

EFFECTIVENESS OF THAI HERMIT EXERCISE (RUESI DATTON) ON MILD COGNITIVE
IMPAIRMENT'S PATIENTS



A Dissertation Submitted in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy in Public Health Sciences

Common Course

College of Public Health Sciences

Chulalongkorn University

Academic Year 2018

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ประสิทธิผลของการฝึกภาษาตัดตนในผู้ป่วยที่มีความบกพร่องในการรู้คิด



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต
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DATTON) ON MILD COGNITIVE IMPAIRMENT'S PATIENTS
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 COGNITIVE IMPAIRMENT'S PATIENTS) อ.ที่ปรึกษาหลัก : ศ. นพ.สุรศักดิ์ ฐานีพานิช
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Mild Cognitive Impairment (MCI) เป็นภาวะความถดถอยของสมองในด้าน
 ความจำ มีสาเหตุจากการเสื่อมของเซลล์สมองที่แตกต่างจากการเสื่อมตามอายุขัย และสามารถ
 ดำเนินไปสู่การเป็นโรคสมองเสื่อมได้ ซึ่งวิธีการหนึ่งในการช่วยฟื้นฟูในด้านความจำคือการออก
 กำลังกาย ซึ่งฤๅษีตัดตนถือเป็นภูมิปัญญาในการออกกำลังกายแบบไทยซึ่งอาจช่วยฟื้นฟูความจำ
 สำหรับภาวะดังกล่าวได้ การศึกษานี้เป็นการศึกษาแบบสุ่มที่มีกลุ่มควบคุม มีวัตถุประสงค์เพื่อ
 ทดสอบประสิทธิภาพของการออกกำลังกายแบบฤๅษีตัดตนในผู้ป่วยMCI 84 คน แบ่งกลุ่มเป็นกลุ่ม
 ทดลอง42คน ได้ทำการฝึกฤๅษีตัดตนเป็นเวลา10สัปดาห์ โดยประเมินด้านพุทธิปัญญา ด้วยแบบ
 ฤๅษี Verbal fluency test, Trail maker test A-B และ Digit span ประเมินผลก่อนการฝึก,
 สัปดาห์ที่ 6, 8 และ 10 และกลุ่มควบคุม 42คน ที่ได้รับการรักษาตามปกติ การศึกษานี้พบว่า ก่อน
 การฝึกฤๅษีตัดตนทั้งสองกลุ่มไม่มีความแตกต่างกันด้านพุทธิปัญญา($p<0.05$) หลังการฝึกฤๅษีตัด
 ตน กลุ่มทดลองมีความแตกต่างด้านพุทธิปัญญาอย่างมีนัยสำคัญ ($p<0.05$) ผลการศึกษานี้แสดงให้เห็นว่า
 การฝึกฤๅษีตัดตนมีประสิทธิภาพต่อผู้ป่วยMCI

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5779051153 : MAJOR PUBLIC HEALTH SCIENCES

KEYWORD: Mild Cognitive Impairment(MCI, Cognitive function, Thai hermit exercise

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Mild Cognitive Impairment (MCI) is a recurrent brain disorder in memory. It is caused by the degeneration of the brain cells that is different from an individual's age and develop to dementia. One way to help restore memory is to exercise. Thai hermit exercise is a wisdom in Thai exercise, which improve memory decline for the condition. The study design is randomized control trial. This study aimed to investigate the effectiveness of Thai hermit exercise among patients with MCI. 84 participants were recruited and randomized into intervention (n=42) control(n=42). The intervention group practiced Thai hermit exercise for 10 weeks. Psychological effect on cognitive function was evaluated measuring cognitive function that determined by Verbal Fluency test, Trail Making test A-B and Digit Span. The control group received standard treatment. Both study groups were assessed by all tests at the baseline and at week6 week8 and week10 of study. At baseline there were no statistically significantly between two groups ($p < 0.05$). After intervention there were statistically significant improvement of cognitive function ($p < 0.05$). The result strongly suggested the capability of Thai hermit exercise to be an effective treatment for patients with MCI.

Field of Study: Public Health Sciences

Student's Signature

Academic Year: 2018

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ACKNOWLEDGEMENTS

The author wishes to express her deepest gratitude and appreciation to her thesis advisor, Associate Professor. Surasak Taneepanichskul and her thesis co-advisor, Dr. Yuttachai Likitjaroen, for their valuable suggestion, guidance, encouragement and support with kindness throughout this study.

Gratitude is grateful to the thesis committee members, Assoc. Prof. Chanida Palanuvej, Assoc. Prof. Rattana Somrongthong,, Assistant Professor Dr. Naowarat Kanchanakhan, Assistant Professor Dr. Kusuma Sriyakul for their valuable suggestions and advices to improve this thesis.

Last but not the least, the author is indebted to Mrs. Ladda Kongarth and Ms. Anchalita Kongarth, her parents for their supporting, understanding and encouraging to dedicate on her study. The author would like to express her deep gratitude and dedicate this degree to them.

Chomlak Kongart

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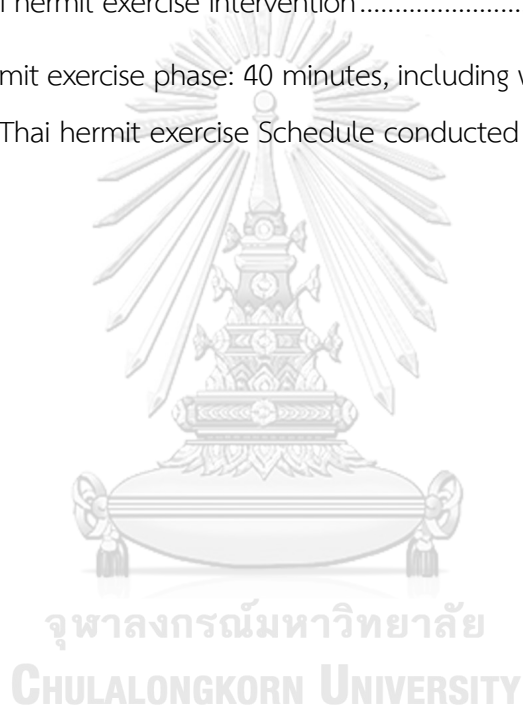
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Chapter I

Introduction

1.1 Background and Rationale

In Thailand, the percentage of young and working age population will continue to decline from 2010 to 2040, while the number of elderly population continues to increase, from 13.2 percent in 2010 and is estimated to be 32.1 percent in 2040. Furthermore, it is projected that the percentage of the young population will be equal to the percentage of the number of elderly people in 2017 (John Knodel, Bussarawan Teerawichitchainan, Vipap Prachuabmoh, & Pothisiri, 2015). Thailand population projections from 2010 until 2040 showed that the percentage of elderly population-end (aged 80 and over) will reach from about 12.7 percent to nearly 20 percent of the total elderly population. One cause of this increase is due to the increase in life expectancy in the elderly, which also resulted in an increase in the number of residents who are economically, socially, and physically dependent (John Knodel et al., 2015). When the distribution of the elderly population by sex, it was found that the number of elderly women was 55.1 percent in 2010, and will be experiencing an increase of up to 56.8 percent in 2040. Meanwhile, the group of late-old women, especially, will increase from 13.9 in 2010 to 21.3 percent in 2040, it is also caused by a group of women tend to live longer than men's group (John Knodel et al., 2015).

Demographic changes and increasing life expectancy contribute to population growth where the percentage of the population aged over 60 increased. The World Health Organization declared that Thailand as a country that has the second new parental population in Southeast Asia and is estimated to amount to double in the next two decades. Based on the results of the survey population data bases showed that the population moving towards the elderly(John Knodel et al., 2015). The increasing growth of aging population will have an impact on social and economic burden of caring for the elderly. The characteristics of the elderly are weak and vulnerable, and it is exacerbated if they have diabetes, hypertension and dementia.(Drewes et al., 2014). A study of elderly gave different results, but all the studies show that there is a sharp increase in the prevalence rate of the elderly. This resulted in the increasing prevalence of dementia risk. This increase occurred because of dementia occur in over 60 years, dementia is very rare in the age under 60 years. Failing to do prevention and treatment, the impact is an increase in the prevalence of dementia and their socio-economic well will increasingly become a burden to family and country. Concerning about Dementia which refers to a cerebral cortex disorder in a memory and higher cognitive function or function of a brain with associated with planning, decisions, and language use. Dementia usually occurs in middle-aged (> 40 years) or old aged(Clare et al., 2014). It's necessary to compare with normal physical condition. Furthermore, the loss of brain function as a result of the degeneration of brain cells(Bethune, 2010). The causes of dementia can be classified into, at least 2

groups based on the groups. The first group is those who are able to determine and can be treated such as normal hydrocephalus, vitamin B12 deficiency, etc. the second group those who are unable to determine and no effective treatment such as Alzheimer's disease: AD. It's reported that dementia Alzheimer's type found in most areas 60-80 %(ASSOCIATION, 1980).

Mild cognitive impairment (MCI) is commonly recognized as a state of cognitive decline greater than that expected for an individual's age and education level but is not severe enough to meet the criteria for a dementia(Gauthier et al., 2006). The reported prevalence and prognosis of mild cognitive impairment varies due to the variation in definition of MCI, study population and diagnostic methodologies (Larrieu et al., 2002). The prevalence of MCI varies from 2% -30% in the general population to 6% -85% in clinical setting (Larrieu et al., 2002).

The concept of Cognitive Impairment No Dementia (CIND) includes all people with the condition between "normal" and "dementia" is caused by a variety of diseases as a diagnostic entity, including memory impairment due to chronic use of drugs, mental illness, mental retardation and vascular pathology. CIND may or may not develop into dementia. CIND concept is the perspective that has been expanded MCI, previously only a limited domain specific for memory deficits but in its development include a variety of clinical subtypes of cognitive deficits and with many potential causes(Petersen, Roberts, Knopman, & et al., 2009).

The prevalence of MCI associated with the definition of operational and clinical status. Mayo Clinic Study of Aging (2009) in 2000 elderly aged 70-89 years in Olmsted County, Minnesota found that the prevalence of 13-15%, 10-11% and the rest of dementia normal, while progressively Alzheimer's 11% (Petersen et al., 2009). Epidemiological data from longitudinal studies of the general population found the prevalence of MCI in the elderly population of 3-19% with an incidence of 8-58 cases per 1000 elderly people per year, and the risk of becoming dementia 11-33% after 2 years after onset. Yet another study found the number in the population to 44% of patients with MCI is expected to return to normal one year later. This is the input that there are many factors that affect cognition in the elderly population may contribute to many cases where MCI reversible (Chertkow, 2002) .

