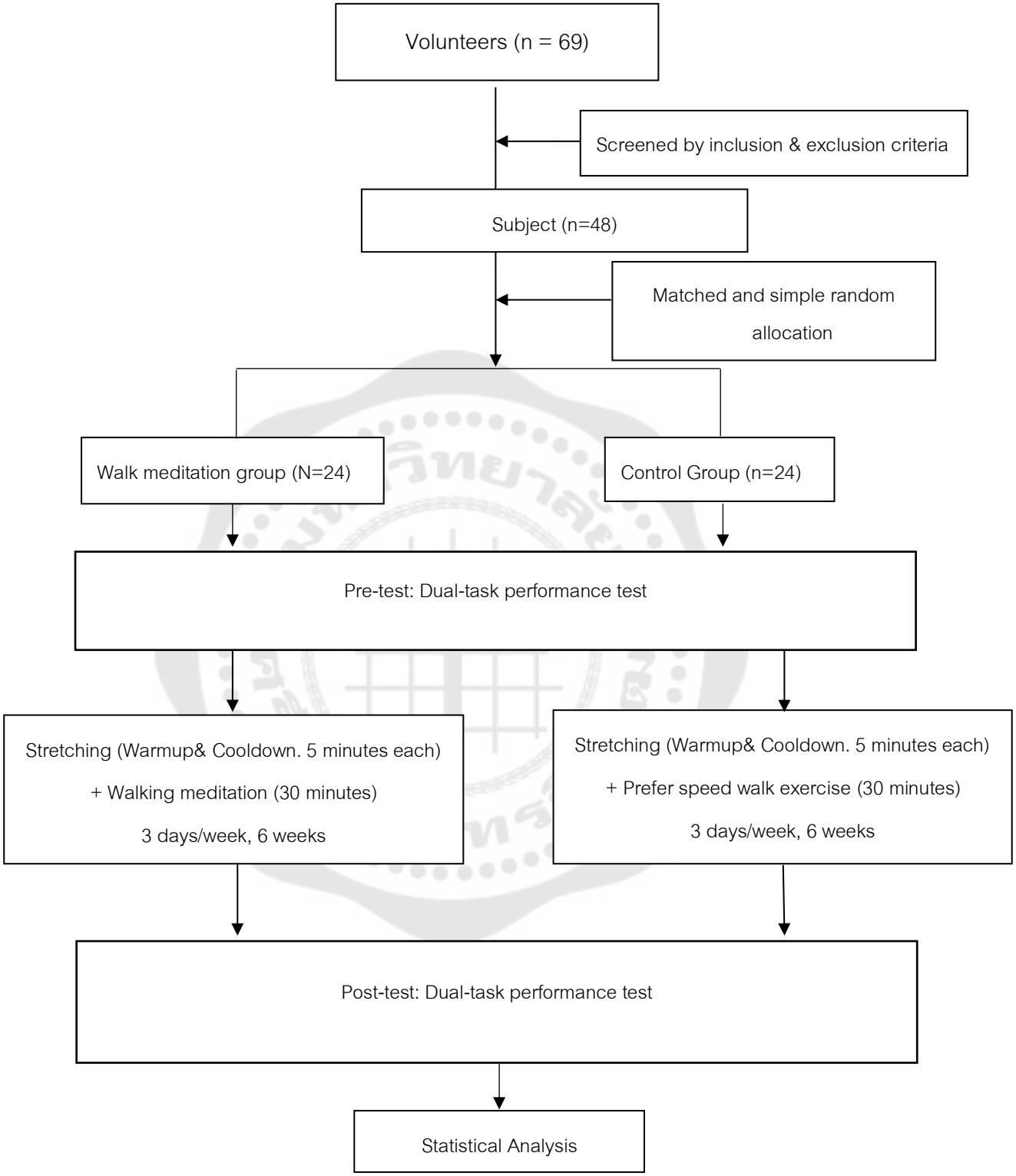



Figure 3. The flow chart depicts the study procedure

**3. The screening instruments used in the recruitment of participants**

This study used a questionnaire to collect background, characteristics, alcohol drinking behavior, and ability to do consecutive number subtraction by three of the elderly based on the inclusion and exclusion criteria. Global Physical Activity Questionnaire (GPAQ-Thai Version2) were used to screen out the elders who have vigorous physical activity. The cognitive MoCA test were used to screen out the elders with cognitive impairment and to detect whether participants have problem in number subtraction part.

**4. Outcome measurement**

The outcome of the study was a dual-task walking performance assessed by a dual-task walking performance test. The dual-task walking test was applied by a Time Up and Go test while performing cognitive task of number subtraction by 3 consecutively. The dual-task walking performance was represented by the Dual-task cost (DTC) and the Correct answers of subtraction during dual-task walking (CAS).

Dual-task walking performance test

The dual-task walking performance test consists of 2 conditions:

1) Single-task walking test by Timed Up and Go Test (TUG), The spent time of the single-task walking was tested and averaged from two trials. Then the averaged spent time of the single-task walking was used for calculation of a Dual-task cost (DTC).

2) Dual-task walking test by doing TUG together with number subtraction by 3, starting with the given number of 2 digits from the assessor, for example starting from 99 and then the consecutive subtraction by 3 will be 96, 93, 90, 87, etc., respectively. Besides, the Correct answers of subtraction during dual-task walking (CAS) was counted by the assessor. The dual-task walking test was assessed and averaged from two trials. Then the Dual-task cost (DTC) and the Correct answer of subtraction during dual-task walking (CAS) was calculated.

Time Up and Go Test (TUG)

TUG starts with the participant sitting on a chair and when the assessor said the word “Go”, the participant gets up from the chair, walk as fast as feeling safe for a distance of 3 meters, then turned around at a traffic cone (80-centimeter height) and

walked back to sit on the same chair. The assessor began the timer when said the word "Go" and stopped the timer when the participants walked back and sat on the chair in upright position. The researcher explained and demonstrated the test to the participants (See more detail of the instruction of the test to the participants in Appendix B.) before starting to assess while the participant sitting on a chair.

In the dual-task walking test condition, the assessor instructed the participant similar to TUG plus giving the participant a starting number of 2 digits for subtraction by three consecutively during TUG. The time recording began when the assessor said the word "Go" and stopped when the participants walked back and sat on the chair in upright position. In the meantime, the researcher recorded numbers of the correct subtraction answers from the participants during the dual-task walking test. In addition, during the test, a video recording was taken to verify the correctness. During the test session, if the participant forgets to start number subtraction or stops walking, the assessor was immediately motivated participant only once, such as reminding the participant to do subtraction, re-telling the starting number, or stimulating when participant halted his/her walking, which recorded.

Dual-task cost (DTC)

To assess the participants' dual-task walking performance, the dual-task cost was determined as the difference of the time use between the dual-task walking test and single-task walking test and standardized it with the time spent of the single-task walking in term of percentage. A lower result of DTC represents better dual-task performance. (24) The formula for DTC calculation is presented below. (18)

$$DTC = \frac{(\text{time use in dual-task walking} - \text{time use in single-task walking})}{\text{time use in single-task walking}} \times 100$$

Correct answers of subtraction during dual-task walking (CAS)

The term "correct answers of subtraction during dual-task walking (CAS)" was adapted from previous literature (18, 74, 75) to describe the level of performance in the cognitive test. The formula for CAS calculation is presented below.

$$\text{CAS} = \frac{\text{number of correct answers of consecutive subtraction during dual-task walking} \times 100}{\text{time(second) use in dual-task walking}}$$

Where "number of correct answers" refers to the total number of correct digits (for the serial subtractions task) generated during the tests, and "time" refers to the time (in seconds) in dual-task walk test required to complete the specified walking activity. A higher result of CAS represents a better cognitive performance.

**5. The statistical analysis**

The Kolmogorov–Smirnov test was used for normal distribution test of the outcome data. The two-way ANOVA mixed model was used to analyze the training effect, time effect, and interaction (training x time) effect on the studied outcomes. The outcomes included of the dual-task cost (DTC) and the correct answer of subtraction during dual-task walking (CAS). Then, post-hoc multiple comparison by Bonferroni test was performed to compare between groups. The level of statistical significance for all tests was set at $p < 0.05$.

# CHAPTER 4
# RESULTS

This study investigated effectiveness of walking meditation on dual-task walking performance in aging. Forty-Eight participants were matched with sex and education, and randomized into two groups; a walking meditation group (WMG) receiving walking meditation training and a control group (CG) receiving walking exercise with self-preferred speed. All participants were members of Kohkha's elderly club, Kokha, Lampang, Thailand. The participants completed the program and no one of participants dropped out.

The outcome measures representing dual-task walking performance of this study was a time up and go test with number subtraction which is a motor task combined with a cognitive task. For the dual-task walking performance test, four parameters were collected as follows: 1) single-task walking time, 2) dual-task walking time, 3) Dual-task cost (DTC), and 4) Correct answers of subtraction during dual-task walking (CAS). DTC is a difference of the time used in dual-task walking test and single-task walking test standardized with the time spent in the single-task walking. CAS is the total number of correct digits from serial subtraction task during dual-task walking test standardized with the time spent in the dual-task walking.

Baseline characteristics of the participants in walking meditation and control groups are shown in Table 5. There was no significant difference in all characteristics related to age, body mass index, genders, education level, score of Montreal cognitive assessment, and physical activity level of the participants between both groups at baseline.

Table 5.Demographic characteristics of participants in walking meditation and control groups

| Characteristics | Walking meditation Group (N = 24) | Control Group (N = 24) | p-value# |
|---|---|---|---|
| Age(year)[a] | 64.79 ± 2.57 (63.71-65.88) | 65.46 ± 2.32 (64.48-66.44) | 0.351 |
| Body Mass Index (kg/m$^2$) [a] | 23.60 ± 3.47 (22.14-25.07) | 23.67 ± 2.97 (21.71-24.16) | 0.942 |
| Gender [b] | | | |
| Male/Female | 6 (25%) /18 (75%) | 6 (25%) /18 (75%) | 1.000 |
| Educational (year) [a] | 11.63 ± 5.36 (9.36-13.89) | 12.04 ± 6.01 (9.12-14.29) | 0.801 |
| Educational (level) [b] | | | 1.000 |
| Primary school | 8 (34%) | 8 (34%) | |
| Secondary school or Vocational certificate | 9 (38%) | 9 (38%) | |
| Bachelor's degree or Diploma | 5 (20%) | 5 (20%) | |
| Master's degree or Doctor's degree | 2 (8%) | 2 (8%) | |
| MoCA score [a] | 27.17 ± 1.86 (26.38-27.95) | 27.33 ± 1.97 (26.50-28.17) | 0.764 |
| Physical activity level [b] | | | 0.500 |
| - Inactive | 1 (4%) | 2 (8%) | |
| - Insufficient active | 23 (96%) | 22 (92%) | |

MoCA: Montreal cognitive assessment

[#] p-value from independent t-test comparing between walking meditation and control groups.

[a] the data are presented as a mean ± standard deviation (95% confidence interval)

[b] the data are presented as number (%)

At baseline or pre-training. The four studied parameters, single-task walking time which assessed by using TUG; dual-task walking time which assessed by TUG with number subtraction; DTC; and CAS, were not significantly different between walking meditation and control groups as shown in Table 6.

Table 6. Comparison of single-task walking time, dual-task walking time, dual-task cost, and correct answers of subtraction during dual-task walking between walking meditation and control groups at baseline or pre-training.

| Studied parameters (Pre-test) | Mean±SD (95% confidence interval) | | p-value[#] (Between Groups) |
|---|---|---|---|
| | Walking meditation Group (N = 24) | Control Group (N = 24) | |
| Single-task walking time[a] (Second) | 9.75±0.89 (9.37-10.13) | 9.96±1.28 (9.41-10.49) | 0.518 |
| Dual-task walking time[b] (Second) | 15.92±2.43 (14.89-16.94) | 14.79±2.88 (13.58-16.01) | 0.153 |
| DTC (%) | 63.41±21.73 (54.24-72.59) | 49.29±27.16 (37.83-60.76) | 0.053 |
| CAS (%) | 15.29±7.24(12.23-18.35) | 14.30±9.18(10.42-18.17) | 0.680 |

[a]single-task walking time assessed by Time up and go test (TUG), [b]dual-task walking time assessed by TUG with number subtraction, DTC: Dual-Task cost, CAS: Correct answers of subtraction during dual-task walking.

[#] p-value from independent t-test comparing between walking meditation and control groups.

Analysis of the data by two-way ANOVA mixed model revealed significant effects of time and time x group interaction on all studied parameters ($p<0.01$), and showed significant group effect on only CAS ($p<0.05$) as shown in Table 7. Since significant time effect on all studied parameters was found, comparison between pre- and post- training within walking meditation and within control groups on each studied parameter was analyzed by dependent t-test. Also, due to the significant effects of group on CAS and also time x group interaction on all studied parameters were found, the post-hoc analysis to multiple compare between groups at pre-training and post-training of each studied parameters was performed with Bonferroni test.