The reported conversion rates of MCI to AD also vary from 12% over 1 year follow-up to 60% over 5-year period (Petersen et al., 2009) . reported a higher conversion rate of 72% in 2 years. Similarly, depending in part on the duration of follow up, the reported conversion rates of MCI back to normal cognition vary from 4% to 15% in clinic-based studies (de Jage & Budge, 2005 ; Gallas *et al.*, 2010) and from 35% to 55% in population-based studies (Fisk, Merry, & Rockwood, 2003; Ganguli, Dodge, Shen, & DeKosky, 2004; Ganguli, Snitz, Saxton *et al.*, 2011). Nevertheless, those who reverted still remained at increased risk for future cognitive decline upon follow-up (Koepell & Monsell, 2012; Patel & Holland, 2012) and it has been found that MCI with

impairment in memory or multiple domain have greater progression and lesser reversion in prognosis (Ganguli *et al*, 2011).

Although there is increasing recognition of mild cognitive impairment (MCI) as a preclinical stage of Alzheimer's disease (AD) and other dementias, there are no standard criteria for defining MCI mainly due to its heterogeneity in etiology, clinical presentation and long-term outcomes or prognosis (Patel & Holland, 2012; Stephan *et al.*, 2013). The most widely used MCI definition in clinical and research practice is that of amnesic MCI defined by Petersen, Smith, Waring *et al.* (1999) which also has undergone several revisions over the year up to 2009 (Petersen, 2004; Petersen, Doody, Kurtz *et al.*, 2001; Petersen, Roberts, Knopman *et al.*, 2009; Portet *et al.*, 2006; Stephan *et al.* 2013).

MCI is thought to be a state of cognitive functioning characterized by mild declines in cognitive functioning that may be a precursor to Alzheimer's disease (AD) or other forms of dementia (Petersen, 2004). Compared to other cognitive domains, memory is most commonly affected in MCI (Petersen, 2004). Older adults with MCI have declines that are identified as greater than those of normal aging processes but that do not qualify for dementia diagnosis (Petersen, 1999; Petersen *et al.*, 2001).

One of the factors thought to affect cognitive function is a physical activity, including mobility. Some studies report that elderly who have difficulty physical movement or a movement disorder, there will be differences in cognitive function score (K. Yaffe, D. Barnes, M. Nevitt, L. Lui, & K. Covinsky, 2001a). Larson *et al.* (2006)

conducted a prospective study to investigate the relationship between physical exercises continuous and decrease the risk of dementia and Alzheimer Dementia. They concluded that sustainable practice associated with risk of dementia and Alzheimer's disease in middle-aged disease where people who commit three or more times per week decreased the risk of dementia compared with those who exercise less than three times per week. Some types of exercise could be expected to reduce the occurrence of disorders related to the elderly such as Alzheimer's Disease and vascular dementia.

Up to now, medications have not yet been shown effective in stopping this particular disease, and some have problematic side effects. But some practices, like regular aerobic exercise, changes in nutrition (diet) and [engagement with learning and the arts](#), have shown progress in delaying the advance of Alzheimer's. People who live an active lifestyle are less likely to get dementia and those with dementia who adopt an active lifestyle can slow its progression (Yao, Giordani, & Alexander, 2008). As mention above optimizing intellectual activities and treating psychiatric morbidity should be part of pre- dementia. According to several scholars have proven that physical activity related to the elderly physical strength (Cyarto et al., 2010b) (Cyarto et al., 2010a). Some researchers have found that aerobic exercise did not necessarily result in dramatic cognitive gains, but was potentially involved in stemming the progression of cognitive decline in Alzheimer disease (AD). For instance, relative stability in cognitive status, as measured by the AD Assessment Scale-Cognition (ADAS-

Cog), was observed in a sample subjects who participated moderate-intensity cycling for 6 months (Fang Yu et al., 2013a) (Fang Yu et al., 2013b; F. Yu et al., 2015). Other strategies such as episodic memory strategic , computer-based training memory, all-day memory training, psychosocial activities (Olazarán et al., 2004), behavioral training are potential noninvasive therapy that may help prevention and treatment of AD.

Exercise can be seen to elicit a positive response on neuroplasticity. In order to understand the extent to which cognitive decline is precluded through exercise, cognitive ability should also be ascertained. Cross sectional studies such as, indicate that fit older adults show a smaller difference in cognitive ability than older sedentary individuals when compared to younger healthy individuals (L. B. Renaud & Maquestiaux, 2010). Moreover, observational studies indicate that staying physically active throughout life will decrease your chances of developing cognitive decline and dementia. Different exercise modalities have been shown to influence areas of the brain and thus with it attain different alterations its cognitive ability. Cognitive benefits in EF and memory have been shown following aerobic exercise (Colcombe, Erickson, & Raz, 2003).

In recent years, the Thai Ministry of Public Health has published several books on Reusi Dat Ton. According these modern texts, some of the benefits of Reusi Dat Ton practice include; improved agility and muscle coordination, increased joint mobility, greater range of motion, better circulation, improved respiration improved digestion, assimilation and elimination, detoxification, stronger immunity, reduced

stress and anxiety, greater relaxation, improved concentration and meditation, oxygen therapy to the cells, pain relief, slowing of degenerative disease and greater longevity. Thailand, found that after one month of regular Reusi Dat Ton practice there was an improvement in anaerobic exercise performance in sedentary females. (Weerapong et al, 2005)

In recent years, interventions to reduce cognitive dysfunction have been investigated, including memory therapy, music therapy, and exercise. Reusi Dat Ton practice is a traditional martial art and is widely practiced by Thai people. Many studies have investigated methods to prevent dementia symptoms, but few have investigated the effect of Reusi Dat Ton on mild cognitive impairment (MCI) (Deschamps, Onifade, Decamps, & Bourdel-Marchasson, 2009). . Importantly the evaluation of mild cognitive impairment (MCI) in this study implemented three methods, namely verbal fluency test (Letters/categories), trail making test (TMT) and digit span test (Colcombe et al., 2003). which are still rare to be used simultaneously to evaluate the effect of Reusi Dat Ton toward the cognitive improvement of mild cognitive impairment patients. This study aims to fill out research gab whether Reusi Dat Ton can improve cognitive function in elderly Thai subjects by applying three indicator of health condition.

1.2 Research gap

1.2.1 Lack of knowledge regarding the effect of Thai hermit exercise on MCI patients

1.2.2 To what extent the effectiveness of Thai hermit in reducing the cognitive impairment progressive in the older adult?

1.3 Research question

Does Thai hermit exercise is able to maintain and improve the cognitive of the MCI patients?

1.4 Research objectives

1.4.1 General objective:

This study aims to examine the effect of the Thai hermit toward the improvement of MCI cognitive function.

1.4.2 Specific objective

- To examine the condition of MCI patient by using the verbal influence test, the trail Maker B test and Digit Span Test before and after Thai Hermit exercise.
- To examine the influence of the psychological condition (stress) toward the advance of the Thai hermit exercise.
- To compare the effect of Thai hermit exercise between intervention and the control group along the time period observation.

1.5 Research hypothesis

This study proposed several hypotheses to answer the research objectives as follow;

Hypothesis 1: The Thai hermit exercise significantly affects to ameliorate the cognitive of MCI patient.

Hypothesis 2: There is a different improvement of cognitive of MCI patients between the intervention and control group.

1.6 Operational definition



Thai Hermit refers to traditional Thai healing and culture. It mainly consists of breathing exercises, self-massage, acupressure

MCI refers to a preclinical stage of Alzheimer's disease (AD) and other dementias, there are no standard criteria for defining MCI mainly due to its heterogeneity in etiology, clinical presentation and long-term outcomes or prognosis (Patel & Holland, 2012; Stephan et al., 2013).

The verbal fluency test refer the verbal fluency test (VFT) is a short screening test that evaluates cognitive function. It's often used by physicians and other practitioners if there is some concern that the person may have Alzheimer's or another type of dementia (M. Mattews & W H., 2004) .

Trail Maker B test refer the Trail Making Test consists of 25 circles distributed over a sheet of paper. In Part A, the circles are numbered 1 – 25, and the patient

should draw lines to connect the numbers in ascending order. In Part B, the circles include both numbers (1 – 13) and letters (A – L) (Tombaugh, 2004).

Digit Span Test refer the examiner says a short string of the digits at the rate of one digit a second in a monotone voice, and then the examinee repeats them.

Psychological status is the psychological state which the qualities of a state are relatively constant even though the state itself may be dynamic a manic state.