Table 7. The effects of groups as walking meditation and control groups, time as pre-training (at week 0) and post-training (at week 6), and time x group interaction analyzed by two-way ANOVA mixed model.

| Studied parameters | F | p-value |
|---|---|---|
| **Single-task walking time**[a] | | |
| Group | 2.87 | 0.097 |
| Time | 49.24 | 0.001** |
| Time x group | 9.44 | 0.004** |
| **Dual-task walking time**[b] | | |
| Group | 0.37 | 0.544 |
| Time | 74.23 | 0.001** |
| Time x group | 46.44 | 0.001** |
| **Dual-Task cost (DTC)** | | |
| Group | 0.18 | 0.674 |
| Time | 24.25 | 0.001** |
| Time x group | 29.96 | 0.001** |
| **Correct answers of subtraction during dual-task walking (CAS)** | | |
| Group | 4.88 | 0.032** |
| Time | 112.30 | 0.001** |
| Time x group | 29.85 | 0.001** |

[a]single-task walking time assessed by Time up and go test (TUG), [b]dual-task walking time assessed by TUG with number subtraction. * Significant difference at $p < .05$ by Two Way ANOVA Mixed model. ** Significant difference at $p < .01$ by Two Way ANOVA Mixed model

When looking at the time effect by comparison between pre-training and post-training within each group, the results were as follows. At post-training, the walking meditation group showed significant decreases in single-task walking time (p=0.001), dual-task walking time (p=0.001) and DTC (p=0.001), but increase in CAS (p=0.001) when compared with the baseline at pre-training as demonstrated in Table 8. Meanwhile, after training, participants in a control group showed a decrease in single-task walking time only (p=0.012), and an increase in CAS (p=0.001) when compared to their baseline at pre-training as presented in Table 8.

As the effects of group on CAS and of time X group interaction on all studied parameters, it was found that only the walking meditation group demonstrated significant decrease in dual-task walking time and DTC after training, while a control group did not show (Table 8). Particularly, after training, the walking meditation group used significantly shorter dual-task walking time (p=0.049) and had significantly higher CAS (p=0.002) than the control groups as shown in Table 9.

Table 8. Comparison of single-task walking time, dual-task walking time, dual-task cost, and correct answers of subtraction during dual-task walking between pre- and post-training within group.

| Studied parameters | Walking meditation Group (N = 24) | Control Group (N = 24) |
|---|---|---|
| **Single-task walking time**[a] (Second) | | |
| - Pre-Test | 9.75±0.89(9.37-10.13) | 9.96±1.28(9.41-10.49) |
| - Post-Test | 8.79±0.99(8.37-9.21) | 9.58±1.08(9.12-10.03) |
| p-value[$] | 0.001** | 0.012* |
| **Dual-task walking time**[b] (Second) | | |
| - Pre-Test | 15.92±2.43(14.89-16.94) | 14.79±2.88(13.58-16.01) |
| - Post-Test | 12.43±2.03(11.53-13.24) | 14.39±2.64(13.19-15.42) |
| p-value[$] | 0.001** | 0.124 |
| **DTC** (%) | | |
| - Pre-Test | 63.41±21.73(54.24-72.59) | 49.29±27.16(37.83-60.76) |
| - Post-Test | 41.67±19.17(32.95-49.67) | 50.45±23.25(40.63-60.27) |
| p-value[$] | 0.001** | 0.652 |
| **CAS** (%) | | |
| - Pre-Test | 15.29±7.24(12.23-18.35) | 14.30±9.18(10.42-18.17) |
| - Post-Test | 26.52±7.18(23.57-29.61) | 17.89±7.93(14.64-21.30) |
| p-value[$] | 0.001** | 0.001** |

[a] single-task walking time assessed by Time up and go test (TUG), [b] dual-task walking time assessed by TUG with number subtraction, DTC: Dual-Task cost, CAS: Correct answers of subtraction during dual-task walking

* Significant difference at $p < 0.05$. ** Significant difference at $p < 0.001$. $ p-value from dependent t-test

Table 9. Comparison of single-task walking time. Dual-task walking time, dual-task cost, and correct answers of subtraction during dual-task walking between walking meditation and control group at post-training.

| Studied parameters (Post-test) | Mean±SD (95% confidence interval) | | p-value[#] (Between Groups) |
|---|---|---|---|
| | Walking meditation Group (N = 24) | Control Group (N = 24) | |
| Single-task walking time[a] (Second) | 8.79±0.99(8.37-9.21) | 9.58±1.08(9.12-10.03) | 0.074 |
| Dual-task walking time[b] (Second) | 12.43±2.03(11.53-13.24) | 14.39±2.64(13.19-15.42) | 0.049* |
| DTC (%) | 41.67±19.17(32.95-49.67) | 50.45±23.25(40.63-60.27) | 1.000 |
| CAS (%) | 26.52±7.18(23.57-29.61) | 17.89±7.93(14.64-21.30) | 0.002** |

[a]single-task walking time assessed by Time up and go test (TUG), [b]dual-task walking time assessed by TUG with number subtraction, DTC: Dual-Task cost, CAS: Correct answers of subtraction during dual-task walking

[#] p-value from Bonferroni test. * Significant difference at $p < 0.05$. ** Significant difference at $p < 0.01$.

# CHAPTER 5
# DISCUSSION

This study was conducted to evaluate walking meditation effect on dual-task walking performance compared to a preferred speed walking exercise in elderly persons.

Forty-eight elderly participants aged 65.13±0.35 years were block matched with gender and education level. They were randomized into control group (CG, n = 24) and walking meditation group (WMG, n = 24). So, these help to reduce the gender, age, and educational factors that affecting the studied outcomes between WMG and CG. Both groups engaged in 6 weeks of practice (30 minutes/day, 3 days/week). The CG received walking exercise with preferred speed, while the WMG received walking meditation training. Four studied parameters were measured before and after training as follows: 1) single-task walking time (STT), 2) dual-task walking time (DTT), 3) dual-task cost (DTC), and 4) correct answers of subtraction during dual-task walking (CAS). The DTC and CAS were main outcomes representing dual-task walking performance

The results showed that, after training, WMG significantly improved all of the studied parameters after training when compared with before training ($p < 0.001$). In addition, at post-training, the WMG demonstrated significant shorter DTT ($p=0.049$) and higher CAS ($p=0.002$) when compared to the control group. Meanwhile, after training, the CG presented an improvement of only STT ($p < 0.05$) and CAS compared with before training ($p < 0.001$). These findings indicate that walking meditation training protocol of this study can improve both single-task walking and dual-task walking performance of the elderly and show better improvement than walking exercise with preferred speed. On the other hand, a walking exercise with preferred speed can improve single-task walking performance rather than dual-task walking performance.

This study found that walking meditation training for 6 weeks improved STT of the elderly which is similar to previous studies that improving timed up and go test (TUG) in persons with type-2 diabetic peripheral neuropathy (61) and healthy elderly women (17) within 4-week and 8-week walking meditation training respectively. This supports that

walking meditation protocol of this study can promote walking balance or balance during TUG within a suggested time (4-6 weeks) for training to improve balance from previous literature review. (76)

A walking exercise with preferred speed for 6 weeks in elderly participants of CG in this study helped improve STT, whereas the previous study which trained persons with type-2 diabetic peripheral neuropathy with preferred speed walking for 4 weeks did not show improvement of TUG. (61) This may suggest that a preferred-speed walking exercise can promote walking balance in inactive elderly if practice at least 6 weeks, while it may need more training time in persons with unhealthy conditions.

For the CAS outcome, before training, both WMG and CG did not show any significant difference in CAS score, but after training, WMG presented significantly higher score of CAS than CG ($p=0.001$). Together with a higher score of CAS in WMG than in CG after training, the WMG also showed faster STT and DTT than the CG, as well as lower DTC than its baseline. These finding represented that walking meditation can improve dual-task walking performance by promoting both motor and cognitive tasks better than preferred speed walking exercise. Although, after training, elderly participants in CG also showed significant improvement of CAS and STT, but they did not show any significant changes in DTT and DTC. These may imply that the CAS improvement when doing dual-task walking of CG may because the elderly paid their attention to a cognitive task and divided their brain's processing on the cognitive task over a motor task which resulting in unchanged DTT and DTC which according to the bottle neck theory of dual-task working. (77) The bottle neck theory explains that, in dual-task conditions, a central brain processing is limited. It can serial selecting response to only one task at a time depending on which task is more focused. (78) Therefore, after training, the DTT of CG did not change from baseline even though STT improved.

The WMG showed improvement of both DTT and CAS better than CG. This represents that WMG definitely improves dual-task walking performance. It can be explained by theory and definition of dual-tasking. Margaret et al. (19) and Verhaeghen

et al. (2003) (79) described “dual-tasking as doing two tasks simultaneously and both tasks will interfere each other, if one task did well, it will make both tasks better”. In accordance with the definition, walking meditation is like dual-tasking by performing two tasks at the same time those were walking and meditation. Walking task during walking meditation practice seems like physical exercise that will improve motor task. (80) Meanwhile the second task during walking meditation practice as “meditation or mindfulness” which concentrated on leg movement could promote cognitive task. (55, 81, 82)

Also, CG could increase cognitive task as shown by increase in CAS. It may be supported by previous studies (76, 83) which claimed that physical exercise could help increase cognition or cognitive task. Thus, a preferred-speed walking exercise could improve cognitive task as number subtraction during TUG test as well. From the previous study in elderly, physical exercise with moderate-intensity to increase cognition needed at least 4 weeks to 12 months and increase balance needed at least 4 weeks to 6 months (12, 84), which agreed with the 6 weeks training effect that found in this study.

However, at post-training, WMG revealed a significant better DTT than CG, but did not show difference of DTC from CG. These can be explained by the tendency of using more DTC in WMG (63.41±21.73 %) than CG (49.29±27.16 %) at before training. After training, although, the walking meditation group showed the improvement of DTC, the amount of DTC improvement may not be large enough to make different from the CG. As a result, a difference in DTC outcome after training between WMG and CG was not found.

Currently, dual-task training, which combines movement and cognitive training with motor learning and task specificity principles, is suggested to integrate in exercise to improve balance and dual-task walking performance for the elderly. (83) For examples, Tai-chi, Qigong, dancing, and walking meditation, which are similar to dual-task training. It was found to help improve balance of elderly people. (3, 85) Besides the benefit for the elderly, a dual-task training has also been shown to be beneficial in a variety of populations with various clinical conditions such as Parkinson’s disease, Mild

cognitive impairment, Stroke and etc. (86-88) Particularly, a motor-cognitive dual-task training has been shown to improve cognitive and physical functions in older adults with and without cognitive impairment. (11, 89) The systematic review recommended that a dual-task training program is rather preferred than a single-task training in order to targeting both motor performance and cognitive ability, especially in a dual-tasking situation, in healthy older adults. As a result of motor and cognitive functions improvement, these will lead to increase in balance performance of elderly persons during dual-task walking which is a necessary daily activity for independent living (90).

Walking meditation can improve individual's ability to maintain balance when single-leg stance while walking because each phase of the walking meditation training helps develop a perceptive sense of stability and control in one's movements, including a subtle shift in weight between both feet that occurs while walking. Therefore, walking meditation practice may have a positive effect alike balance training, specifically in a single-leg stance. Also, the walking meditation practice involves the continuously tracking of one's thought or focus on every steps of foot and leg movements during walking, which is similar to controlled attention training. (91) Previous literatures reported that attention training can improve cognitive function in various domains, including working memory. (92) This may be the reason why walking meditation training can improve dual-task walking performance, as it enhances mental tracking task, or controlled attention, that is an important required cognitive function for working memory when doing more than one task simultaneously. (91-92) Therefore, it can be concluded that the benefits of walking meditation training with six-phases progression within 6-weeks are not limited to physical aspect such as balance and stability, but it also extends to cognitive function, including attention and working memory supporting by the improvement of DTC found in this study.

In this study, none of the participants in WMG and CG dropped out of the study. This may be due to a good management of the researcher team as follows. The researcher followed up with good care of all participants at every session to prevent them from dropping out of the study. Also, the researcher offered the participants to

engage the training (walking meditation practice or self-preferred speed walking exercise) during their free time. In addition, the training place was close to the participants' residences where easily for coming to join.

In conclusion, this study supported that walking meditation practice alike motor-cognitive dual-task training can improve dual-task walking performance which is necessary for balance during walking in community of the elderly persons. Also, within 6-week training, walking meditation helped improve dual-task walking performance better than preferred-speed walking exercise. Therefore, walking meditation practice can be an alternative exercise for promoting dual-task walking performance in elderly people via improving both motor and cognitive tasks.