1.7 Conceptual Framework

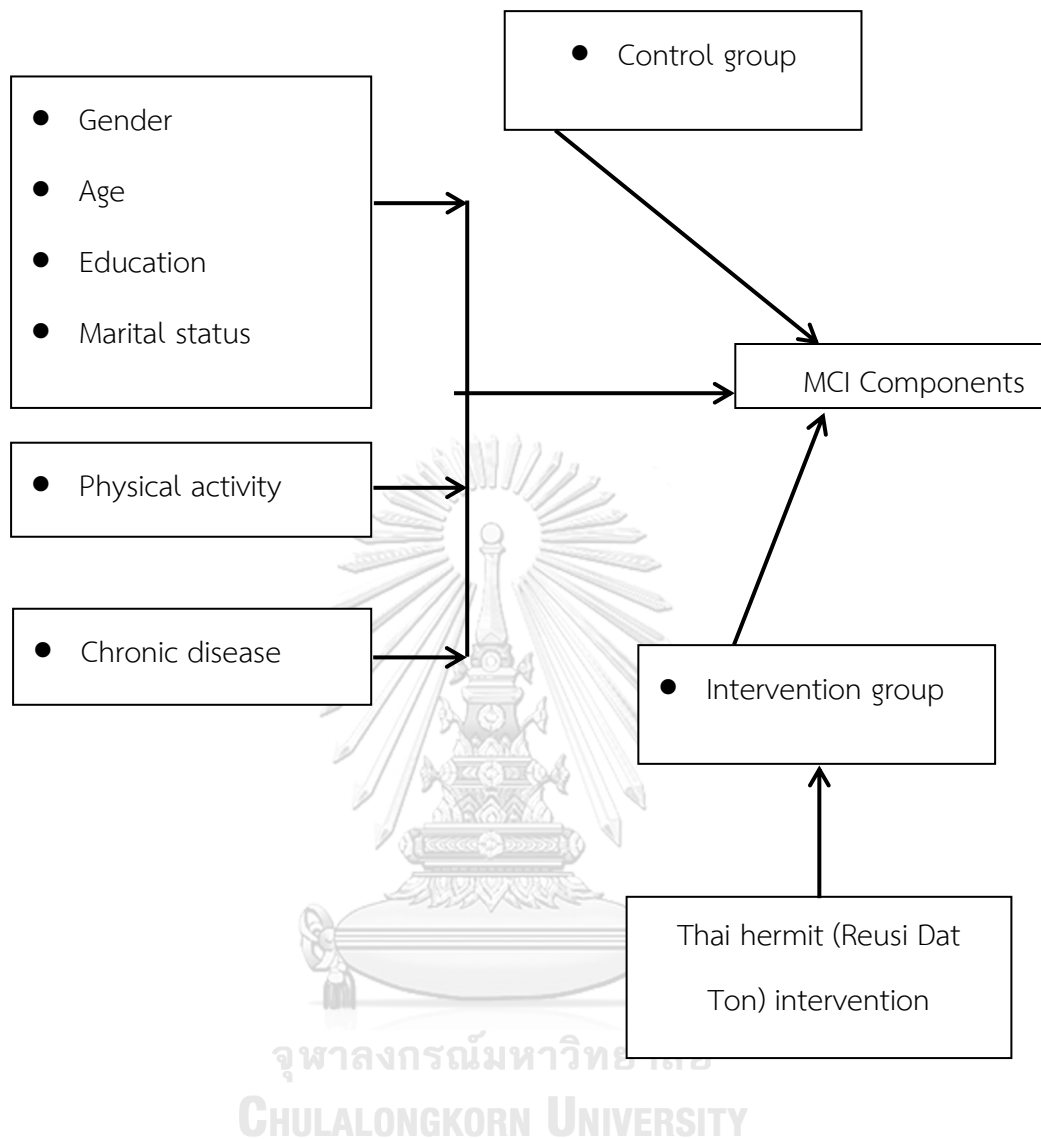


Figure 1 Conceptual framework of the Thai hermit effect toward MCI level

CHAPTER II

REVIEW OF RELATED LITERATURES

This chapter discusses the related study which support to the deep understanding about aging process, mild cognitive impairment (cause, epidemiology, diagnosis, treatment and the risk factors), Reusi Dat Ton (Thai hermit), the relationship between exercise and cognitive function and also discuss about the randomized control trial as the method of this study.

2.1 Epidemiology and Ageing Process

Each individual will experience the aging process is normal and natural event. This process is already under way after a person reaches adulthood. All the organs of the aging process will undergo structural and physiological changes, so does the brain organ. As is known the process of healthy aging is influenced by endogenous and exogenous factors, which means internal and external factors influenced the degenerative process (Darmojo, 2002). As a result of the influence of internal factors include a decline in anatomy, physiology and especially the decrease in psychosocial changed enormously, resulting in easily arise disease. While external factors that accelerate the aging process is a cultural lifestyle, environment and employment (Martono, 2009).

According to Kane and Ouslander (2011) problems of the elderly is often called as the term 14 Impairment (14 Is). Impairment Fourteenth are: Immobility (experienced impairment of more than three days), Incontinence (bedwetting), instability (unstable, stand and walk easily fall), Infection (infection), Intellectual

impairment (intellectual impairment or dementia), Impaction (difficult bowel movements), Impairment of vision and hearing, communication, taste, convalescence, smell, skin integrity (interference of the five senses, communication, resilience and skin), Inanition (malnutrition), Isolation (depression) Impecunity (no money), Immune deficiency (southwest the immune system is decreased), iatrogenesis (emergence of the disease due to consuming drugs), impotence (impotence) and Insomnia or sleep disorders. There are several theories that explain the aging process, namely: the theory of biological, psychological theory, social theory, and the theory of spiritual (Mary et al., 2008).

In this study we focus on the cognitive impairment. The cognitive impairment is one of the issues that may progress into worst condition such as Alzheimer. Cognitive disorders including dementia prevalence increases with age, less than 3% are in the age group of 65-75 years and over 25% occurred in the age group 85 years and over (WHO, 1998). The admission process begins with the receipt of information through visual information (visual input) or hearing (auditory input) and then forwarded by the sensory registers are influenced by the attention, is part of the input process. After that, the information will be accepted and included in the short-term memory, when it attracted the attention and interest it will be stored in long-term memory. If at any time the memory required will be called back (Ellis, 1993).

Among the functions of the brain that decreases linearly (line) with increasing age is a function of memory in the form of a decline in the ability of naming (naming)

and the speed of looking back information that has been stored in the memory center (speed of information retrieval from memory). Linearly decrease in memory function that occurs in cognitive abilities and does not affect normal life spans (Strub and Black, 1992).

Changes or memory impairments in aging brain occurs only in certain aspects, for example, primary memory (short term memory / Short time memory) is relatively unchanged on the addition of age, whereas in secondary memory (memory of long-term / long term memory) unchanged meaningful. This means that the ability to transmit information from short-term memory into long-term decline with increasing age. From a study in people with normal cognition 62-100 years old, it was concluded that the ability of the learning process or the information acquisition have decreased significantly in increasing age, but it is not related to education, while the memory were delayed (delayed recall or Forgetting) slightly but usually remains, especially the initial learning factors considered (Petersen et al., 2002).

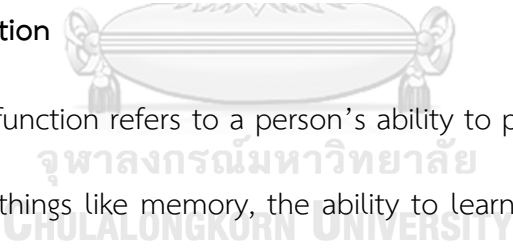
Petersen (2002) has also managed to do a longitudinal study comparing cognitive ability in elderly normal, mild cognitive impairment (mild cognitive impairment / MCI) and Alzheimer's dementia light, it has been concluded that MCI is a transitional state between normal cognitive and dementia (especially Alzheimer). Background research Petersen is that the subject of MCI have memory disorders according to age and education but no dementia, so the diagnosis of MCI was made in patients with the following criteria: (a) no memory complaints, (b) activities of daily

living normal, (c) normal general cognitive function, (d) abnormal memory for age, (e) no dementia.

According to the World Health Organization (2009), the number of people aged 60 years and older will double to 1.2 billion people by 2025. This discovery has important implications as the prevalence of positive cognitive disorders associated with advanced age (Ritchie , 2010). The prevalence of MCI in the United States is estimated to range from 19.2% for ages 65-74 years, 27.6% for ages 75-84 years, and 38% for ages 85 years and older. The incidence and prevalence of MCI will increase with increasing age and in those with a low educational background as well as the presence of risk factors as well as the incidence of dementia was increased significantly with increasing age (Klusmann et al., 2010). There have been a lot of studies that show changes direction MCI to dementia showed that individuals with MCI will have to be dementia risk may reach 25% per year. In another study noted that about 20% of patients with MCI will be dementia only takes about 3 years. While Petersen reported that a person with MCI will progress to dementia by an average of 10-15% each year. The Italian Longitudinal Study on Aging (ILSA) reported incidence rate of 21.5% / year, while the Leipzig Longitudinal Study of of the Aged (Leila) acquire MCI incidence rate was 8.5% / year. Several other studies showed that individuals with MCI or other cognitive disorders in the period more than five years, it can evolve into dementia. However, this study depend on the definition used and the population (Golomb, 2001; Palmer, 2002).

The prevalence of MCI associated with the definition of operational and clinical status. Mayo Clinic Study of Aging (2009) in 2000 elderly aged 70-89 years in Olmsted County, Minnesota found that the prevalence of 13-15%, 10-11% and the rest of dementia normal, while progressively Alzheimer's 11% (Petersen et al., 2009). Epidemiological data from longitudinal studies of the general population found the prevalence of MCI in the elderly population of 3-19% with an incidence of 8-58 cases per 1000 elderly people per year, and the risk of becoming dementia 11-33% after 2 years after onset. Yet another study found the number in the population to 44% of patients with MCI is expected to return to normal one year later. This is the input that there are many factors that affect cognition in the elderly population may contribute to many cases where MCI reversible (Chertkow, 2002).

2.2 Cognitive function



Cognitive function refers to a person's ability to process thoughts. Cognition primarily refers to things like memory, the ability to learn new information, speech, and reading comprehension. In most healthy individuals the brain is capable of learning new skills in each of these areas, especially in early childhood, and of developing personal and individual thoughts about the world. Factors such as aging and disease may affect cognitive function over time, resulting in issues like memory loss and trouble thinking of the right words while speaking or writing. Humans are generally equipped with a capacity for cognitive function at birth, meaning that each person is capable of learning or remembering a certain amount of information. This is generally

measured using tests like the intelligence quotient (IQ) test, although these can be inaccurate at fully measuring a person's cognitive abilities. Infanthood and early childhood are the periods of time when most people are best able to absorb and use new information, with most children learning new words, concepts, and ways to express oneself on a weekly or even daily basis. Capacity to learn slows down little by little as one gets older, but overall cognitive function should not deplete on a large scale in healthy individuals.

Cognitive has several functions, namely attention, language, memory, visuo-spatial, and executive function. These next paragraphs will give in detail explanation.

Attention: Attention is the ability to react to a stimulus by being able to ignore other stimuli that are not required to be able to focus on a specific stimulus and ignore the other irrelevant stimuli. Concentration is the ability to sustain attention on a longer period. Impaired attention and concentration will affect other cognitive functions such as memory and language.

Language is basic communication devices and modalities basic building capabilities cognitive function. Where the existence of language disorders, cognitive examination such as verbal memory and executive function will have difficulty or can not do. Language functions include four parameters: (a) Fluency refers to the ability to produce sentences in length, rhythm and melody are normal. (b) Understanding which refers to the ability to understand a word or command, evidenced by one's ability to perform the command. (c) Repetition is a person's ability to repeat a statement or

spoken sentence someone. (d) Naming that refers to a person's ability to name an object and its parts. Language disorders are frequently seen in both the brain lesion focal lesion or lesions are diffuse, so the language disorder is a pathognomonic symptom of a brain dysfunction. It is important for clinicians to recognize language disorders due to language disorders have a specific relationship between aphasia syndrome with lesion location.

Memory; Memory function consists of the admissions process and encryption of information, the storage process and the process of considering the effect on memory function. Memory functions are divided into three levels depending on the length of the time span between stimulus to recall, namely: (a) immediate memory (immediate memory), the time span between the stimulus to recall only a few seconds. Here only needed to remember the concentration of attention (attention); (b) a new memory (recent memory), a longer time is a few minutes, hours, months or even years; (c) a long memory (remote memory), the time spans for years, even for life. Memory impairment is the most frequent symptom patients complain. Amnesia is largely an effect memory function. The inability to learn new material after a brain injury is called amnesia anterogard. Retrogard amnesia amnesia refers to what happened before the brain injury. Almost all patients with dementia showed memory problems early in the course of illness. Not all memory impairment is an organic disorder. Patients often experience depression and anxiety disorders of memory.

Visuospatial; Visuospatial ability is a constructional abilities such as drawing or emulate a variety of images and arrange the blocks. All lobe plays a role in the ability of the parietal lobe construction with right hemisphere dominant role. Drawing hours often used for screening visuospatial abilities and executive functions which related to disturbances in the frontal and parietal lobes.

Executive functions; Executive functions of the brain can be defined as a complex process of someone in solving problems / new issues. These processes include awareness of the existence of a problem, evaluate, analyze and solve / find a way out of a problem.

2.3 Mild Cognitive Impairment (MCI)

Mild cognitive impairment (MCI) is defined as cognitive decline greater than expected for an individual's age and education level, which does not interfere notably with activities of daily life (Petersen R, 2011). In people aged 60 years and older, the reported prevalence of MCI ranges from 14 to 18% and the progression rate to dementia is 5-15% per year (Ganguli, Snitz, Saxton, & et al., 2011). MCI is widely considered a transition stage between normality and dementia (Ronald C. Petersen, 2011). However not all patients with MCI convert to dementia several studies reported that about 60% of these patients remains cognitively stable in a time range of about 2-3 years (Taylor, 2011). Furthermore, in other studies it was determined that 40% of MCI subjects returned cognitively normal at further follow-ups (Larrieu et al., 2002). Also MCI represents an extremely heterogeneous condition. MCI may represent the

clinical manifestation of an incipient neurodegenerative process, thus constituting the early stage of AD and other dementias (Canevelli & Kelaiditi, 2014). However, it may also represent the “cognitive” expression of other underlying pathological conditions, not confined to the brain and cognitive domain. In this case, the progression of MCI to dementia is not obvious nor unavoidable (Canevelli & Kelaiditi, 2014). The heterogeneous aspects of MCI and the different trajectories in the evolution of this situation suggest that it may be sustained also by non-neurodegenerative factors such as cognitive frailty. The concept of cognitive frailty may provide useful insights for better exploring the complex construct of early stages of cognitive impairment.

(Boyle P, Buchman A, Wilson R, Leurgans S, & D, 2010) notice a relation between physical frailty and an increased risk of MCI and a more rapid rate of cognitive decline in aging. In their study physical frailty was associated with a greater decline in global cognition and in five specific cognitive systems. These data may suggest that physical frailty and cognitive impairment share a common underlying pathogenesis. For example, many risk factors for cardiovascular disease such as inflammation, hypertension, diabetes, dyslipidemia, and hyperhomocysteinemia are possibly responsible for brain damage and are strongly associated with frailty (Gregory, Gill, & Petrella, 2013). Regular physical activity, nutrition, social contacts and cognitively stimulating activities such as reading, have been individually correlated to cognitive status (Verghese et al., 2006). In particular, these activities play a protective role against both the onset and the progression of MCI to dementia. Most available observational

studies have shown that such activities are associated with a reduced risk of dementia. Nevertheless, there are still only few studies, with RCT design, that have shown that physical and cognitive interventions may actually prevent dementia or MCI progression. Further studies are therefore required to develop prevention programs, at the intermediate stage between normality and pathology, with the goal of delaying the onset of dementia.



Cognitive disorders may include disorders of the aspects of language, memory, visuospatial and cognition.

2.3.1 Disruption language, memory, emotion, and cognition visuospatial

Language disorder that often occurs mainly in the vocabulary. Patients unable to name objects or pictures shown to them (confrontation naming), but it would be difficult to name a fruit or animals in one category (categorical naming), it is because the power of abstraction began to decline.

2.3.2 Memory Disorders

The first symptoms often occur in patients with cognitive impairment is a disorder remember. In the early stages of his new disturbances in memory, but then the old memory will also be affected. Impaired function of memory is divided into three levels depend on the length of the interval between the stimulus and the recall, namely:

a. Immediate memory (immediate memory), the interval between stimulus and recall only a few seconds. Here only needed to remember the concentration of attention (attention).

b. The new memory (recent memory), within a longer time is a few minutes, hours, months and even years.

c. The old memory (remote memory) within the time for many years, even a lifetime.

2.3.3. Impaired visuo-spatial

Often occurs in patients with post-stroke recovery phase. Patients forget the time, did not recognize the day, the faces of friends and often do not know where he is (disorientation to time, place and person). Visuospatial disorders can be determined by asking the patient to scour the trail alternately, copy the images or the block beams corresponding form.

2.3.4 Impaired cognitive

This function is most often compromised, especially power failures abstraction. Elderly always thought concrete, making it difficult to give meaning proverbs, also a decline in the power equation (Wolf & Kudielka, 2008).

Regarding to the Mild cognitive impairment (MCI), it is a condition in which someone has minor problems with cognition - their mental abilities such as memory or thinking. In MCI these difficulties are worse than would normally be expected for a

healthy person of their age. However, the symptoms are not severe enough to interfere significantly with daily life, and so are not defined as dementia.

It is estimated that between 5 and 20 per cent of people aged over 65 have MCI. It is not a type of dementia, but a person with MCI is more likely to go on to develop dementia. This factsheet explains what MCI is, the link between MCI and dementia, and the benefits of diagnosing MCI. It then looks at treatments for MCI, ways to cope with the symptoms, and how you can reduce your risk of developing MCI and dementia. Many people who are diagnosed with MCI use this as an opportunity to change their lifestyle for the better. There is a lot that someone can do to help reduce their chances of MCI progressing to dementia.

2.3.5 Symptoms

Symptoms include cognitive impairment, including (Sherman, Mauser, Nuno, & Sherzai, 2017):

- (1) Often forget. For example people will forget important events that will be done, people begin to forget the road that is often impassable in the environment, forget the family phone number.
- (2) Often ask the same question, tell a similar story, and provide the same information repeatedly.
- (3) Not being able to do a job with a lot of clues.
- (4) Lack of focus in the talks.

(5) In addition, patients may also experience depression, anxiety, and apathy.

These symptoms will have been noticed by the individual, or by those who know them. For a person with MCI, these changes may cause them to experience minor problems or need a little help with more demanding daily tasks (eg paying bills, managing medication, driving). However, MCI does not cause major problems with everyday living. If there is a significant impact on everyday activities, this may suggest dementia.

Most healthy people experience a gradual decline in mental abilities as part of ageing. In someone with MCI, however, the decline in mental abilities is greater than in normal ageing. For example, it's common in normal ageing to have to pause to remember directions or to forget words occasionally, but it's not normal to become lost in familiar places or to forget the names of close family members.

If the person with MCI has seen a doctor and taken tests of mental abilities, their problems will also be shown by a low test score or by falling test scores over time. This decline in mental abilities is often caused by an underlying illness.

2.3.6 Pathophysiologic

There is no single cause that led to MCI. Relatively little is known about the causes of this mild cognitive impairment, but a number of neurological and medical conditions may contribute to these symptoms. In some cases studied at autopsy,

pathologists have observed changes in brain structure and the increased accumulation of amyloid plaque proteins

Predictors of amnesic MCI progress to dementia, namely:

- The presence of apolipoprotein epsilon 4 gene (ApoE4 gene)
- Hippocampal volume is less than 25% of those with MRI
- PET imaging (positron Eemission Tomography) show the temporal and parietal brain hypometabolism
- Test showed low cerebrospinal fluid amyloid beta 42 and an increase in tau protein
- Amyloid brain plaques were detected on imaging PET (Positron Emission Tomography) uses Pittsburgh compound B

MCI risk factor are (Gorelick Philip et al., 2011) :

- Increasing age
- Diabetes mellitus
- Smoke
- Depression
- Hypertension
- Elevated blood cholesterol levels
- Lack of physical activity

2.3.7 Diagnosis

MCI has a heterogeneous symptoms, consisting of a variety of cognitive domains and neuropsychiatric symptoms or behavioral (Dannhauser et al., 2005). Mayo study the proposed criteria Normative Older Adult Studies include: Subjective memory complaint; Objective memory deficits (as compared with normal controls appropriate to their age and level of education, ≥ 1.5 SD); Other cognitive functions intact; The function of daily activities (ADL) intact; Not dementia (Petersen et al. 1999). This concept persisted despite later modified by the new findings, including: Subjective memory complaints turned out to be meaningful; memory deficits must be relative to normative data according to age and level of education; forecasts a decrease in other cognitive abilities; mild deficits in ADL may exist. ADL intact generally are basic ADL (activities related to the care and personal hygiene, including bathing, urination and defecation management, dressing, eating and personal hygiene). If there is impairment ADL, generally complex or Instrumental ADL, an activity which is not fundamental but allows people to live independently in the community, such as: shopping, housekeeping, planning and use of money, preparation of food and cleansing, religious activity or security procedures and gravity (Schoenberg & Duff, 2011).

Related consensus definition of cognitive impairment is still sorely lacking. Psychometric validation criteria to identify cognitive disorders (ranging from mild stage (MCI) to severe) yet no accepted widely accepted. DSM-IV-TR and ICD-10 offers several

categories to diagnose cognitive problems caused by a general medical condition. Conditions dementia recorded in the classification, MCI nothing but synonymous with mild neurocognitive disorder were included Impaired Cognitive Not Otherwise Classified (NOS) DSM-IV for identification must be no impairment in at least 2 domain, which can include attention, language, learning and memory, motor skills - perceptual and / or executive functions. Cognitive impairment should be for general medical or neurological conditions, are considered abnormal or decreased function said that before, and cause psychological distress or impairment of social functioning, occupational or other (Iverson & Brooks, 2011).

In DSM 5 (APA 2013), dementia, delirium, amnesic and other cognitive diseases of DSM-IV Disorders becomes Neurokognif (neurocognitive disorder = NCD), consisting of delirium, major NCD, mild NCD, and subtype aetiology. NCD major or mild subtype can be caused due to Alzheimer's disease, vascular, Lewy Body, Parkinson's, frontotemporal, traumatic brain injury, HIV infection, induction substances / medications, Huntington's disease, because of other medical conditions, the etiology of multiple and nonspecific. Diagnosis of dementia including major NCD, but DSM 5 identify cognitive impairment that is not as severe dementia, mild NCD, is also the focus of attention is identical to MCI. DSM 5 also provides additional specificity "with or without behavioral disorders". Mental component - MCI behavior at getting unwitting, where it is a major predictor of tendency to become dementia. One

hierarchical cluster analysis mentioned Peters et al. (2008) identified two clusters neuropsychiatric symptoms, namely:

(1) Cluster mood (including depression, anxiety, apathy, irritability and sleep problems), is more common than frontal cluster of symptoms (95% of subjects had at least 1 symptom mood: 53% of subjects had at least 1 symptom frontal);

(2) Cluster frontal (aberrant motor behavior, disinhibition, agitation and problems of appetite), was found to be associated with functional disability even after controlling for cognitive status and mood cluster scores.

2.3.8 Type of Mild Cognitive Impairment

Furthermore, MCI is divided into two subtypes: amnesic and non-amnesic. Amnesic MCI involves a memory domain, domain non-amnesic non - memory. Both can be single (one domain) or multiple.