**Study limitations**

This study recruited participants aged 60-69 years who were early elderly with inactive physical activity lifestyle, so that they may not represent overall elderly population. Therefore, the research findings of this study cannot be extrapolated to other aging people such as those with cognitive problems or with underlying diseases that excluded from the study.

**Further studies**

Further studies related to a comparison of walking meditation effect with other exercise regimens, such as Tai-chi, dancing, and yoga on dual-task walking performance in elderly are interesting to investigate. Furthermore, effects of walking meditation training in other focused groups, for example persons with mild-cognitive impairment, and on other outcomes as quality of life are also fascinating.

**Conclusion**

Walking meditation protocol of this study (30 minutes a day, 3 days a week, for 6 weeks) significantly improved dual-task walking performance of the elderly persons. At post-training, the WMG presented significant improvements of STT, DTT, DTC, and CAS, while the CG showed significant improvements of STT and CAS when compared to their baseline at pre-training. Moreover, after training, the elderly participants who received walking meditation practice in WMG showed significantly faster DTT and higher CAS than whom in the CG which received a preferred speed walking exercise. Therefore,

walking meditation can be applied as an alternative exercise for health promotion to improve dual-task walking performance for inactive elderly people who able to walk independently.

# REFERENCES


1. Damrikarnlerd L, Aruntippaitun S, Pothisiri W, Rittirong J, Chamchan C, Chuanwan S. Situation of the thai elderly 2019. Bangkok,Thailand: Institute for Population and Social Research, Mahidol University and Foundation of Thai Gerontology Research and Development institute (TGRI); December, 2020. 128.
2. Chidchanok S, Julalak K. The effects of thasala model on physical competency promoting to minimize risk from falls in the elderly. Region 4-5 Medical Journal. 2020;39:127-39.
3. Varela-Vásquez LA, Minobes-Molina E, Jerez-Roig J. Dual-task exercises in older adults: A structured review of current literature. JFSF. 2020;5(2):31-7.
4. Menant JC, Schoene D, Sarofim M, Lord SR. Single and dual task tests of gait speed are equivalent in the prediction of falls in older people: A systematic review and meta-analysis. Ageing Res Rev. 2014;16:83-104.
5. Wollesen B, Wanstrath M, Van Schooten K, Delbaere K. A taxonomy of cognitive tasks to evaluate cognitive-motor interference on spatiotemoporal gait parameters in older people: A systematic review and meta-analysis. Eur Rev Aging Phys Act 2019;16(1):1-27.
6. Li KZ, Bherer L, Mirelman A, Maidan I, Hausdorff JM. Cognitive involvement in balance, gait and dual-tasking in aging: A focused review from a neuroscience of aging perspective. Front Neurol. 2018;9:913.
7. Gobbo S, Bergamin M, Sieverdes JC, Ermolao A, Zaccaria M. Effects of exercise on dual-task ability and balance in older adults: A systematic review. Arch Gerontol Geriatr. 2014;58(2):177-87.
8. Plummer P, Zukowski LA, Giuliani C, Hall AM, Zurakowski D. Effects of physical exercise interventions on gait-related dual-task interference in older adults: A systematic review and meta-analysis. Gerontol. 2016;62(1):94-117.
9. Gallou-Guyot M, Mandigout S, Bherer L, Perrochon A. Effects of exergames and cognitive-motor dual-task training on cognitive, physical and dual-task functions in

cognitively healthy older adults: An overview. Ageing Res Rev. 2020:101-35.

10. Valentine ER, Sweet PL. Meditation and attention: A comparison of the effects of concentrative and mindfulness meditation on sustained attention. Ment Health Relig Cult. 1999;2(1):59-70.
11. Gard T, Hölzel BK, Lazar SW. The potential effects of meditation on age-related cognitive decline: A systematic review. Ann N Y Acad Sci. 2014;1307:89-99.
12. Di Lorito C, Long A, Byrne A, Harwood RH, Gladman JR, Schneider S, et al. Exercise interventions for older adults: A systematic review of meta-analyses. J Sport Health Sci. 2021;10(1):29-47.
13. Foster CE, Brennan G, Matthews A, McAdam C, Fitzsimons C, Mutrie N. Recruiting participants to walking intervention studies: A systematic review. Int J Behav Nutr Phys Act. 2011;8(1):1-28.
14. Ogilvie D, Foster CE, Rothnie H, Cavill N, Hamilton V. Interventions to promote walking: A systematic review. BMJ. 2007;28:121-35.
15. Gomeñuka NA, Oliveira HB, Silva ES, Costa RR, Kanitz AC, Liedtke GV, et al. Effects of nordic walking training on quality of life, balance and functional mobility in elderly: A randomized clinical trial. PLoS One. 2019;14(1):21-42.
16. Kelly P, Kahlmeier S, Götschi T, Orsini N, Richards J, Roberts N, et al. Systematic review and meta-analysis of reduction in all-cause mortality from walking and cycling and shape of dose response relationship. Int J Behav Nutr Phys Act. 2014;11(1):1-15.
17. Chatutain A, Pattana J, Parinsarum T, Lapanantasin S. Walking meditation promotes ankle proprioception and balance performance among elderly women. J Bodyw Mov Ther. 2019;23(3):652-7.
18. McCulloch KL, Buxton E, Hackney J, Lowers S. Balance, attention, and dual-task performance during walking after brain injury: Associations with falls history. J Head Trauma Rehab. 2010;25(3):155-63.
19. Weightman MM, McCulloch K. Dual-task assessment. Mild traumatic brain injury rehabilitation toolkit. 2014. 321-32.

20. Agmon M, Belza B, Nguyen HQ, Logsdon RG, Kelly VE. A systematic review of interventions conducted in clinical or community settings to improve dual-task postural control in older adults. Clin Interv Aging. 2014;9:477-92.
21. Ghai S, Ghai I, Effenberg AO. Effects of dual tasks and dual-task training on postural stability: A systematic review and meta-analysis. Clin Interv Aging. 2017;12:557-65.
22. Muir-Hunter S, Wittwer J. Dual-task testing to predict falls in community-dwelling older adults: A systematic review. Phys Ther. 2016;102(1):29-40.
23. Pang MYC, Yang L, Ouyang H, Lam FMH, Huang M, Jehu DA. Dual-task exercise reduces cognitive-motor interference in walking and falls after stroke: A randomized controlled study. Stroke. 2018;49(12):2990-8.
24. Wrisley DM, Marchetti GF, Kuharsky DK, Whitney SL. Reliability, internal consistency, and validity of data obtained with the functional gait assessment. Phys Ther. 2004;84(10):906-18.
25. Rabaglietti E, De Lorenzo A, Brustio PR. The role of working memory on dual-task cost during walking performance in childhood. Front Psychol. 2019;10:1754-63.
26. Sachdev PS, Blacker D, Blazer DG, Ganguli M, Jeste DV, Paulsen JS, et al. Classifying neurocognitive disorders: The dsm-5 approach. Nat Rev Neurol. 2014;10(11):634-42.
27. Morris J, Michael Kent. Oxford dictionary of sports science and medicine. 94. St Austell,UK: Oxford University Press; 2008. 260-4.
28. Diamond A. Executive functions. Annu Rev Psychol. 2013;64:135-68.
29. Tomasello M. The new psychology of language: Cognitive and functional approaches to language structure, volume i. Leipzig,Germany: Psychology Press; 2014.
30. Anderson JR. Learning and memory: An integrated approach. California, U.S.: John Wiley & Sons Inc; 2000.
31. Styles E. The psychology of attention. Oxford,UK: Psychology Press; 2006. 352.
32. Beaudoin C, Beauchamp MH. Social cognition. Handbook of clinical neurology. 173. Montreal, Canada: Elsevier; 2020. 255-64.
33. Matsuda O, Saito M. Crystallized and fluid intelligence in elderly patients with mild

dementia of the alzheimer type. Int Psychogeriatr. 1998;10(2):147-54.

34. Van Hooren S, Valentijn A, Bosma H, Ponds R, Van Boxtel M, Jolles J. Cognitive functioning in healthy older adults aged 64–81: A cohort study into the effects of age, sex, and education. Neuropsychol Dev Cogn B Aging Neuropsychol Cogn. 2007;14(1):40-54.
35. Harada CN, Love MCN, Triebel KL. Normal cognitive aging. Clin Geriatr Med. 2013;29(4):737-52.
36. Levy R. Aging-associated cognitive decline. 6. Cambridge, United Kingdom: Cambridge University Press; 1994. 63-8.
37. Borson S, Scanlan JM, Chen P, Ganguli M. The mini-cog as a screen for dementia: Validation in a population-based sample. J Am Geriatr Soc. 2003;51(10):1451-4.
38. Rezaei M, Rashedi V, Lotfi G, Shirinbayan P, Foroughan M. Psychometric properties of the persian adaptation of mini-cog test in iranian older adults. Int J Aging Hum Dev. 2018;86(3):266-80.
39. Trongsakul S, Lambert R, Clark A, Wongpakaran N, Cross J. Development of the thai version of mini-cog, a brief cognitive screening test. Geriatr Gerontol Int 2015;15(5):594-600.
40. Mahendran R, Chua J, Feng L, Kua E, Preedy V. The mini-mental state examination and other neuropsychological assessment tools for detecting cognitive decline. Diet and nutrition in dementia and cognitive decline. London,UK: Elsevier; 2015. 1159-74.
41. Hemrungrojn S, Tangwongchai S, Charoenboon T. Use of the montreal cognitive assessment thai version (moca) to discriminate amnestic mild cognitive impairment from alzheimer's disease and healthy controls: Machine learning results. Dement Geriatr Cogn Disord. 2021;50(2):183-94.
42. Julayanont P, Tangwongchai S, Hemrungrojn S, Tunvirachaisakul C, Phanthumchinda K, Hongsawat J, et al. The montreal cognitive assessment—basic: A screening tool for mild cognitive impairment in illiterate and low-educated elderly adults. J Am Geriatr Soc. 2015;63(12):2550-4.

43. Hsu Y-L, Chung P-C, Wang W-H, Pai M-C, Wang C-Y, Lin C-W, et al. Gait and balance analysis for patients with alzheimer's disease using an inertial-sensor-based wearable instrument. IEEE J Biomed Health Inform. 2014;18(6):1822-30.

44. Sano M, Rosen W, Stern Y, Rosen J, Mayeux R. Simple reaction time as a measure of global attention in alzheimer's disease. J Int Neuropsychol Soc. 1995;1(1):56-61.

45. Tanglakmankhong K, Hampstead BM, Ploutz-Snyder RJ, Potempa K. Cognitive screening assessment in thai older adults: A prospective study of the reliability and validity of the abbreviated mental test. J Health Res. 2021.

46. Swain DG, O'Brien AG, Nightingale PG. Cognitive assessment in elderly patients admitted to hospital: The relationship between the abbreviated mental test and the mini-mental state examination. Clin Rehabil. 1999;13(6):503-8.

47. Walsh R, Shapiro SL. The meeting of meditative disciplines and western psychology: A mutually enriching dialogue. Am Psychol. 2006;61(3):227-33.

48. Saini GK, Haseeb SB, Taghi-Zada Z, Ng JY. The effects of meditation on individuals facing loneliness: A scoping review. BMC Psychol. 2021;9(1):1-30.

49. Goyal M, Singh S, Sibinga EM, Gould NF, Rowland-Seymour A, Sharma R, et al. Meditation programs for psychological stress and well-being: A systematic review and meta-analysis. JAMA Intern Med. 2014;174(3):357-68.

50. Levine GN, Lange RA, Bairey-Merz CN, Davidson RJ, Jamerson K, Mehta PK, et al. Meditation and cardiovascular risk reduction: A scientific statement from the american heart association. J Am Heart Assoc. 2017;6(10):218-23.

51. Kim K-N, Son H-G, Park H-J. Effects of mindfulness meditation program on sleep, depression and quality of life in the institutionalized elderly women. KJ-HSM. 2014;8(3):157-68.

52. Marciniak R, Sheardova K, Čermáková P, Hudeček D, Šumec R, Hort J. Effect of meditation on cognitive functions in context of aging and neurodegenerative diseases. Front Behav Neurosci. 2014;8:17-26.

53. Sangprasert P, Palangrit S, Buranatrevedh S, Tiyoa N, Pattaraarchachai J. A systematic review of the effectiveness of mindfulness meditation and

contemplation upon vascular disease patients. TMJ. 2018;18(1):79-92.