(1) Amnesic

Based on the theory that amnesic MCI is the preclinical stage of AD (Winblad et al., 2004), it is expected that participants with amnesic MCI will show similar trends in performance on verbal fluency tasks as individuals with AD. However, several research groups have reported that verbal fluency impairment in amnesic MCI is selective (Taler & Phillips, 2008). For example, Murphy and colleagues (2006) found that individuals with amnesic MCI, while being impaired on category fluency, were relatively unimpaired in generating words that begin with a given letter. Adlam, Bozeat, Arnold, Watson, and Hodges (2006) reported similar results.

Regarding the extensive literature reviewed, switching and clustering performance in amnesic MCI was only found to be explored by Murphy and colleagues (2006). They found that both amnesic MCI and normal controls produced greater average cluster sizes on semantic compared to phonemic fluency tasks. Furthermore, the amnesic MCI groups cluster sizes were comparable to the control group on both fluency tasks. In regard to total switches, both groups switched more on phonemic fluency than semantic. Switching ability was similar on both fluency tasks between the control and amnesic MCI groups. To summarize, according to Murphy et al.'s results, clustering and switching abilities do not appear to be compromised at the MCI stage of impairment.

Individuals with single domain amnesic MCI were equally impaired on category fluency and letter fluency. Furthermore, participants with single domain amnesic MCI were the least impaired of the following groups: single domain amnesic MCI, multiple domain amnesic MCI, non-amnesic MCI, and AD, and performed comparably to controls. While, compared to controls, the multiple domain amnesic MCI group showed deficits in both fluency tasks, they demonstrated an unequal impairment on the verbal fluency tasks. Specifically, they performed worse on category compared to letter fluency. Results from this study suggest that single domain amnesic MCI performance parallels Nutter-Upham and colleagues' (2008) results while multiple domain amnesic MCI performance is more consistent with the results reported by Adlam et al. (2006) and Murphy et al. (2006). These findings may reflect

the importance of separating MCI into single and multiple domains. To this author's knowledge, no research has been conducted on clustering and switching ability in single domain amnesic MCI compared to multiple domain amnesic MCI.

(2) Non – amnesic

Brandt and Manning found that non-amnesic MCI performance on both category and letter fluency was below that of healthy older adults. Additionally, non-amnesic MCI participants were not more impaired in category than letter fluency, or vice-versa. Of interest, the fluency patterns seen in individuals with non-amnesic MCI are similar to those observed in study outcomes of verbal fluency ability in individuals with LBD, VaD, and FTD. More specifically, non-amnesic MCI performance was poorer on both category and letter fluency but neither fluency subtest showed more impairment than the other. Examination of clustering and switching on verbal fluency tasks was not included in Brandt and Manning's study nor any study to this author's knowledge.

Non-amnesic MCI is expected to produce fewer words than controls on both category and letter fluency. It is also expected that they will show equivalent deficits on letter and category tests. Based on the clustering and switching performance of FTD and VaD participants, it is predicted that the non-amnesic MCI participants will have an equivalent level of deficit on switching and clustering for both of the fluency tasks

2.3.9 The Petersen Criteria

Petersen et al (1999) was initial criteria for the diagnosis of MCI: (1) memory complaint; (2) normal activities of daily living; (3) normal general cognitive function; (4) abnormal memory for age; and (5) no dementia. This current definition of “amnesic” MCI is better suited to represent the clinical manifestation of incipient AD, and is recommended when specifically assessing the pre-dementia stage of AD (Petersen et al., 2001a).

1. Memory Complaint

There should be evidence of lower performance in one or more cognitive domains that is greater than would be expected for the patient’s age and educational background if repeated assessments are available, then a decline in performance should be evident over time. This change can occur in a variety of cognitive domains, including: memory, executive function, attention, language and visuospatial skills. An impairment in episodic memory for example; the ability to learn and retain new information is seen most commonly in MCI patients who subsequently progress to a diagnosis of AD.

2. Normal Activities of Daily Living (ADLs)

Persons with MCI commonly have mild problems performing complex functional tasks they used to be able to perform, such as paying bills, preparing a meal, shopping at the store. They may take more time, be less efficient, and make more errors at performing such activities than in the past. Nevertheless, they generally maintain their independence of function in daily life, with minimal aids or assistance.

3. Normal General Cognitive Function

There should be evidence of concern about a change in cognition, in comparison to the Person's prior level. This concern can be obtained from the patient, from an informant who knows the patient well, or from a skilled clinician observing the patient.

4. Abnormal Memory for Age

Memory disorders are the result of damage to neuroanatomical structures that hinders the storage, retention and recollection of memories. Memory disorders can be progressive, including Alzheimer's disease, or they can be immediate including disorders resulting from head injury.

5. Not Demented

These cognitive changes should be sufficiently mild that there is no evidence of a significant impairment in social or occupational functioning. It should be emphasized that the diagnosis of MCI requires evidence of intra-individual change. If an individual has only been evaluated once, change will need to be inferred from the history and/or evidence that cognitive performance is impaired beyond what would have been expected for that individual. Serial evaluations are of course optimal, but may not be feasible in a particular circumstance.

The introduction of clinical subtypes can help estimate the etiology of MCI (Process diagnosis and classification in Figure 2.1).

Cognitive complaint

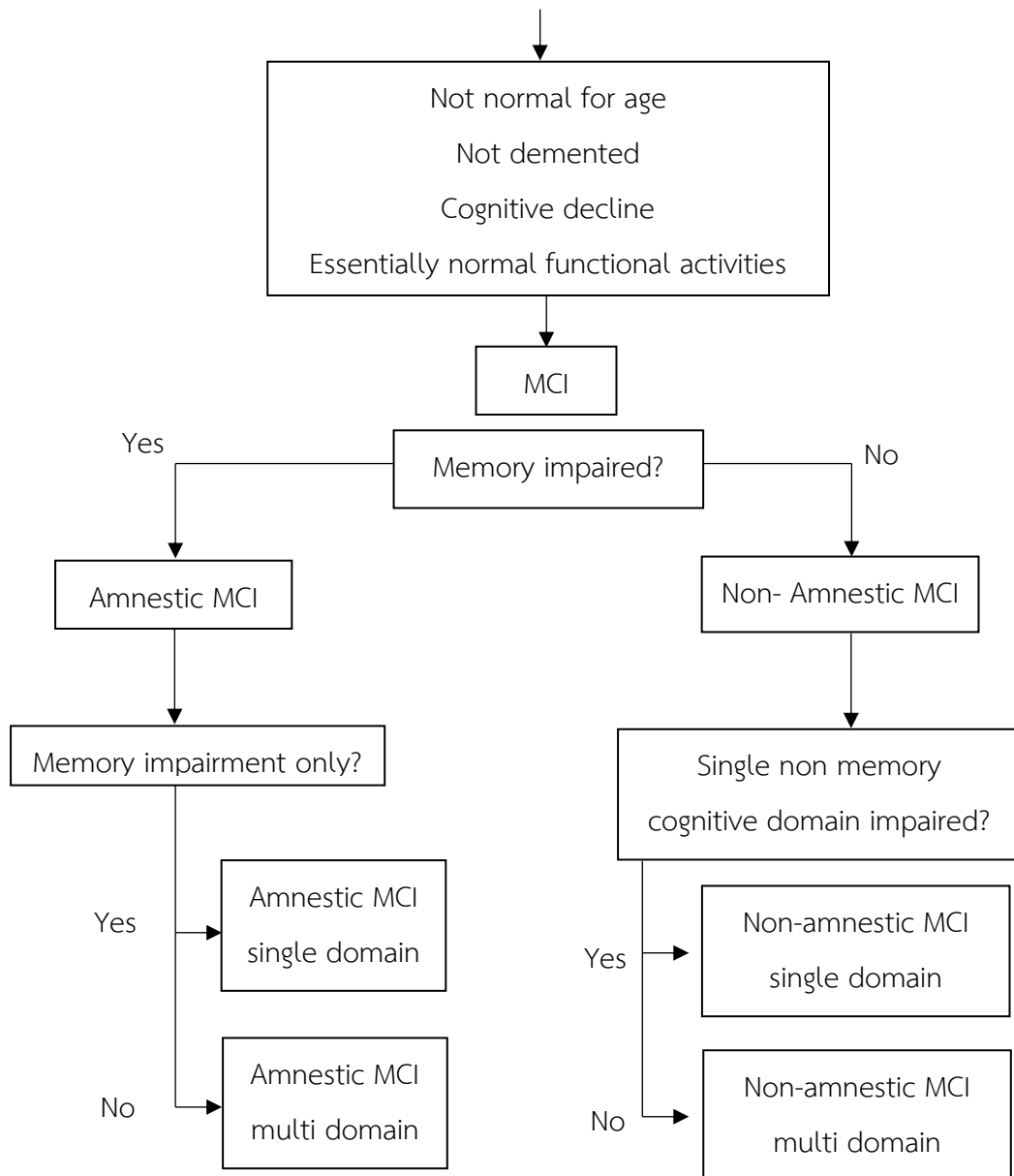


Figure 2 The MCI criteria diagnosis (R.C. Petersen, 2011; Winblad, Palmer, & Kivipelto, 2004)

If there are no complaints that associated with cognitive functions, then adjust the criteria. If you already established a diagnosis of MCI, it must find whether there are signs of memory decline or not. If yes (exist), then diagnosed with amnesic MCI. If only a memory disorder only, MCI amnesic single domain, if other complaints da MCI amnesic multiple domain. But, if there is no disturbance of memory, called MCI non-amnesic. If accompanied by another cognitive impairment called MCI non-amnesic multiple domains, otherwise called MCI non-amnesic single domain.

Deeper examination sometimes needed to get rid of the differential diagnosis, especially depression. Some biomarkers potentially useful as a diagnostic support as well as predictors of progression, including APOE $\epsilon 4$, the increase in total protein tau and tau phosphorylation in CSS, as well as a decrease in amyloid β 40 and 42, but none of the variables that the current "gold-standard" predictor of progression of MCI into dementia. The trend is a combination of various factors that exist.

There are several examination of cognitive functions, such as Montreal cognitive Assessment (MoCA) that have been modified are called MoCA-Ina which is implemented for a research that conducted by Nasreddine, Phillips, and Chertkow (2012). Test of MoCA-Ina with the cut of point 26 to get the sensitivity MoCA-Ina 90% higher MMSE compared to only 18%, whereas the specificity test Moca-Ina is equal to 87% for detecting Mild cognitive Impairment (MCI). Test MoCA-Ina very high sensitivity and spesivity to measure Mild cognitive Impairment and only takes about 10 minutes

(Nasreddine, Rossetti, et al., 2012). K. Yaffe, D. Barnes, M. Nevitt, L. Y. Lui, and K. Covinsky (2001b) in his study found that MoCA-Ina more sensitive than MMSE for detecting cognitive dysfunction after acute stroke. Test Validation MoCA-Ina has been done in Indonesia, from the results of this study, a total value of two doctors Kappa was 0.820. It was concluded that the MoCA test version of Indonesia (Ina MoCA) was valid according to the transcultural validation rules that can be used.

MoCA-Ina consists of 30 points tested by assessing some cognitive domains, namely:

a. function of the executive: rated with trail making B (one point), phonemic fluency test (one point), and two verbal items abstraction (one point).

b. Visuospatial: rated with clock drawing test (three points) and describe the three-dimensional cube (one point)

c. Language: name three animals (lions, camels, rhinos, and three points), repeating two sentences (two points), and fluency (one point).

d. Delayed recall: mentions five words (5 points), mentioning again after five minutes (5 minutes)

e. Attention: assess alertness (1 point), reducing the sequence (3 points), digit forward and backward (1 point each)

f. ABSTRACT: assessing the similarity of an object (2 points)

g. Orientation: the date, month, year, day, place and city (1 point each)

(Nasreddine, 2012).

2.3.10 Physical Activity and Mild Cognitive Impairment (MCI)

Some evidence indicates that motor and cognitive systems are both likely to be influenced by processes, both developmental and degenerative, which regulate CNS function; this suggestion has been termed the “common cause” hypothesis (Christensen H, Mackinnon A, Korten A, Jorm A, 2001). Sustaining this hypothesis is the evidence that both cognitive and physical performance can be negatively influenced in parallel by factors such as chronic disease, sedentary lifestyles and poor socioeconomic conditions (Alfaro-Acha A, Al Snih S, Raji M, Markides K, Ottenbacher K, 2007). Many studies demonstrated that poor baseline physical performance results in cognitive impairment or dementia (Van Kan G, Rolland Y, Bergman H, Morley J, Kritchevsky S, Vellas B, 2008). Two of our recent studies are in line with these findings, in fact good physical performance seems to play as a protective factor against cognitive decline [Gallucci M, Antuono P, Ongaro F, Forloni PL, Albani D, Amici GP, Regini C, 2009]. Increasing evidence indicates, through prospective studies, that regular exercise is able to reduce the risk of MCI and dementia (Ahlskog J, Geda Y, Graff-Radford N, Petersen R, 2011). Among patients with dementia or MCI, RCTs and cross-sectional studies show improvement in cognitive scores after 6 months-1 year of exercise, increase in volume of the hippocampus and improved spatial memory (Suzuki T, 2012). Neuroimaging studies of cognitive networks also show that regular exercise improves connectivity and increases neuroplasticity which translates into better learning skills

(Erickson K, 2008). Aerobic exercise was the training regimen in most of the trials showing significant improvement in global cognitive function. Isolated resistance training was studied in trials and produced significant effects on memory (Foster P, Rosenblatt K, Kuljis, 2011). While it is still unclear what type of exercise is most beneficial and at what age it has to start, much more research seems to be required to understand dose response linkages between exercise and cognitive effects. Currently, the American College of Sports Medicine recommends that exercise programs for older adults include both aerobic and non-aerobic physical activities, such as resistance training, balance training, and stretching for optimal general health.

Older adults can benefit a lot from a combination of exercise that can build strength, maintain bone density, improve balance, coordination and mobility, reducing the risk of falling and helping maintain independence in performing activities of daily life. Even moderate exercise can improve the health of people who are frail or who have diseases associated with aging. Several explanations for the protective effect of physical activity on cognitive functions have been suggested. Possible mechanisms underlying the relationship between physical activity and cognition are indirect, through the positive effect of physical activity on brain vascularity which include pressure reduction, improvement of the lipoprotein profile, increased perfusion and direct on the brain through the preservation of the neuronal structure and major changes in plasticity in the hippocampus (Foster P, Rosenblatt K, Kuljis, 2011). Furthermore, physical activity reduces cardiovascular risk factors for example diabetes,

hypertension, obesity, dyslipidaemia and the incidence of cardiovascular and cerebrovascular injuries, with global haemodynamic benefits (Sofi F, Capalbo A, 2007). Finally, it has been reported that an active lifestyle with regular physical exercise may prevent distress, reducing cortisol levels, which in turn can positively influence cognitive function (Kalmijn S, Launer LJ, 1998)

2.3.11 Physical Activity and Cognitive Function

One of the factors thought to affect cognitive function is a physical activity, including mobility. Some studies report that elderly who have difficulty physical movement or a movement disorder, there will be differences in cognitive function score (Zuelsdorff et al., 2013). (Wilson et al., 2006) conducted a prospective study to investigate the relationship between physical exercises continuous and decrease the risk of dementia and Alzheimer Dementia. They concluded that sustainable practice associated with risk of dementia and Alzheimer's disease in middle-aged disease where people who commit three or more times per week decreased the risk of dementia compared with those who exercise less than three times per week. Some types of exercise could be expected to reduce the occurrence of disorders related to the elderly such as Alzheimer's disease and vascular dementia.

In fact many studies have explained that physical activity can prevent cognitive functions slow (Foster, Rosenblatt, & Kuljiš, 2011). Physical activity is

beneficial affect cognitive function middle age. And also as a precaution against cognitive impairment and dementia (Blondell, Hammersley-Mather, & Veerman, 2014).

Various scientific studies have proven that the brain aging process can be slowed by a variety of ways that include physical activity, mental stimulation and social activities. Research shows that older people who get brain stimulation programs and activities are funny, have much better cognitive function compared to those who did not receive any stimulation or with medication alone (Van Kan G et al., 2008). Exercise can be seen to elicit a positive response on neuroplasticity. In order to understand the extent to which cognitive decline is precluded through exercise, cognitive ability should also be ascertained. Cross sectional studies such as, indicate that fit older adults show a smaller difference in cognitive ability than older sedentary individuals when compared to younger healthy individuals (M. Renaud, Bherer, & Maquestiaux, 2010). Moreover, observational studies indicate that staying physically active throughout life will decrease your chances of developing cognitive decline and dementia. Different exercise modalities have been shown to influence areas of the brain and thus with it attain different alterations its cognitive ability. Cognitive benefits in EF and memory have been shown following aerobic exercise (Weuve et al., 2004).

Resistance based exercises seem to have an influence on executive functions and verbal fluency in healthy older adults (CASSILHAS et al., 2007) whilst improvements in episodic memory seems to be a result of cognitive training (Engvig et al., 2010). In addition to these findings, recent reviews indicate that a combined

multiple modality exercise intervention can attenuate cognitive decline greater than aerobic, resistance or cognitive training alone (Bherer, Erickson, & Liu-Ambrose, 2013).

Furthermore, sport or physical activity may be a non-pharmacological treatment which is important and give beneficial for cognitive function and reduce the risk of cognitive impairment. By doing some form of aerobic activity for at least 20 minutes, three or four times a week, with periods of warming and cooling, the elderly can expect a greater likelihood to undergo subsequent years with a good health condition. It is very impressive is the slightest amount of physical activity undertaken mainly outside the home, can improve posture, reduce stress and loneliness, making sleep better, and prevent feelings of depression (Gauthier et al., 2006).

Physical activity can maintain cerebral blood flow and may also increase the supply of nutrients the brain (Yaffe et al., 2001). In exercise or physical activity several molecular systems can play a role in terms that are beneficial to the brain. Neurotrophic factors play the important a role in the beneficial effects. Neurotrofik factor was mainly Brain derived neurotrophic factor (BDNF), because it can improve the resilience and growth of several types of neurons, including neurons glutamanergic. BDNF acts as a major mediator of synaptic efficacy, linking nerve cells and nerve cell plasticity (Cotman & Berchtold, 2002).

Physical activity allows maintaining brain vascular health by lowering blood pressure, improve the lipoprotein profile, support the production of endothelial nitric oxidation and ensure sufficient cerebral perfusion. Similarly, emerging evidence of an

association between insulin and aminoid show that the benefits of aerobic activity on insulin resistance and glucose intolerance, perhaps this is another mechanism in which physical activity can prevent or delay a decline in cognitive function (Weuve et al., 2004).

Previous study elaborated by Williamson (2008) in the United States which shows an increase in cognitive value associated with improved physical function. Importantly, the study M. Matthews and Williams H. (2004) with Taichi exercises at the age of 68-84 years showed a positive relationship.

2.4 Stress and cognitive function

According to Mann (1998) in (Johansson et al., 2010) changes in the brain caused by Alzheimer's disease has appeared 20 to 30 years before clinical manifestations appear from the disease. The amendment allows a person susceptible to stress, thereby increasing the stress response is possible predictors or early marker of dementia. Increased tolerance to stress reflects early symptoms of dementia (Johansson et al., 2010). According to (Glymour, Weuve, Fay, Glass, & Berkman, 2008) and (Drewes et al., 2014) stress that takes place within a short time frame disrupt short term memory primarily related to verbal memory, whereas when stress occurs in the long term and occur repeatedly resulted in exposure to the hormone cortisol become more frequent, causing shrinkage hippocampus and trigger a further decline in cognitive function that leads to dementia. Epidemiological research looks at the role of stress in neurodegenerative disease is still relatively small.

Stress requires one to use physiological and psychological energy to respond and adapt to the stressor. The stress response is a natural, adaptive and protective. The stress response is as result of neuroendocrine responses are integrated and there are individual differences in responds to the same stressor (Potter & Perry, 2005). Adaptive response consists of Local Adaptation Syndrome (LAS) and the General Adaptation Syndrome (GAS). LAS response is divided into a reflex response of pain and inflammatory response. Pain reflex response is an adaptive response that aims to protect the body from further damage. The inflammatory response is stimulated by trauma and infection. GAS is a physiological response of the body against stress. The response is involved in the autonomic nervous system and the endocrine system (Yao et al., 2008).

Stress indicators are quantitative and qualitative measure to describe the stress level of individuals, including students. Stress has direct impact on human psychological indirectly impact the physiological. There are several indicators of stress, the physiological, emotional, and behavioral stress (Potter & Perry, 2005) . Physiological stress indicators are objective and more easily identifiable. Form of an increase in blood pressure, cold hands and feet, posture straight, fatigue, headaches, stomach upset, high-pitched voice, vomiting, nausea, diarrhea, appetite changes, weight changes, and sweaty palms. Physiological indicators can generally be observed.

Indicators of emotional and behavioral stress are very subjective by nature. Indicators of psychological stress and behavior in the form of: anxiety, depression,

fatigue, mental fatigue, feeling inadequate, loss of self-esteem, interest and motivation, emotional outbursts and crying, a tendency to make mistakes, forgetfulness and thought dead end, the loss of attention to matters detailed, preoccupation, inability to concentrate on the task, prone to accidents, as well as a decrease in productivity and quality of their work. Emotional and behavioral indicators are not easily observable.