54. Kwon C-Y, Chung S-Y, Kim JW. Mindfulness meditation program for the elderly in korea: A preliminary review for planning the program. Integr Med Res. 2021;10(1):451-55.
55. Edwards MK, Rosenbaum S, Loprinzi PD. Differential experimental effects of a short bout of walking, meditation, or combination of walking and meditation on state anxiety among young adults. Am J Health Promot. 2018;32(4):949-58.
56. Hanh TN, Anh-Huong N. Walking meditation. Oxford, UK: Sounds True; 2006.
57. Hanh TN. The long road turns to joy: A guide to walking meditation. Hue,Vietnam: Parallax Press; 2011.
58. Goodman C. Buddhist meditation: Theory and practice. Bangkok,Thailand: Buddhist Missionary Society; 2013. 553-71.
59. Brahm A, Dorje D. Walking meditation: Three expositions on walking meditation. I. Bangkok,Thailand: Wheel Publication; 2007. 60.
60. Srisoongnern S, Pajareya K, Sriboon R, Thanakiatpinyo T, Chirakarnjanakorn S, Thirapatarapong W. Effects of buddhist walking meditation on exercise capacity and quality of life of patients with chronic heart failure: A randomized controlled trial. Heart Lung. 2021;50(3):363-8.
61. Saisathit S, Lapanantasin S. Effets of walking meditation on balance performance in individuals with peripheral neuropathy from type 2 diabetes. http://ir-ithesis.swu.ac.th/dspace/handle/123456789/1008: Srinakharinwirot University; 2020.
62. Prakhinkit S, Suppapitiporn S, Tanaka H, Suksom D. Effects of buddhism walking meditation on depression, functional fitness, and endothelium-dependent vasodilation in depressed elderly. J Altern Complement Med. 2014;20(5):411-6.
63. Gainey A, Himathongkam T, Tanaka H, Suksom D. Effects of buddhist walking meditation on glycemic control and vascular function in patients with type 2 diabetes. Complement Ther Med. 2016;26:92-7.
64. Yu J, Rawtaer I, Feng L, Fam J, Kumar AP, Cheah IK-M, et al. Mindfulness intervention

for mild cognitive impairment led to attention-related improvements and neuroplastic changes: Results from a 9-month randomized control trial. J Psychiatr Res. 2021;135:203-11.

65. Morone NE, Greco CM, Moore CG, Rollman BL, Lane B, Morrow LA, et al. A mind-body program for older adults with chronic low back pain: A randomized clinical trial. JAMA Intern Med. 2016;176(3):329-37.
66. Suwannawat P. The effect of walking meditation on the elderly's balance. http://search.swu.ac.th/permalink/f/1912klb/ALEPH_MONO000103356: Srinakharinwirot University; 2007.
67. Yamwong N. The effect of walking meditation on physical fitness, short memory and emotional quotient of the aging in nakhon nayok province. http://padatabase.net/uploads/files/01/media/496_496_496_496_496_496_NCPA2015_p305-322.pdf2015.
68. Kim N-I. The effects of walking meditation program on autonomous nervous system and risk factors of dementia in elderly women. The Korean J Growth Dev. 2017;25(1):15 - 23.
69. Jacobs CA, Mace RA, Greenberg J, Popok PJ, Reichman M, Lattermann C, et al. Development of a mind body program for obese knee osteoarthritis patients with comorbid depression. Contemp Clin Trials Commun. 2021;21:720-29.
70. Bull FC, Maslin TS, Armstrong T. Global physical activity questionnaire (gpaq): Nine country reliability and validity study. J Phys Act Health. 2009;6(6):790-804.
71. Ngamjarus C. N4studies: Sample size calculation for an epidemiological study on a smart device. Siriraj Med J. 2016;68(3):160-70.
72. Kerlinger FN. Foundations of behavioral research. New York,USA: Fort Worth; 1966. 480.
73. Hecksteden A, Faude O, Meyer T, Donath L. How to construct, conduct and analyze an exercise training study? Front physiol. 2018;9:997-1007.
74. Yang L, He C, Pang MYC. Reliability and validity of dual-task mobility assessments in people with chronic stroke. PLoS One. 2016;11(1):22-44.

75. Kelly VE, Eusterbrock AJ, Shumway-Cook A. The effects of instructions on dual-task walking and cognitive task performance in people with parkinson's disease. Parkinsons Dis. 2012;9:212-20.

76. Howe TE, Rochester L, Neil F, Skelton DA, Ballinger C. Exercise for improving balance in older people. Cochrane Database Syst Rev. 2011(11).

77. Pashler H. Processing stages in overlapping tasks: Evidence for a central bottleneck. J Exp Psychol Hum Percept Perform. 1984;10(3):358.

78. Han SW, and René Marois. The source of dual-task limitations: Serial or parallel processing of multiple response selections? Atten Percept Psychophys. 2013;75(7):1395-405.

79. Verhaeghen P, Steitz DW, Sliwinski MJ, Cerella J. Aging and dual-task performance: A meta-analysis. Psycho Aging. 2003;18(3):443.

80. Lapanantasin S, Thongloy N, Samsee M, Wonghirunsombat N, Nuangpulsarp N, Ua-Areejit C, et al. Comparative effect of walking meditation and rubber-band exercise on ankle proprioception and balance performance among persons with chronic ankle instability: A randomized controlled trial. Complement Ther Med 2022;65:102807.

81. You T, Ogawa EF. Effects of meditation and mind-body exercise on brain-derived neurotrophic factor: A literature review of human experimental studies. Sports Med Health Sci. 2020;2(1):7-9.

82. Jayatunge RM. Meditation and brain plasticity. 2011.

83. Frankel JE, Bean JF, Frontera WR. Exercise in the elderly: Research and clinical practice. Clin Geriatr Med. 2006;22(2):239-56.

84. Scherder E, Scherder R, Verburgh L, Königs M, Blom M, Kramer AF, et al. Executive functions of sedentary elderly may benefit from walking: A systematic review and meta-analysis. Am J Geriatr Psychiatry. 2014;22(8):782-91.

85. Rogers CE, Larkey LK, Keller C. A review of clinical trials of tai chi and qigong in older adults. West J Nurs Res. 2009;31(2):245-79.

86. Montero-Odasso MM, Sarquis-Adamson Y, Speechley M, Borrie MJ, Hachinski VC,

Wells J, et al. Association of dual-task gait with incident dementia in mild cognitive impairment: Results from the gait and brain study. JAMA Neurol. 2017;74(7):857-65.

87. He Y, Yang L, Zhou J, Yao L, Pang MYC. Dual-task training effects on motor and cognitive functional abilities in individuals with stroke: A systematic review. Clin Rehabil. 2018;32(7):865-77.
88. Raffegeau TE, Krehbiel LM, Kang N, Thijs FJ, Altmann LJ, Cauraugh JH, et al. A meta-analysis: Parkinson's disease and dual-task walking. Parkinsonism Relat Disord. 2019;62:28-35.
89. Bherer L. Cognitive plasticity in older adults: Effects of cognitive training and physical exercise. Ann N Y Acad Sci. 2015;1337:1-6. eng. 2015/03/17.
90. Patel P, Lamar M, Bhatt T. Effect of type of cognitive task and walking speed on cognitive-motor interference during dual-task walking. Neuroscience. 2014;260:140-8.
91. Draheim C, Pak R, Draheim AA, Engle RW. The role of attention control in complex real-world tasks. Psychon Bull Rev. 2022;29(4):1143-97.
92. Oberauer K. Working memory and attention—a conceptual analysis and review. J Cogn. 2019; 2(1): 1–23.

# APPENDIX

# APPENDIX A

## Stretching Exercise for Warm-up and Cool-down

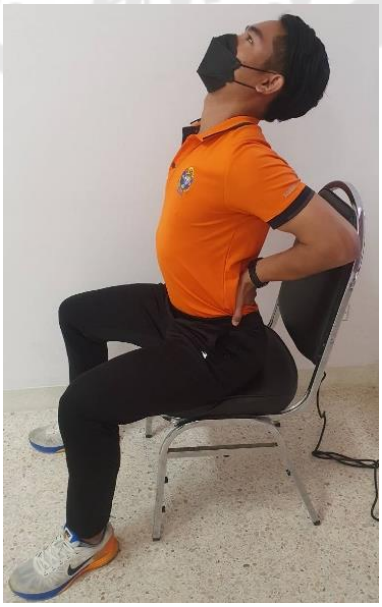
The stretching exercise for warm-up and cool-down in the study includes of the following postures.

1.Back flexion in sitting position

Let the participant sit on a chair. Then, ask the participant to bend the trunk forward slowly by reaching to touch the floor as far as feeling tight at the lower back without pain. Hold at that position for 10 seconds. Repeat 3 times.

2. Back extension in sitting position

Let the participant sit on a chair. Then, ask the participant to place both hands on the lumbar and bend the trunk backward slowly as far as feeling tight without pain. Hold as the position for 10 seconds. Repeat 3 times.



3.Knee to chest in sitting position

Let the participant sit on a chair. Then, ask the participant to use both hands to hold the thigh and pull it up to the chest slowly as far as feeling tight at gluteal region without pain. Hold at that position for 10 seconds. Repeat 3 times. Then switch to do on the other leg.

4. Sit and reach

Let the participant sit on a chair. Then, ask the participant to straighten one leg forward with ankle dorsiflexion and slowly reach the hand to touch tip of the toes or until feeling tight at posterior of leg and thigh without pain. Hold at that position for 10 seconds. Repeat 3 times. Then switch to do on the other leg.

5. Dorsiflexion of ankle with knee straight in sitting position

Sit and straighten the knee and hold it. Then, try to dorsiflex the ankle as much as having a slight feeling of tightness without pain, hold for 10 seconds, repeat 3 times. Then switch to do on the other leg.

6. Plantarflexion of ankle with knee straight in sitting position

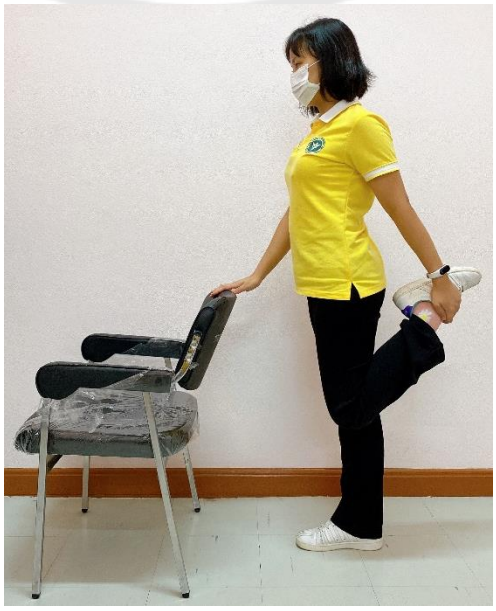
Sit and straighten the knee and hold it. Then, try to plantarflex the ankle as much as having slight feeling of tightness without pain, hold for 10 seconds, repeat 3 time. Then switch to do on the other leg.

7. Gastrosoleus muscle stretching

Stand in lunge position facing with the wall (as shown in the picture). Then use both hands to push the wall. Gently bend the right knee until feeling the tension at the left calf. Hold at that position for 10 seconds, repeat 3 times, then switch side.

8. Quadriceps muscle stretching

Start in a standing position with hands on a chair shown in the picture below. Bend your left knee backward slowly until feeling tension in front of your thigh without pain. If you are able to maintain good balance, use your hand to pull your ankles toward your buttocks slowly until feeling tight in front of your thigh without pain. Hold at the position for 10 seconds, repeat 3 times, then switch side.



9. Foot's intrinsic muscle stretching

Start in a sitting position with your hand grasping your toes (as shown in the picture) and gently bend your toes up and down to stretch foot's intrinsic muscle, so that you should feel tight at the dorsum of the foot when bending toes downward and at the soles of foot when bending toes upward. Hold at each position for 10 seconds, repeat 3 times, then switch side.

# APPENDIX B

## Instruction for Dual-Task Walking Performance Test

The dual-task walking performance test of the study consisted of two conditions; 1) Single-task walking test by Time up and go test, and 2) Dual-task walking test by Time up and go test with number subtraction. The instructions for both conditions are as follows.