Behavioral indicators can be either constructive or destructive. Constructive behavior to help students accept the challenge to resolve the conflict, while the destructive behavior will affect the reality orientation, problem solving ability, personality, the situation is very severe, and ability to function. Psychological adaptive behavior can be termed as a coping mechanism. This task-oriented mechanism which includes the use of problem-solving techniques directly to confront the threat, this mechanism tends to be found in women. While men are more likely to use a coping mechanism in the form of ego defense, to set the emotional distress and can provide protection against anxiety and stress (Potter & Perry, 2005). So that women are more easily identified when experiencing stress than men. Walker (2002) and Goff A.M. (2011) found that stress levels in women were higher than men for all types of stressors.

2.4.1 The stress level

Every individual has a perception and a different response to stress. A person's perception is based on beliefs and norms, experience and lifestyle, environmental factors, structure and function of the family, the family developmental stage, past

experience with stress and coping mechanism. Based on the literature, found levels of stress into five level, namely:

(1) **Normal Stress**; Stress normally encountered on a regular basis and is a natural

part of life. As in the situation: fatigue after the task, afraid do not pass the test, feel the beat of the heart beat harder after activity (Crowford & Henry, 2003). Stress is normal and naturally become important, because every person must have experienced stress, in fact, since in the womb of mother (Buschert, Bokde, & Hampel, 2010).

(2) **Mild stress** is encountered regularly stressors that can last a few minutes or

hours. Situations such as sleep, congestion or scolded lecturers. Stressors can cause symptoms, such as the lips are often dry, difficulty breathing (often panting), difficulty swallowing, feeling shaky, feel faint, sweating excessively when the temperature is not hot and not after the move, afraid for no apparent reason, aware of heart rate although not after physical activity, tremor of the hands, and feel very relieved if the situation ends (Psychology Foundation of Australia, 2010). Thus, mild stressors in large numbers in a short period of time may increase the risk of disease for the elderly (Buschert et al., 2010).

(3) **Moderate stress**; Stress is the case much longer, between a few hours to several

days. For example disputes that cannot be solved with a friend or girlfriend. Stressors can cause symptoms, such as irritability, overreacting to a situation, it is difficult to rest, feeling tired because anxious, impatient when experiencing delays and face disruption to things being done, irritability, anxiety, and cannot understand it obstructs when you're doing something, coursework (Psychology Foundation of Australia, 2010). At the level of mild stress, the system neurochemical particular are likely to affect the learning process, along with the increasing levels of stress, both in duration and or intensity, some changes are temporary and permanent can be observed in the hippocampus, including modifications in synaptic plasticity, changes in morphology, suppressing cells The new adult nerve, and harm the nervous system (Malhotra, Schuler, & Boender, 2002).

(4) **Severe stress;** Severe stress is a chronic situation that may occur within a few

weeks to several years, such as disputes with professors or friends on an ongoing basis, the prolonged financial difficulties, and long-term physical ailments. The more frequent and longer situations of stress, the higher the risk of stress-induced. Stressor can cause symptoms, such as feeling unable to feel positive feelings, feeling no longer strong enough to perform an activity, do not feel there are things that can be expected in the future, sad and depressed, hopeless, loss of interest in all things, was not worth as a human being, thinking that life is not helpful. Increasing the stress experienced by

students gradually will decrease the energy and the adaptive response (Buschert et al., 2010).

(5) **Very heavy;** Very heavy stress is a chronic situation that may occur within a few months and in that time cannot be determined. Someone who experience severe stress have no motivation to live and tend to surrender. Someone in the levels of stress is usually identified as severely depressed (Buschert et al., 2010).

According to Wilson et al. (1996) and Stein, Schettler, Rohrer, & Valenti, (2008) adults are more prone to distress are 2.7 times more likely to develop Alzheimer's disease compared with those not prone to distress. This prospective cohort study found that the tendency to experience psychological distress associated with an increased risk of up to ten-fold to hit episodic memory decline (Wilson et al. In Stein et al., 2008). The results of the study support previous research which states that a condition that causes stress can degrade memory performance significantly (Lupien et al., 1997).

2.5 Treatment of Mild Cognitive Impairment (MCI)

Currently there is no treatment to relieve mild cognitive impairment. Basically the management of MCI is intended to slow the onset of dementia. In this case management for MCI is divided into two, namely non-pharmacological and pharmacological (Anderson, 2010).

2.5.1 Non Pharmacological

Physical activity, social, and mental often recommended for patients with MCI, many experts recommend that activities that stimulate cognitive functions, such as crossword puzzles, brain teasers and discussion may be useful for patients with MCI. Although definitive proof of the success of these activities are not available, but this activity is recommended by experts (Johansson et al., 2010).

Changes in lifestyle can also reduce the risk. Adherence to a strict low-fat diet was associated with lower incidence of MCI and with a lower incidence of the development of dementia. The diet such as eating fruits and vegetables, olive oil, grains, fish and poultry, food rich in antioxidants and omega 3 (Baker LD, Frank LL, & Foster-SchubertK, 2010).

Non-pharmacological therapies reported in the Cochrane review is cognitive rehabilitation and acupuncture, but the results have not been consistent because of the possibility of methodological limitations. Some evidences of the potential usefulness of cognitive remediation, including the use of mnemonics, an association strategy, and computer-assisted training program. Acupuncture shows cognitive benefits in mouse models with vascular dementia, but the man could not be concluded, indicating that more research is needed (Gorelick Philip et al., 2011).

Physical activity is mentioned in many studies say, allegedly because of the effect of increasing the variety neurotropic brain (such as BDNF, neuregulin, NGF), improves cerebrovascular function and perfusion of the brain, reducing the stress response and increases through synaptogenesis brain plasticity and neurogenesis.

Physical activity or exercise that is recommended is aerobic. For those able, the American Heart Association recommends 30 minutes of moderate intensity exercise with almost daily frequency. Several other studies define physical activity interventions total of 150-200 minutes per week. People with disabilities, can be given treatment regimen with supervision. Problems in the application of physical activity as a therapeutic modality and prevention are the determination of the frequency and duration of exercise that affect expected results. Most of the research in this regard does not use a standardized protocol of physical activity and none using a randomized controlled design in patients with MCI or Alzheimer lightly. Most studies of interventions also does not control the risk of cardiovascular disease that often overlap with risk factors for Alzheimer's. A prospective RCT aerobic exercise with the observation of biomarkers and brain imaging will greatly assist in determining causality and the protective mechanisms of physical exercise as well as the determination of the useful volume of training according to the characteristics of the patients (Obisesan et al., 2012).

The benefits of exercise on cognition are widely recognized (Cotman & Berchtold, 2007; Kramer & Erickson, 2007; van Praag, 2009). Studies have suggested that physical exercise may have a protective effect against dementia and AD (Larson et al., 2006; Laurin, Verreault, Lindsay, MacPherson, & Rockwood, 2001; Wilson et al., 2002). The beneficial effects of physical activity and exercise in improving cognitive function have been observed in cognitively normal elderly (Baker et al., 2010;

Colcombe, & Kramer, 2003; Kramer, Colcombe, McAuley, Scalf, & Erickson, 2005) and in older adults with cognitive impairment or dementia (Eggermont, Swaab, Luiten, & Scherder, 2006; Lautenschlager et al., 2008; Penrose, 2005). However, diverse findings can still be found in studies where there was no observed effect of physical activity interventions on cognition in people with dementia (Christofolletti, Olini, Gobbi, & Stella, 2007; Etnier, Nowell, Landers, & Sibley, 2006; Gregory, Parker, & Thompson, 2012). A recent systematic review by Snowden *et al.* (2011) also did not find sufficient evidence that physical activity or exercise could improve cognition in older adults. Strong evidence to support the effects of exercise interventions on cognitive functions is still lacking.

Animal studies have consistently shown exercise increases cell proliferation and neurogenesis in the dentate gyrus of the hippocampus (Fabel *et al.*, 2003; Kronenberg *et al.*, 2006; van Praag, Kempermann, & Gage, 1999), an important brain area for learning and memory. Other studies found exercise influenced the production of new neurons in the motor cortex (Ehninger & Kempermann, 2003) and prefrontal cortex (PFC) which improved PFC-dependent cognition and memory (Mandyam, Wee, Eisch, Richardson, & Koob, 2007). Colcombe *et al.* (2006) have suggested that exercise correlates with an increase in brain volume over the frontal, parietal, and temporal cortices in humans. Therefore, despite the discrepant findings, the evidence on the effects of exercise on the brain is mounting.

2.5.2 Pharmacological

Some drugs have been studied for the prevention of the development progression of dementia, including cholinesterase inhibitors, antioxidants, and nootropics, which modifies the level of brain chemicals. (Mila, 2010)

(1) Cholinesterase inhibitors; Cholinesterase inhibitors are commonly used to treat the symptoms of the early stages of the disease such as Alzheimer's. This is because the alleged decline in the production of acetylcholine more quickly with age. These include Donepezil, Tacrine, rivastigmine & Galantamine, to slow the onset of dementia. Donepezil is the most common given a daily dose given is usually 5-10 mg. This dose is given only once a day, either in the morning or in the evening. The side effects can occur after administration such as nausea, vomiting, headache, difficulty sleeping and dizziness (Mila, 2010)

(2) Anti-Oxidant; Substances anti-oxidants such as vitamin E may protect brain cells from oxidative stress. Vitamin E is a dietary compounds with antioxidant properties that are involved in the search of free radicals. Laboratory studies and animal studies have shown that Vitamin E (400 UI / day) possible were able to slow the cognitive decline (Mila, 2010).

(3) Nootropics; Nootropics are drugs that increase brain activity and memory. Nootropics improve brain function. Piracetam is a nootropic most widely used, improving performance in a variety of cognitive tasks, appears to be effective in dementia and MCI. The dose of Piracetam used for MCI 1600 mg / day (Mila, 2010).

2.6 The Clinical Dementia Rating (CDR)

The CDR is a 5-point scale used to characterize six domains of cognitive and functional performance applicable to Alzheimer disease and related dementias: Memory, Orientation, Judgment & Problem Solving, Community Affairs, Home & Hobbies, and Personal Care. The necessary information to make each rating is obtained through a semi-structured interview of the patient and a reliable informant or collateral source (e.g., family member).

The provided "Full" and "Refresher" training on this site is technically referred to as the Brief Training & Reliability Protocol (BTRP) as it is a subset of the complete CDR training that takes place in-person at the Knight ADRC.

The CDR table provides descriptive anchors that guide the clinician in making appropriate ratings based on interview data and clinical judgment. In addition to ratings for each domain, an overall CDR score may be calculated through the use of an algorithm. This score is useful for characterizing and tracking a patient's level of impairment/dementia:

0 = Normal

0.5 = Very Mild Dementia: Memory problems are slight but consistent;
some

difficulties with time and problem solving; daily life slightly impaired.

1 = Mild Dementia: Memory loss moderate, especially for recent events, and

interferes with daily activities. Moderate difficulty with solving problems; cannot function independently at community affairs; difficulty with daily activities and hobbies, especially complex ones.