**Single-task walking test by Time up and go test**

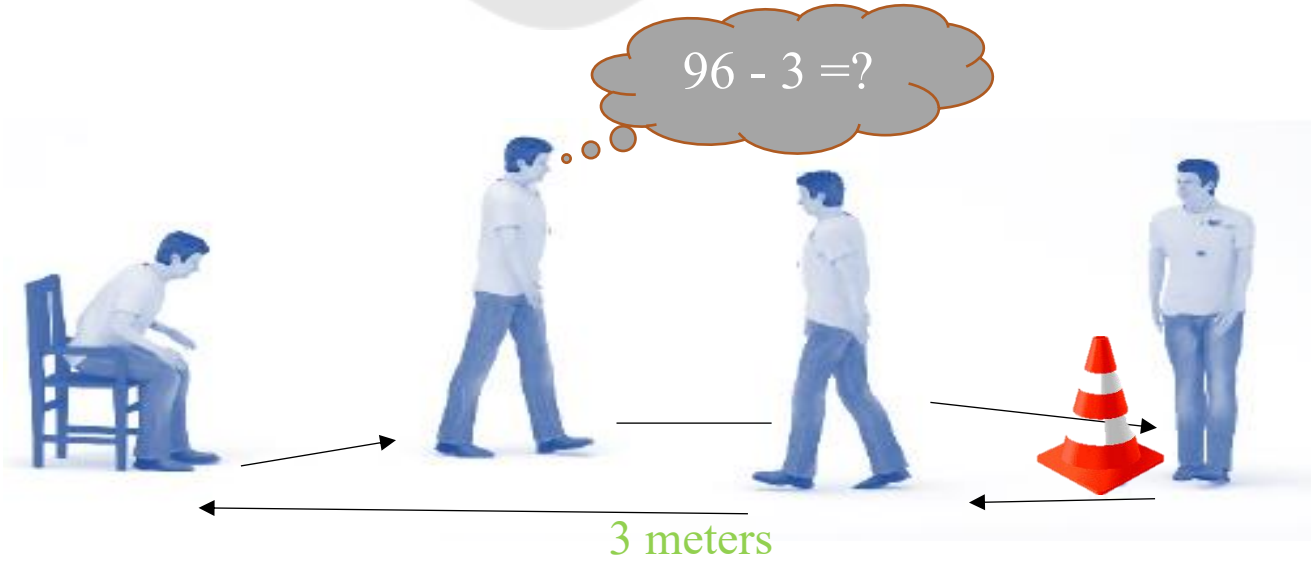
The assessor will demonstrate and instruct the participant how to perform the test activity in Thai language as shown below.

"เริ่มจากให้คุณลุง/ป้านั่งที่เก้าอี้นี้ จากนั้น เมื่อดิฉัน/ผมพูดคำว่า "ไป" แล้ว ให้คุณลุง/คุณป้าลุกจากเก้าอี้แล้วเดินตรงไปด้วยความเร็วที่เร็วที่สุดที่มั่นใจว่าปลอดภัยและไม่ล้ม เป็นระยะทาง 3 เมตร จนถึงกรวยจราจรนี้แล้วเดินอ้อมกรวยกลับมานั่งที่เก้าอี้เหมือนเดิมนะคะ/นะครับ"

**Dual-task walking test by Time up and go test with number subtraction**

The assessor will demonstrate and instruct the participant how to perform the test activity in Thai language as follows "เริ่มจากให้คุณลุง/ป้านั่งที่เก้าอี้นี้ จากนั้น เมื่อดิฉัน/ผมพูดคำว่า "ไป" แล้ว ให้คุณลุง/คุณป้าลุกจากเก้าอี้แล้วเดินตรงไปด้วยความเร็วที่เร็วที่สุดที่มั่นใจว่าปลอดภัยและไม่ล้ม ร่วมกับการเปล่งเสียงบอกผลการลบเลขทีละ 3 โดยจะเริ่มต้นจากเลข 98 และให้ลบไปเรื่อยๆ เป็นระยะทาง 3 เมตร จนถึงกรวยจราจรนี้แล้วเดินอ้อมกรวยกลับมานั่งที่เก้าอี้เหมือนเดิมนะคะ/นะครับ โดยยังคงต้องลบเลขทีละ 3 ตลอดการเดินจนกว่าจะกลับมานั่งเหมือนเดิม"

Notification: The starting number that the assessor will give to the participant for the pre-test is 98 and for the post-test is 96



# APPENDIX C

## Training Check-list Form and Data Collection Forms

Training Check-list form for participants

**สมุดประจำตัวผู้เข้าร่วมวิจัย**
**ผลของการเดินจงกรมต่อประสิทธิภาพของการเดินขณะมีการทำงานร่วมในผู้สูงอายุ**

ของ..... อายุ.....

เบอร์โทรศัพท์.....

หากท่านเก็บสมุดเล่มนี้ได้โปรดส่งคืนมาที่ นายพิชิตชัย ชูวัฒนกูล
โรงพยาบาลเวชชารักษ์ ลำปาง โทรศัพท์ 0924293692
386 ม.3 ต.ศาลา อ.เกาะคา จ.ลำปาง 52130

**ใบเซ็นชื่อของนักกายภาพบำบัด เมื่อเข้ารับ PROGRAM WALKING/WALKING MEDITATION 1 ครั้ง/สัปดาห์**

| | วันที่ฝึก |
|---|---|
| สัปดาห์ที่ 1 | |
| สัปดาห์ที่ 2 | |
| สัปดาห์ที่ 3 | |
| สัปดาห์ที่ 4 | |
| สัปดาห์ที่ 5 | |
| สัปดาห์ที่ 6 | |

**ต้องได้รับการฝึกครบ 6 ครั้ง เท่านั้น ถึงจะนำมาคิดคำนวณในวิจัย**


## NOTE เพิ่มเติมสำหรับนักกายภาพบำบัด

สัปดาห์ที่ 1

สัปดาห์ที่ 2

สัปดาห์ที่ 3

สัปดาห์ที่ 4

สัปดาห์ที่ 5

สัปดาห์ที่ 6

## โปรดจงเติมข้อมูลและทำเครื่องหมาย √ ในกิจกรรมที่ท่านทำ

| ครั้งที่ | วัน/เวลา | ยืด กล้ามเนื้อ | ..... | ยืด กล้ามเนื้อ | หมายเหตุ |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |

Note

ท่านจะได้รับการช่วยเหลือหรือดูแลรักษาการบาดเจ็บ/เจ็บป่วยอันเนื่องมาจากการวิจัยตามมาตรฐานทางการแพทย์ โดยผู้รับผิดชอบค่าใช้จ่ายในการรักษาคือ นายพิชิตชัย ชูวัฒนกูล นักกายภาพบำบัดชำนาญการ โรงพยาบาลเวชชารักษ์ ลำปาง เลขที่ 386 ม.3 ต.ศาลา อ.เกาะคา จ.ลำปาง เบอร์โทรติดต่อ0924293692,0804165591

ประโยชน์ที่คิดว่าจะได้รับจากการวิจัย ท่านจะได้รับการส่งเสริมสุขภาพด้วยโปรแกรมการออกกำลังกายด้วยการเดิน และการเดินจงกรม โดยการออกกำลังกายมีหลากหลายรูปแบบ การประยุกต์นำเอากิจวัตรประจำวันในการเดินปกติให้กลายเป็นการออกกำลังกายก็สามารถทำได้ หรือการทำกิจกรรมที่ชอบอย่างอื่น เช่น การเต้นรำ หรือการเต้นแอโรบิค ถ้าท่านออกกำลังกายเป็นประจำก็ไม่จำเป็นต้องเข้าร่วมโครงการวิจัยนี้

ค่าตอบแทนที่ผู้เข้าร่วมการวิจัยจะได้รับ: *ค่าตอบแทน*

ค่าใช้จ่ายที่ผู้เข้าร่วมการวิจัยจะต้องรับผิดชอบเอง: *ค่าเสียเวลา ค่าเดินทาง และค่าอาหาร*

หากมีข้อมูลเพิ่มเติมทั้งด้านประโยชน์และโทษที่เกี่ยวข้องกับการวิจัยนี้ ผู้วิจัยจะแจ้งให้ทราบโดยรวดเร็วและไม่ปิดบัง

ข้อมูลส่วนตัวของผู้เข้าร่วมการวิจัย จะถูกเก็บรักษาไว้โดยไม่เปิดเผยต่อสาธารณะเป็นราย บุคคล แต่จะรายงาน ผลการวิจัยเป็นข้อมูลส่วนรวมโดยไม่สามารถระบุข้อมูลรายบุคคลได้ ข้อมูลของผู้เข้าร่วมการวิจัยเป็นรายบุคคล อาจมีคณะบุคคลบางกลุ่มเข้ามาตรวจสอบได้ เช่น ผู้ให้ทุนวิจัย สถาบัน หรือองค์กรของรัฐที่มีหน้าที่ตรวจสอบ รวมถึงคณะกรรมการ จริยธรรมการวิจัยในคนมีหน้าที่ตรวจสอบได้

ผู้เข้าร่วมการวิจัยมีสิทธิ์ถอนตัวออกจากโครงการวิจัยเมื่อใดก็ได้ โดยไม่ต้องแจ้งให้ทราบล่วงหน้า และการไม่เข้าร่วมการวิจัยหรือถอนตัวออกจากโครงการวิจัยนี้ จะไม่มีผลกระทบต่อการบริการและการรักษาที่สมควรจะได้รับตาม มาตรฐานแต่ประการใด

หากท่านได้รับการปฏิบัติที่ไม่ตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงนี้ ท่านสามารถแจ้งให้ประธานคณะกรรมการจริยธรรมการวิจัยในคนทราบได้ที่ คณะกรรมการจริยธรรมการวิจัยเกี่ยวกับมนุษย์ วิทยาลัยพยาบาลบรมราชชนนีนครลำปาง โทรศัพท์ 054-225-254 ต่อ 114



## รูปแบบการยืดเหยียดกล้ามเนื้อก่อนและหลังออกกำลังกาย


**ท่านั่งก้มหลังแตะพื้น**

พยายามก้มตัวเอามือไปแตะพื้นให้ได้มากที่สุดโดยให้มีความรู้สึกตึงเล็กน้อยบริเวณหลัง โดยที่ไม่มีอาการปวด

ทำค้างไว้ 10 วินาที ทำซ้ำ 3 ครั้ง

## โปรแกรมสัปดาห์ที่ ๑ (กลุ่มเดินจงกรม)

ระยะที่ 1: กำหนดสมาธิไปพร้อมกับการเคลื่อนไหวของเท้าขณะเดินช้าๆ ร่วมกับการพูดว่า "ขวาย่างหนอ-ซ้ายย่างหนอ" ในทุกย่างก้าว

| นักกายภาพบำบัดให้โปรแกรม | ทำเองที่บ้าน ครั้งที่ 1 | ครั้งที่ 2 |
|---|---|---|
| 1. ยืดเหยียดกล้ามเนื้อ 5 นาที | | |
| 2. เดินจงกรม 10 นาที | | |
| 3. นั่งพัก 3 นาที | | |
| 4. เดินจงกรม 10 นาที | | |
| 5. นั่งพัก 3 นาที | | |
| 6. เดินจงกรม 10 นาที | | |
| 7. ยืดเหยียดกล้ามเนื้อ 5 นาที | | |

VDO ระยะที่ 1 การเดินกลับตัว

## โปรแกรมสัปดาห์ที่ ๒ (กลุ่มเดินจงกรม)

ระยะที่ 2 : กำหนดสมาธิไปพร้อมกับการเคลื่อนไหวของเท้าขณะเดินช้าๆ แบบละเอียดมากขึ้นในขณะเดินในทุกย่างก้าวร่วมกับการพูดว่า "ยกหนอ-เหยียบหนอ" ในทุกก้าวของขาขวา และขาซ้ายอย่างต่อเนื่อง

| นักกายภาพบำบัดให้โปรแกรม | ทำเองที่บ้าน ครั้งที่ 1 | ครั้งที่ 2 |
|---|---|---|
| 1. ยืดเหยียดกล้ามเนื้อ 5 นาที | | |
| 2. เดินจงกรม 10 นาที | | |
| 3. นั่งพัก 3 นาที | | |
| 4. เดินจงกรม 10 นาที | | |
| 5. นั่งพัก 3 นาที | | |
| 6. เดินจงกรม 10 นาที | | |
| 7. ยืดเหยียดกล้ามเนื้อ 5 นาที | | |

VDO ระยะที่ 2 การเดินกลับตัว

## โปรแกรมสัปดาห์ที่ ๑ (กลุ่มเดินออกกำลังกาย)

| นักกายภาพบำบัดให้โปรแกรม | ทำเองที่บ้าน ครั้งที่ 1 | ครั้งที่ 2 |
|---|---|---|
| 1. ยืดเหยียดกล้ามเนื้อ 5 นาที | | |
| 2. เดินออกกำลังกายไม่จำกัดระยะทาง 10 นาที | | |
| 3. นั่งพัก 3 นาที | | |
| 4. เดินออกกำลังกายไม่จำกัดระยะทาง 10 นาที | | |
| 5. นั่งพัก 3 นาที | | |
| 6. เดินออกกำลังกายไม่จำกัดระยะทาง 10 นาที | | |
| 7. ยืดเหยียดกล้ามเนื้อ 5 นาที | | |

## โปรแกรมสัปดาห์ที่ ๒ (กลุ่มเดินออกกำลังกาย)

| นักกายภาพบำบัดให้โปรแกรม | ทำเองที่บ้าน ครั้งที่ 1 | ครั้งที่ 2 |
|---|---|---|
| 1. ยืดเหยียดกล้ามเนื้อ 5 นาที | | |
| 2. เดินออกกำลังกายไม่จำกัดระยะทาง 10 นาที | | |
| 3. นั่งพัก 3 นาที | | |
| 4. เดินออกกำลังกายไม่จำกัดระยะทาง 10 นาที | | |
| 5. นั่งพัก 3 นาที | | |
| 6. เดินออกกำลังกายไม่จำกัดระยะทาง 10 นาที | | |
| 7. ยืดเหยียดกล้ามเนื้อ 5 นาที | | |

# Data collection forms for Pre- and Post-test

รหัส.....

**แบบสอบถาม และแบบประเมินสำหรับคัดกรองและรวบรวมข้อมูลพื้นฐานของผู้สนใจเข้าร่วมงานวิจัย**

"ผลของการเดินจงกรมต่อประสิทธิภาพของการเดินขณะมีการทำงานร่วมในผู้สูงอายุ

(Walking meditation effects on dual-task walking performance in elderly)"

ส่วนที่ 1 แบบสอบถามข้อมูลทั่วไป

1.เพศ ☐ ชาย ☐ หญิง

2.อายุ.....ปี ระดับการศึกษา.....

3.น้ำหนัก.....ส่วนสูง.....BMI.....ที่อยู่.....

ส่วนที่ 2 แบบประเมินเบื้องต้นเพื่อคัดกรองเกณฑ์การเข้าร่วมการวิจัย

4.ปกติท่านมีกิจวัตรประจำวัน ในแต่ละวันอยู่ระดับใด

☐ เบา (ในแต่ละวันมีการเคลื่อนไหวน้อยมาก นั่ง/ยืนนิ่งๆ เป็นส่วนใหญ่)

☐ ปานกลาง (มีการเคลื่อนไหวออกแรงบ้าง เช่น การเดินเร็ว ขี่จักรยาน เต้นรำ ทำงานบ้าน ออกกำลังกายระดับปานกลางน้อยกว่า 5 ครั้ง/สัปดาห์)

☐ หนัก(ในแต่ละวันมีการเคลื่อนไหวเยอะ เช่น วิ่ง เดินขึ้นลงบันไดหลายๆขั้น การทำงานหนักๆ และออกกำลังกายอย่างหนักมากกว่า 3 ครั้ง/สัปดาห์ หรือออกกำลังกายระดับปานกลาง 7 ครั้ง/สัปดาห์)

5.ท่านมีโรคประจำตัวหรือไม่ ☐ ไม่มี ☐ มี (หากมีโปรดระบุ).....

6.ท่านเคยเดินจงกรมหรือไม่ ☐ เคย ☐ ไม่เคย

7.จงลบเลขทีละ 3 (ความสามารถด้านการคิดคำนวณ)

99 ☐ 96 ☐ 93 ☐ 90 ☐ 87 ☐ 84

8.ท่านสามารถเดินในระยะเวลา 10 นาทีโดยไม่ใช้ไม้เท้า หรืออุปกรณ์ช่วยเหลืออื่นๆ ☐ ได้ ☐ ไม่ได้

9.ท่านปัญหาปวดเรื้อรังบริเวณหลังหรือขาขณะยืนหรือเดิน ที่มีระดับความรุนแรงของอาการปวดมากกว่า 6


☐ มี ระดับ.....

☐ ไม่มีปัญหา

ท่านสามารถงดบุหรี่ สุรา ยาเสพติด ในขณะที่ท่านเข้าร่วมงานวิจัยนี้ได้หรือไม่ ☐ ได้ ☐ ไม่ได้

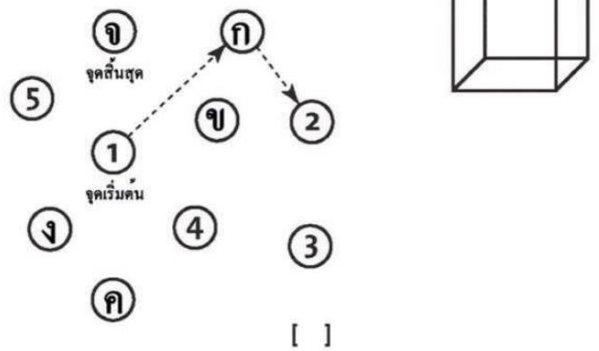
มีคุณสมบัติผ่านเกณฑ์คัดเข้า และไม่มีปัญหาของเกณฑ์คัดออก ☐ ผ่าน ☐ ไม่ผ่าน

รหัส.....

# MONTREAL COGNITIVE ASSESSMENT (MOCA)

ชื่อ :
ระดับการศึกษา :
เพศ :
วันเดือนปีเกิด:
วันที่ทำการทดสอบ :

## VISUOSPATIAL / EXECUTIVE




[ ] [ ]

คัดลอก ลูกบาศก์

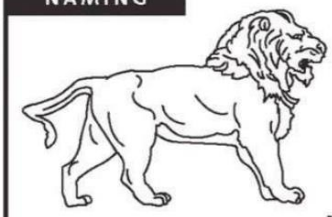


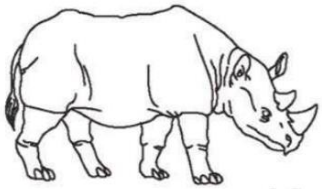
วาดหน้าปัดนาฬิกา บอกเวลาที่ 11.10 น. (3 คะแนน)

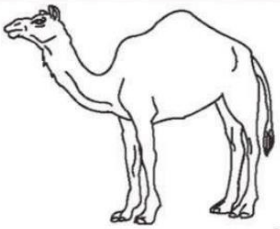
[ ] รูปร่าง [ ] ตัวเลข [ ] เข็ม

คะแนน __/5

## NAMING







[ ] [ ] [ ]

__/3

## MEMORY

อ่านชุดคำเหล่านี้แล้วให้ผู้ทดสอบทวนซ้ำ ทดสอบ 2 ครั้ง และถามซ้ำอีกครั้งหลัง 5 นาที

| | หน้า | ผ้าไหม | วัด | มะลิ | สีแดง |
|---|---|---|---|---|---|
| ทวนครั้งที่ 1 | | | | | |
| ทวนครั้งที่ 2 | | | | | |

## ATTENTION

อ่านตัวเลขต่อไปนี้ตามลำดับ (1 ตัว/วินาที) ให้ผู้ทดสอบทวนซ้ำตามลำดับ [ ] 2 1 8 5 4

ผู้ทดสอบทวนซ้ำแบบย้อนลำดับ [ ] 7 4 2

__/2

อ่านออกเสียงตัวเลขต่อไปนี้ แล้วให้ผู้ทดสอบเคาะโต๊ะเมื่อได้ยินเสียงอ่านเลข " 1 " (ไม่มีคะแนนถ้าผิดเกิน 2 ครั้ง)

[ ] 5 2 1 3 9 4 1 1 8 0 6 2 1 5 1 9 4 5 1 1 1 4 1 9 0 5 1 1 2

__/1

เริ่มจาก 100 ลบไปเรื่อยๆทีละ 7 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

ลบถูก 4 หรือ 5 ตัว ได้ 3 คะแนน , 2 หรือ 3 ตัว ได้ 2 คะแนน , 1 ตัวได้ 1 คะแนน , 0 ตัว ไม่ได้คะแนน

__/3

## LANGUAGE

Repeat : ฉันรู้ว่าจอมเป็นคนเดียวที่มาช่วยงานวันนี้ [ ]

แมวมักซ่อนตัวอยู่หลังเก้าอี้เมื่อมีหมาอยู่ในห้อง [ ]

__/2

Fluency / บอกคำที่ขึ้นต้นด้วยตัวอักษร " ก " ให้มากที่สุดใน 1 นาที ก [ ] _____ (N ≥ ๑๑ words)

__/1

## ABSTRACTION

บอกความเหมือนระหว่าง 2 สิ่ง เช่น กล้วย-ส้ม : เป็นผลไม้ [ ] รถไฟ - จักรยาน [ ] นาฬิกา - ไม้บรรทัด

__/2

## DELAYED RECALL

| ให้ทวนชุดคำที่จำไว้ก่อนหน้านี้ โดยไม่มีการให้ตัวชวย | หน้า [ ] | ผ้าไหม [ ] | วัด [ ] | มะลิ [ ] | สีแดง [ ] | ให้คะแนนเฉพาะคำที่ทวนได้โดยไม่ให้ตัวชวย |
|---|---|---|---|---|---|---|
| Optional — Category cue | | | | | | |
| Optional — Multiple choice cue | | | | | | |

__/5

## ORIENTATION

[ ] วันที่ [ ] เดือน [ ] ปี [ ] วัน [ ] สถานที่ [ ] จังหวัด

__/6

Translated by Solaphat Hemrungrojn MD
Trial version 01 Updated August 31, 2011
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www.mocatest.org

ค่าปกติ ≥ 25/30

คะแนนรวม __/30
เพิ่ม 1 คะแนน ถ้าจำนวนปีการศึกษา ≤ 6

# Pre-Test

รหัส.....

Date:_____

## Timed Up and Go Test (TUG) with Single-task – Scoring sheet

First

Time (Seconds):_____

Second

Time (Seconds):_____

**Notes:**

Average Time (Seconds): .....

## Timed Up and Go Test (TUG) with Dual-task – Scoring sheet

Time (Seconds):_____

Counting correct:_____

Exhort:_____

Baulk:_____

**Notes:**

# Post-Test

รหัส.....

Date:_____

## Timed Up and Go Test (TUG) with Single-task – Scoring sheet

First

Time (Seconds):_____

Second

Time (Seconds):_____

**Notes:**

Average Time (Seconds): .....

## Timed Up and Go Test (TUG) with Dual-task – Scoring sheet

Time (Seconds):_____

Counting correct:_____

Exhort:_____

Baulk:_____

**Notes:**

Table 10. Practice Timeline of Walking meditation group

| No. | Pre-test | Round 1 | Round 2 | Round 3 | Round 4 | Round 5 | Round 6 | Post-test |
|---|---|---|---|---|---|---|---|---|
| 1 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 16/5/2022 | 20/5/2022 |
| 2 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 3 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 21/5/2022 |
| 4 | 14/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 5 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 6 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 7 | 14/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 8 | 14/3/2022 | 10/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 9 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 10 | 14/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 11 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 21/5/2022 |
| 12 | 14/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 13 | 15/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 14 | 15/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 20/5/2022 |
| 15 | 15/3/2022 | 9/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 16 | 15/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 17 | 30/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 18 | 30/3/2022 | 9/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 19 | 30/3/2022 | 9/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 20 | 31/3/2022 | 21/4/2022 | 28/4/2022 | 5/5/2022 | 12/5/2022 | 19/5/2022 | 26/5/2022 | 2/6/2022 |
| 21 | 31/4/2022 | 19/4/2022 | 26/4/2022 | 3/5/2022 | 10/5/2022 | 17/5/2022 | 24/5/2022 | 11/6/2022 |
| 22 | 1/4/2022 | 19/4/2022 | 27/4/2022 | 4/5/2022 | 11/5/2022 | 18/5/2022 | 25/5/2022 | 9/6/2022 |
| 23 | 1/4/2022 | 20/4/2022 | 27/4/2022 | 4/5/2022 | 11/5/2022 | 18/5/2022 | 25/5/2022 | 16/6/2022 |
| 24 | 2/4/2022 | 20/4/2022 | 27/4/2022 | 4/5/2022 | 11/5/2022 | 18/5/2022 | 25/5/2022 | 4/6/2022 |

Table 11 Practice Timeline of Control group

| No. | Pre-test | Round 1 | Round 2 | Round 3 | Round 4 | Round 5 | Round 6 | Post-test |
|---|---|---|---|---|---|---|---|---|
| 1 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 16/5/2022 | 21/5/2022 |
| 2 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 3 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 4 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 5 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 6 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 7 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 8 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 9 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 10 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 11 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 21/5/2022 |
| 12 | 14/3/2022 | 9/4/2022 | 16/4/2022 | 23/4/2022 | 30/4/2022 | 7/5/2022 | 15/5/2022 | 20/5/2022 |
| 13 | 14/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 14 | 14/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 20/5/2022 |
| 15 | 14/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 16 | 15/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 17 | 15/3/2022 | 10/4/2022 | 17/4/2022 | 24/4/2022 | 1/4/2022 | 8/5/2022 | 16/5/2022 | 21/5/2022 |
| 18 | 30/3/2022 | 19/4/2022 | 26/4/2022 | 7/5/2022 | 15/5/2022 | 22/5/2022 | 25/5/2022 | 5/6/2022 |
| 19 | 30/3/2022 | 19/4/2022 | 26/4/2022 | 7/5/2022 | 15/5/2022 | 22/5/2022 | 25/5/2022 | 5/6/2022 |
| 20 | 31/3/2022 | 19/4/2022 | 26/4/2022 | 3/5/2022 | 10/5/2022 | 17/5/2022 | 24/5/2022 | 1/6/2022 |
| 21 | 1/4/2022 | 19/4/2022 | 26/4/2022 | 3/5/2022 | 10/5/2022 | 17/5/2022 | 24/5/2022 | 15/6/2022 |
| 22 | 1/4/2022 | 19/4/2022 | 27/4/2022 | 4/5/2022 | 11/5/2022 | 18/5/2022 | 25/5/2022 | 1/6/2022 |
| 23 | 2/4/2022 | 20/4/2022 | 27/4/2022 | 4/5/2022 | 11/5/2022 | 18/5/2022 | 25/5/2022 | 11/6/2022 |
| 24 | 2/4/2022 | 20/4/2022 | 27/4/2022 | 4/5/2022 | 11/5/2022 | 18/5/2022 | 25/5/2022 | 11/6/2022 |

# APPENDIX D

Raw data

Table 12. Raw data of baseline of the walking meditation group

| No. | Gender | Year of Edu. | Age | High | Weight | BMI | U/D | Pain | PA | Cognitive (MOCA) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | +1* | SUM |
| 1 | F | 18 | 62 | 148 | 52 | 23.74 | HT | 3 | 2 | 4 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 5 | 6 | 0 | 28 |
| 2 | F | 16 | 69 | 143 | 68 | 33.25 | | 4 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 5 | 6 | 0 | 30 |
| 3 | M | 18 | 62 | 167 | 62 | 22.23 | DLP | 6 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 3 | 6 | 0 | 28 |
| 4 | F | 4 | 63 | 163 | 66 | 24.84 | DLP,HT | 5 | 1 | 4 | 3 | 2 | 1 | 2 | 0 | 1 | 1 | 3 | 6 | 1 | 24 |
| 5 | M | 6 | 63 | 167 | 55 | 19.72 | Asthma | 3 | 2 | 4 | 3 | 2 | 1 | 3 | 2 | 0 | 0 | 5 | 6 | 1 | 27 |
| 6 | F | 14 | 61 | 148 | 55 | 25.11 | | 1 | 2 | 5 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 4 | 6 | 0 | 28 |
| 7 | F | 14 | 68 | 146 | 58 | 27.21 | | 1 | 2 | 4 | 3 | 1 | 1 | 3 | 1 | 1 | 2 | 4 | 6 | 0 | 26 |
| 8 | F | 18 | 64 | 152 | 52 | 22.51 | | 5 | 2 | 4 | 3 | 2 | 1 | 3 | 0 | 1 | 2 | 4 | 6 | 0 | 26 |
| 9 | F | 14 | 66 | 150 | 55 | 24.44 | | 0 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 5 | 6 | 0 | 30 |
| 10 | F | 14 | 64 | 151 | 52 | 22.81 | | 1 | 2 | 4 | 3 | 2 | 1 | 2 | 0 | 1 | 2 | 5 | 6 | 0 | 26 |
| 11 | F | 13 | 64 | 165 | 65 | 23.88 | HT | 0 | 2 | 4 | 3 | 2 | 1 | 2 | 1 | 0 | 1 | 5 | 6 | 0 | 25 |
| 12 | F | 8 | 66 | 146 | 50 | 23.46 | Asthma | 2 | 2 | 5 | 3 | 1 | 0 | 2 | 1 | 1 | 2 | 3 | 6 | 0 | 24 |
| 13 | F | 6 | 66 | 150 | 66 | 29.33 | DLP, Thyroid | 2 | 2 | 4 | 3 | 2 | 1 | 2 | 2 | 0 | 2 | 1 | 6 | 1 | 24 |
| 14 | F | 6 | 68 | 150 | 61 | 27.11 | | 0 | 2 | 4 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 5 | 6 | 1 | 29 |
| 15 | M | 12 | 68 | 166 | 76 | 27.58 | | 3 | 2 | 5 | 3 | 2 | 1 | 3 | 0 | 1 | 2 | 5 | 6 | 0 | 28 |
| 16 | F | 6 | 68 | 151 | 42 | 18.42 | | 0 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 5 | 6 | 1 | 25 |
| 17 | F | 18 | 64 | 160 | 53 | 20.7 | C spondylosis | 5 | 2 | 4 | 3 | 2 | 1 | 2 | 2 | 1 | 2 | 4 | 6 | 0 | 27 |
| 18 | M | 4 | 68 | 162 | 54 | 20.58 | L spondylosis | 6 | 2 | 4 | 3 | 2 | 1 | 2 | 2 | 1 | 2 | 4 | 6 | 1 | 28 |
| 19 | F | 6 | 67 | 154 | 51 | 21.5 | | 2 | 2 | 4 | 3 | 2 | 1 | 3 | 1 | 0 | 1 | 5 | 6 | 1 | 27 |
| 20 | M | 18 | 66 | 170 | 64 | 22.15 | DLP | 0 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 6 | 0 | 27 |
| 21 | F | 9 | 62 | 150 | 42 | 18.67 | | 0 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 5 | 6 | 0 | 30 |
| 22 | F | 6 | 61 | 149 | 51 | 22.97 | | 5 | 2 | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 5 | 6 | 1 | 29 |
| 23 | M | 18 | 63 | 153 | 56 | 23.92 | HT,BPH | 2 | 2 | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 5 | 6 | 0 | 28 |
| 24 | F | 16 | 62 | 163 | 54 | 20.32 | | 3 | 2 | 4 | 3 | 2 | 1 | 2 | 2 | 1 | 2 | 5 | 6 | 0 | 28 |

Table 13. Raw data of baseline of control group

| No. | Gender | Year of Edu. | Age | High | Weight | BMI | U/D | Pain | PA | Cognitive (MOCA) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | + 1 * | SUM |
| 1 | M | 14 | 68 | 166 | 61 | 22.14 | HT | 5 | 2 | 4 | 3 | 2 | 1 | 3 | 1 | 1 | 1 | 3 | 6 | 0 | 25 |
| 2 | F | 19 | 68 | 148 | 51 | 23.28 | DLP | 5 | 1 | 5 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 4 | 6 | 0 | 28 |
| 3 | M | 5 | 67 | 163 | 59 | 22.21 | | 0 | 2 | 4 | 3 | 2 | 1 | 2 | 1 | 0 | 1 | 3 | 6 | 1 | 24 |
| 4 | F | 16 | 65 | 156 | 57 | 23.42 | DM,HT | 1 | 2 | 5 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 4 | 6 | 0 | 28 |
| 5 | F | 6 | 67 | 153 | 60 | 25.63 | HT,DLP | 0 | 2 | 4 | 3 | 2 | 1 | 3 | 0 | 0 | 1 | 3 | 6 | 1 | 24 |
| 6 | F | 14 | 62 | 145 | 56 | 26.63 | | 4 | 2 | 3 | 3 | 2 | 1 | 3 | 1 | 1 | 1 | 5 | 6 | 0 | 26 |
| 7 | F | 15 | 65 | 154 | 52 | 21.93 | | 1 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 0 | 2 | 4 | 6 | 0 | 28 |
| 8 | F | 20 | 66 | 154 | 51 | 21.5 | | 4 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 4 | 6 | 0 | 29 |
| 9 | F | 4 | 68 | 155 | 51 | 21.23 | | 2 | 2 | 4 | 3 | 2 | 1 | 3 | 2 | 0 | 2 | 3 | 6 | 1 | 27 |
| 10 | F | 4 | 68 | 154 | 54 | 22.77 | | 0 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 4 | 6 | 1 | 30 |
| 11 | F | 14 | 62 | 160 | 76 | 29.69 | HT | 5 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 5 | 6 | 0 | 30 |
| 12 | F | 8 | 68 | 155 | 62 | 25.81 | | 0 | 2 | 4 | 3 | 2 | 1 | 3 | 0 | 1 | 2 | 3 | 6 | 0 | 25 |
| 13 | F | 8 | 63 | 146 | 55 | 25.8 | | 0 | 2 | 4 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 5 | 6 | 0 | 28 |
| 14 | F | 6 | 66 | 152 | 62 | 26.84 | | 0 | 2 | 4 | 3 | 2 | 1 | 3 | 1 | 0 | 2 | 5 | 6 | 1 | 28 |
| 15 | M | 22 | 66 | 172 | 74 | 25.01 | CAD | 0 | 2 | 5 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 4 | 6 | 0 | 28 |
| 16 | F | 4 | 66 | 143 | 46 | 22.49 | DLP | 5 | 2 | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 4 | 6 | 1 | 27 |
| 17 | F | 16 | 65 | 155 | 47 | 19.56 | COPD | 6 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 5 | 6 | 0 | 30 |
| 18 | F | 18 | 60 | 160 | 55 | 21.48 | HT, DLP | 5 | 2 | 5 | 3 | 2 | 1 | 3 | 1 | 0 | 2 | 2 | 6 | 0 | 25 |
| 19 | M | 4 | 66 | 162 | 50 | 19.05 | | 0 | 2 | 4 | 3 | 2 | 1 | 2 | 0 | 0 | 2 | 3 | 6 | 1 | 24 |
| 20 | M | 16 | 68 | 167 | 57 | 20.44 | DM | 0 | 2 | 4 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 3 | 6 | 0 | 27 |
| 21 | M | 18 | 64 | 166 | 78 | 28.31 | Asthma,BPH | 3 | 2 | 5 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 4 | 6 | 0 | 28 |
| 22 | F | 16 | 67 | 147 | 60 | 27.77 | CAD | 6 | 1 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 4 | 6 | 0 | 29 |
| 23 | F | 16 | 62 | 160 | 50 | 19.53 | | 5 | 2 | 5 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 5 | 6 | 0 | 30 |
| 24 | F | 6 | 64 | 157 | 63 | 25.56 | | 0 | 2 | 4 | 3 | 2 | 1 | 3 | 0 | 1 | 2 | 5 | 6 | 1 | 28 |

Table 14.Raw data of timed up and go test at pre- and post- training of the walking meditation and control groups

| No. | Timed up and go test (TUG) | | | |
|---|---|---|---|---|
| | Walking meditation group | | Control group | |
| | Pre- training | Post-training | Pre- training | Post-training |
| 1 | 9.37 | 8.88 | 9.69 | 9.89 |
| 2 | 9.79 | 8.77 | 10.71 | 10.64 |
| 3 | 9.51 | 7.41 | 9.83 | 9.27 |
| 4 | 10.06 | 9.23 | 11.70 | 10.59 |
| 5 | 8.76 | 7.96 | 8.54 | 9.25 |
| 6 | 8.92 | 8.41 | 9.46 | 9.74 |
| 7 | 10.07 | 7.86 | 9.92 | 9.36 |
| 8 | 9.45 | 8.86 | 10.10 | 10.99 |
| 9 | 10.58 | 9.17 | 8.58 | 7.37 |
| 10 | 8.39 | 7.82 | 9.31 | 8.92 |
| 11 | 9.36 | 8.48 | 9.22 | 9.16 |
| 12 | 8.89 | 8.28 | 10.36 | 10.09 |
| 13 | 9.71 | 8.99 | 8.63 | 8.37 |
| 14 | 10.40 | 10.35 | 10.47 | 10.07 |
| 15 | 9.03 | 7.36 | 9.61 | 8.97 |
| 16 | 11.76 | 9.12 | 10.04 | 10.59 |
| 17 | 10.44 | 9.81 | 9.38 | 8.68 |
| 18 | 10.34 | 9.71 | 14.10 | 11.91 |
| 19 | 9.00 | 8.57 | 8.59 | 8.17 |
| 20 | 11.92 | 11.63 | 10.01 | 9.69 |
| 21 | 8.57 | 7.22 | 11.77 | 11.32 |
| 22 | 9.59 | 8.61 | 8.48 | 8.49 |
| 23 | 9.61 | 9.04 | 9.44 | 8.71 |
| 24 | 10.45 | 9.55 | 11.10 | 9.86 |

Table 15. Raw data of Timed up and go with dual-task test (DTC ,CAS ,Time) at pre- and post-training of the walking meditation and control groups

| No. | Time up and go with dual-task test | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Walking meditation group | | | | | | Control group | | | | | |
| | Pre- training | | | Post-training | | | Pre- training | | | Post-training | | |
| | DTC | CAS | Time | DTC | CAS | Time | DTC | CAS | Time | DTC | CAS | Time |
| 1 | 58.51 | 20.19 | 14.86 | 25.00 | 36.03 | 11.10 | 60.28 | 6.43 | 15.54 | 50.65 | 6.71 | 14.90 |
| 2 | 89.47 | 16.17 | 18.55 | 27.36 | 26.85 | 11.17 | 62.72 | 11.48 | 17.42 | 67.76 | 16.80 | 17.85 |
| 3 | 63.82 | 19.26 | 15.58 | 42.27 | 28.43 | 10.55 | 53.68 | 6.62 | 15.10 | 63.30 | 13.21 | 15.13 |
| 4 | 90.66 | 15.63 | 19.19 | 60.75 | 20.22 | 14.83 | 11.62 | 15.31 | 13.06 | 14.50 | 16.50 | 12.12 |
| 5 | 72.16 | 13.25 | 15.09 | 56.81 | 32.02 | 12.49 | 105.38 | 5.70 | 17.53 | 90.26 | 5.68 | 17.59 |
| 6 | 27.01 | 26.48 | 11.33 | 26.27 | 37.66 | 10.62 | 16.65 | 9.06 | 11.03 | 24.22 | 8.26 | 12.10 |
| 7 | 58.21 | 18.82 | 15.94 | 18.39 | 32.25 | 9.30 | 8.36 | 18.60 | 10.75 | 38.46 | 15.43 | 12.96 |
| 8 | 88.78 | 22.41 | 17.85 | 55.16 | 29.11 | 13.74 | 17.32 | 42.19 | 11.85 | 28.38 | 35.43 | 14.11 |
| 9 | 82.23 | 20.75 | 19.28 | 65.19 | 26.42 | 15.14 | 88.45 | 6.18 | 16.16 | 90.90 | 21.32 | 14.07 |
| 10 | 83.31 | 13.00 | 15.38 | 63.68 | 23.43 | 12.80 | 35.87 | 15.81 | 12.65 | 36.51 | 24.65 | 12.17 |
| 11 | 33.11 | 24.08 | 12.46 | 30.02 | 27.22 | 11.02 | 46.74 | 14.78 | 13.53 | 44.75 | 22.62 | 13.26 |
| 12 | 70.41 | 6.60 | 15.15 | 67.75 | 21.59 | 13.89 | 23.35 | 15.65 | 12.78 | 28.40 | 15.44 | 12.95 |
| 13 | 73.01 | 17.86 | 16.80 | 11.23 | 30.00 | 10.00 | 29.73 | 17.87 | 11.19 | 31.73 | 18.14 | 11.02 |
| 14 | 87.40 | 5.128 | 19.50 | 59.90 | 18.12 | 16.55 | 52.89 | 12.50 | 16.00 | 15.84 | 17.15 | 11.66 |
| 15 | 32.81 | 33.33 | 12.00 | 23.72 | 43.95 | 9.10 | 68.76 | 24.68 | 16.21 | 67.87 | 26.57 | 15.05 |
| 16 | 53.25 | 5.54 | 18.03 | 31.57 | 16.66 | 12.00 | 89.64 | 5.25 | 19.04 | 81.30 | 10.41 | 19.20 |
| 17 | 68.58 | 11.36 | 17.60 | 51.17 | 13.48 | 14.83 | 17.16 | 9.09 | 10.99 | 26.34 | 18.24 | 10.96 |
| 18 | 51.54 | 6.38 | 15.67 | 31.82 | 23.43 | 12.80 | 36.52 | 15.58 | 19.25 | 55.75 | 16.17 | 18.55 |
| 19 | 70.44 | 13.04 | 15.34 | 41.85 | 32.92 | 12.15 | 34.49 | 8.65 | 11.56 | 34.84 | 9.08 | 11.01 |
| 20 | 32.32 | 12.67 | 15.78 | 13.03 | 22.83 | 13.14 | 53.74 | 6.49 | 15.39 | 55.29 | 13.29 | 15.04 |
| 21 | 84.25 | 18.99 | 15.80 | 68.83 | 24.61 | 12.19 | 67.03 | 5.08 | 19.66 | 68.71 | 15.71 | 19.09 |
| 22 | 41.29 | 7.38 | 13.55 | 40.65 | 16.51 | 12.11 | 89.85 | 31.06 | 16.10 | 81.37 | 32.48 | 15.39 |
| 23 | 25.91 | 8.26 | 12.10 | 20.13 | 27.62 | 10.86 | 33.43 | 31.77 | 12.59 | 43.02 | 32.12 | 12.45 |
| 24 | 83.44 | 10.43 | 19.17 | 67.52 | 25.01 | 15.99 | 69.45 | 10.63 | 18.81 | 70.47 | 17.85 | 16.80 |

# APPENDIX E

Inter-tester Reliability of Timed Up and Go Test between senior physical therapist and research tester.

# Inter-tester reliability of timed up and go test

Raw data for inter-tester reliability of Timed up and go test (TUG) from 15 elderly participants who received services in Vejjarak Hospital Lampang during February – March 2022 are shown in the table below. The test was assessed in the same day by 2 physical therapists: a senior physical therapist with over 10 years of work experience in using TUG, and the researcher with 2 years of work experience who was going to be a tester of this study.

| No. | Gender | Age (years) | Timed up and go test (seconds) | |
|---|---|---|---|---|
| | | | Physical therapist 1 (Senior) | Physical therapist 2 (Researcher) |
| 1 | Men | 67 | 11.46 | 11.30 |
| 2 | Men | 72 | 13.40 | 13.59 |
| 3 | Woman | 64 | 14.00 | 14.25 |
| 4 | Woman | 65 | 11.40 | 11.08 |
| 5 | Woman | 60 | 12.88 | 12.55 |
| 6 | Men | 61 | 10.01 | 10.28 |
| 7 | Woman | 63 | 10.30 | 10.11 |
| 8 | Men | 67 | 12.69 | 12.80 |
| 9 | Men | 62 | 12.29 | 12.10 |
| 10 | Woman | 65 | 10.86 | 9.85 |
| 11 | Men | 79 | 14.50 | 11.56 |
| 12 | Woman | 71 | 10.10 | 11.09 |
| 13 | Woman | 69 | 9.49 | 10.56 |
| 14 | Woman | 65 | 12.23 | 12.25 |
| 15 | Woman | 68 | 12.39 | 11.59 |

It was found that the inter-tester reliability of TUG between the two physical therapists determined by intraclass correlation (ICC) was excellent [ICC (2,1) = 0.78, $p < 0.001$].

# APPENDIX F

## Intra-tester Reliability of the research tester

# Intra-tester reliability of timed up and go test

An Intra-tester reliability for the Timed up and go test (TUG) of the researcher, who was going to be a tester of this study, was investigated. The raw data for the intra-tester reliability of TUG from 15 elderly participants who received services in Vejjarak Hospital Lampang during February – March 2022 are presented in the table below. The TUG was assessed on each participant by the same researcher for 2 times which were 7 - 14 days apart.

| No. | Gender | Age (years) | Timed up and go test (seconds) | |
|---|---|---|---|---|
| | | | Test 1 | Test 2 |
| 1 | Men | 67 | 11.25 | 11.35 |
| 2 | Men | 72 | 13.00 | 14.18 |
| 3 | Woman | 64 | 14.00 | 14.50 |
| 4 | Woman | 65 | 11.21 | 10.95 |
| 5 | Woman | 60 | 12.99 | 12.11 |
| 6 | Men | 61 | 9.09 | 11.47 |
| 7 | Woman | 63 | 10.11 | 10.11 |
| 8 | Men | 67 | 12.08 | 13.52 |
| 9 | Men | 62 | 12.20 | 12.00 |
| 10 | Woman | 65 | 9.71 | 9.99 |
| 11 | Men | 79 | 12.06 | 11.06 |
| 12 | Woman | 71 | 10.59 | 11.59 |
| 13 | Woman | 69 | 10.12 | 11.00 |
| 14 | Woman | 65 | 12.15 | 12.35 |
| 15 | Woman | 68 | 11.65 | 11.53 |

It was found that the intra-tester reliability for TUG of the assessor in this study which determined by an intraclass correlation (ICC) was excellent [ICC (3,1) = 0.88, $p < 0.001$].

# APPENDIX G

Human Research Ethic

เอกสารรับรองเลขที่ E 2564-070

ชื่อหน่วยงาน วิทยาลัยพยาบาลบรมราชชนนี นครลำปาง สถาบันพระบรมราชชนก
สำนักงานปลัดกระทรวง กระทรวงสาธารณสุข
ที่อยู่ 268 ถนนป่าขาม ตำบลหัวเวียง อำเภอเมือง จังหวัดลำปาง 52000 โทร. 0-542-262-54

## เอกสารรับรองโครงการวิจัย

คณะกรรมการจริยธรรมการวิจัยเกี่ยวกับมนุษย์ วิทยาลัยพยาบาลบรมราชชนนี นครลำปาง ดำเนินการให้การรับรองโครงการวิจัยตามแนวทางหลักจริยธรรมการวิจัยเกี่ยวกับมนุษย์ที่เป็นมาตรฐานสากลได้แก่ Declaration of Helsinki, The Belmont Report, CIOMS Guideline และ International Conference on Harmonization in Good Clinical Practice หรือ ICH-GCP

**ชื่อโครงการ :** ผลของการเดินจงกรมต่อประสิทธิภาพของการเดินขณะมีการทำงานร่วมในผู้สูงอายุ
Walking meditation effects on dual-task walking performance in elderly

**เลขที่โครงการวิจัย :** 073/2564

**ผู้วิจัยหลัก :** นายพิชิตชัย ชูวัฒนกูล

**สังกัดหน่วยงาน :** โรงพยาบาลเวชชารักษ์ จังหวัดลำปาง

**วิธีทบทวน :** คณะกรรมการเต็มชุด (Full board)

**เอกสารที่รับรอง :**
1. โครงร่างการวิจัย
2. เอกสารข้อมูลคำอธิบายสำหรับผู้รับการวิจัย
3. เอกสารแสดงความยินยอมเข้าร่วมในโครงการวิจัย
4. เครื่องมือวิจัย / เก็บรวบรวมข้อมูล

**วันที่รับรอง :** 1 กันยายน 2564

**วันหมดอายุ :** 1 กันยายน 2565

**รายงานความก้าวหน้า :**
1. ส่งรายงานความก้าวหน้าและรายงานฉบับสมบูรณ์หากดำเนินโครงการเสร็จสิ้นก่อน 1 ปี เมื่อสิ้นสุดโครงการวิจัย
2. ส่งรายงานเมื่อมีการปรับเปลี่ยนกิจกรรมการวิจัยที่แตกต่างไปจากที่ระบุไว้ในโครงการวิจัยหรือเมื่อเกิดเหตุการณ์ไม่พึงประสงค์ที่เกิดขึ้นระหว่างการดำเนินการวิจัย

ลงนาม.....

(นางศรีประไพ อินทร์ชัยเทพ)
ประธานคณะกรรมการจริยธรรมการวิจัย
เกี่ยวกับมนุษย์

**นักวิจัยทุกท่านที่ผ่านการรับรองจริยธรรมการวิจัยต้องปฏิบัติดังต่อไปนี้**

1. ดำเนินการวิจัยตามที่ระบุไว้ในโครงร่างการวิจัยอย่างเคร่งครัด
2. ใช้เอกสารแนะนำอาสาสมัคร ใบยินยอม (และเอกสารเชิญเข้าร่วมวิจัยหรือใบโฆษณาถ้ามี) แบบสัมภาษณ์ และหรือแบบสอบถาม เฉพาะที่มีตราประทับของคณะกรรมการพิจารณาจริยธรรมเท่านั้น
3. รายงานเหตุการณ์ไม่พึงประสงค์ร้ายแรงที่เกิดขึ้นหรือการเปลี่ยนแปลงกิจกรรมวิจัยใด ๆ ต่อคณะกรรมการพิจารณาจริยธรรมการวิจัย ภายใน 5 วันทำการ
4. ส่งรายงานความก้าวหน้าต่อคณะกรรมการพิจารณาจริยธรรมการวิจัย ตามเวลาที่กำหนดหรือเมื่อได้รับการร้องขอ
5. หากการวิจัยไม่สามารถดำเนินการเสร็จสิ้นภายในกำหนด ผู้วิจัยต้องยื่นขอความเห็นชอบใหม่ก่อนหมดอายุ 1 เดือน
6. หากการวิจัยเสร็จสมบูรณ์ผู้วิจัยต้องแจ้งปิดโครงการตามแบบฟอร์มของคณะกรรมการจริยธรรมการวิจัยเกี่ยวกับมนุษย์ วิทยาลัยพยาบาลบรมราชชนนี นครลำปาง

# VITA

| | |
|---|---|
| NAME | Mr.Pichitchai Shuwuttanakul |
| DATE OF BIRTH | 30 May 1987 |
| PLACE OF BIRTH | Chiangrai |
| INSTITUTIONS ATTENDED | Master of Science (Physical Therapy) Srinakharinwirot University |
| HOME ADDRESS | 561 M.10 T.Wang A.Wangpapao Chiangrai |