2 = Moderate Dementia: Memory loss moderate, especially for recent events,

and interferes with daily activities. Moderate difficulty with solving problems; cannot function independently at community affairs; difficulty with daily activities and hobbies, especially complex ones.

2= Severe Dementia: Severe memory loss; not oriented with respect to time or

Place, no judgment or problem solving abilities, cannot participate in community affairs outside the home; requires help with all tasks of daily living and [requires help](#) with most personal care. Often incontinent.

The healthcare provider gains an accurate assessment of severity of the patient's dementia in order to appropriately develop or revise a plan of care. Dementia is often nonreversible and affects a patient's memory, thinking process, language, judgment, and/or behavior. Dementia can develop as a result of numerous medical conditions; the most common type of dementia is that caused by AD. Dementia manifests with a variety of signs and symptoms, including insomnia,

delusions, and loss of language. Persons with progressive and worsening dementia eventually lose the ability to independently perform activities of daily living (ADLs) and to recognize familiar.

The 6 cognitive categories of the CDR are evaluated during the semi-structured interview and the responses recorded by the healthcare researcher or clinician on the CDR worksheet. Depending on the category, some of the same questions are asked of both the patient and informant, whereas other questions are specific to either the patient or the informant. In some cases, the answers from the patient and the informant are compared in order to assess the accuracy of the patient's statements.

(1) To evaluate the memory domain, the healthcare clinician may ask the informant, "What is the patient's birthdate?" and record the response on the worksheet. The healthcare clinician may subsequently ask the patient the same question and record and compare the patient's response with that of the informant's response to assess the accuracy of the patient's Memory.

(2) To evaluate the patient's orientation, the healthcare clinician may ask the patient "What is today's date?" and mark the patient's response as "correct" or "incorrect." In addition, the healthcare clinician may ask the informant how often the patient recalls the correct date and record "usually," "sometimes," "rarely," or "don't know" based on the informant's Response

(3) To evaluate the patient's judgment, the healthcare clinician may ask the patient, "How are sugar and hot peppers different from one another?", and record the

patient's response. In addition, the healthcare clinician may ask the informant, "Does the patient behave normally in social situations?" and record "usually," "sometimes," "rarely," or "don't know" based on the informant's response.

(4) To evaluate the patient's community affairs, the healthcare clinician may ask the patient, "the level in job, shopping, volunteer and social groups?", and record the patient's response. In addition, the healthcare clinician may ask the informant, "Does the patient behave normally activated about job and shopping?" and record "usually," "sometimes," "rarely," or "don't know" based on the informant's response.

(5) To evaluate the patient's Home and Hobbies, the healthcare clinician may ask the patient, "Life at home, hobbies, and intellectual interests well maintained?", and record the patient's response. In addition, the healthcare clinician may ask the informant, "Does the patient behave normally activated about Life at home and hobbies?" and record "usually," "sometimes," "rarely," or "don't know" based on the informant's response.

(6) To evaluate the patient's Personal Care, the healthcare clinician may ask The patient, "Do the patient could fully capable of self-care?", and record the patient's response. "Needs prompting" "Requires assistance in dressing, hygiene, and keeping of personal effects" "Requires much help with personal care; frequent incontinence" based on the informant's response.

The healthcare researcher or clinician consults the CDR scoring sheet, selects the appropriate score for each category based on the results of the semi-structured interviews, and indicates on the scoring sheet which score was selected in each category. Signs and symptoms of dementia do not typically progress in a uniform manner, and it is unusual for patients to score in the same severity range in all of the 6 categories, namely:

(1) The memory, orientation, judgment and problem solving, community affairs and involvement, and home life and hobbies categories are scored using a 5-point ordinal scale, as follows:

0 indicates no impairment

0.5 indicates very mild impairment

1 indicates mild impairment

2 indicates moderate impairment

3 indicates severe impairment

(2) The personal care category is scored using a 4-point ordinal scale, as follows:

0 indicates no impairment

1 indicates mild impairment

2 indicates moderate impairment

3 indicates severe impairment

(3) The descriptors for each score on the CDR scoring sheet vary based on the Category being evaluated; the selection criteria for each score are clearly described on the scoring sheet.

An overall CDR global score indicating the severity of dementia is obtained based on a standard algorithm that weights memory as the primary category and weights the remaining categories as secondary.

The second option for scoring the CDR is the SOB method in which all 6 categories are weighted equally and the scores for each of the categories are summed to obtain a total score; the total score can be 0–18. The advantages of the SOB method include:

- (a) Greater ease in calculating dementia severity
- (b) The ability to better detect subtleties in dementia severity
- (c) Increased precision in serially tracking the severity of dementia

SOB scores are used to rate dementia severity as follows:

- 0 indicates normal cognitive functioning
- 0.5–4.0 indicates questionable cognitive impairment
- 0.5–2.5 indicates questionable impairment
- 3.0–4.0 indicates very mild dementia
- 4.5–9.0 indicates mild dementia
- 9.5–15.5 indicates moderate dementia
- 16.0–18.0 indicates severe dementia

Preliminary steps that should be performed before administering the CDR include the following:

- Review the facility/unit protocol for administration of dementia screening tools and for the CDR, in particular, if one is available
- Review the treating clinician's order for administering the CDR, if necessary, although administering the CDR does not.
- Require a physician's written or verbal order.
- Review the instructions for the CDR semi-structured interview protocol and for scoring and interpreting the CDR.
- Verify completion of facility informed consent documents, if appropriate.
- Review the patient's presenting problem, including: –mental and medical health status and history; –family medical and mental health history; –functional status; –social and developmental history; –current medication regimen.
- Verify that a reliable informant is available to participate in data collection.

2.7 Thai Hermit Exercise (Reusi Dat Ton)

Thai Hermit Exercise or Reusi Dat Ton is traditional Thai healing and culture. It mainly consists of breathing exercises, self-massage, acupressure, dynamic exercises, poses, mantras, visualization and meditation which brings it very near to the Hathayogic practices. In the present study a detailed description of Reusi Dat Ton has been

presented along with the relevant photographs so that a striking similarity can be seen in these two practices. It is difficult to determine who has obliged whom but these practices are available in two different countries with two different objectives.

2.7.1 Reusi Dat Ton Mural at Wat Machimawat

There is a special section devoted to Thai Medical history at the Mahidol University's Siriraj Medical Museum on the Bangkok Noi campus in Bangkok. There one can view a Reusi Dat Ton display featuring small painted wood Reusi figures that depict over 60 different Reusi Dat Ton techniques. This display is based upon the 1958 Wat Po text *The Book of Medicine*. In Nonthaburi, on the Ministry of Public Health Campus at the Institute of Thai Traditional Medicine, there is the Thai Traditional Medicine Museum. Inside the museum is a small display of Reusi Dat Ton statues. Outside the museum is an artificial mountain upon which have been placed various Reusi statues demonstrating Reusi Dat Ton techniques. Within the mountain is the "Hermit's Cave" which houses numerous small Reusi statues also depicting Reusi Dat Ton techniques. These statues depict techniques from both the *Samut Thai Kao* and *The Book of Medicine*. On the outskirts of Bangkok, in the town of Samut Prakan, is the cultural park, the Ancient City or "Muang Boran." One of the many attractions is a "Sala of 80 Yogi" which features 80 life-sized Reusi statues illustrating various Reusi Dat Ton techniques. There are even depictions of Reusi Dat Ton techniques not found in either of the two Wat Po texts. While most of these statues are fairly accurate depictions of

Reusi Dat Ton techniques, a few actually show Indian Hatha Yoga techniques, which are not part of the Reusi Dat Ton system.

Students of Reusi Dat Ton should bear in mind that while some of the Reusi Dat Ton statues, drawings, paintings and poems are beautiful works of art, they were created by artists who were not necessarily all practitioners of Reusi Dat Ton. In fact, a number of images do not illustrate the actual techniques entirely accurately. Even in 1836, there was some uncertainty as to which technique produced which effect and some poems were used for more than one technique. Therefore, students of Reusi Dat Ton should also seek out living teachers who have learned from authentic sources such as actual Reusis, who can teach the techniques in their authentic form. There are also additional Reusi Dat Ton techniques practiced by Reusis today, which are not found in any text, nor depicted in any sculpture or paintings. These are also traditional techniques, which have been passed down from teacher to student over the centuries. There are close to 300 different exercises and poses, including variations, in the entire Reusi Dat Ton system.

2.7.2 The Benefits of Reusi Dat Ton

In both the Samut Thai Kao and The Book of Medicine, the texts not only describe the techniques, but also ascribe a therapeutic benefit to each pose or exercise. Some poems describe specific ailments while others use Sanskrit Ayurvedic medical terminology. Some of the ailments mentioned include; abdominal discomfort and pain, arm discomfort, back pain, bleeding, blurred vision, chest congestion, chest

discomfort and pain, chin trouble, chronic disease, chronic muscular discomfort, congestion, convulsions, dizziness and vertigo, dyspepsia, facial paralysis, fainting, foot cramps, pain and numbness, gas pain, generalized weakness, generalized sharp pain, headache and migraine, hand discomfort, cramps and numbness, heel and ankle joint pain, hemorrhoids, hip joint problems, joint pain, knee pain and weakness, lack of alertness, leg discomfort, pain and weakness, lockjaw, low back pain, lumbar pain, muscular cramps and stiffness, nasal bleeding, nausea, neck pain, numbness, pelvic pain, penis and urethra problems, scrotal distention, secretion in throat, shoulder and scapula discomfort and pain, stiff neck, thigh discomfort, throat problems, tongue trouble, uvula spasm, vertigo, waist trouble, wrist trouble, vomiting, and waist discomfort. Some of the Ayurvedic disorders described in the texts include; Wata in the head causing problems in meditation, severe Wata disease, Wata in the hands and feet, Wata in the head, nose and shoulder, Wata in the thigh, Wata in the scrotum, Wata in the urethra, Wata causing knee, leg and chest spasms, Wata causing blurred vision, Sannipat which a very serious and difficult to treat condition due to the simultaneous imbalance of Water, Fire and Wind Elements which may also involve a toxic fever.

In recent years, the Thai Ministry of Public Health has published several books on Reusi Dat Ton. According these modern texts, some of the benefits of Reusi Dat Ton practice include; improved agility and muscle coordination, increased joint mobility, greater range of motion, better circulation, improved respiration improved

digestion, assimilation and elimination, detoxification, stronger immunity, reduced stress and anxiety, greater relaxation, improved concentration and meditation, oxygen therapy to the cells, pain relief, slowing of degenerative disease and greater longevity. A recent study at Naresuan University in Phitsanulok, Thailand, found that after one month of regular Reusi Dat Ton practice there was an improvement in anaerobic exercise performance in sedentary females. (Weerapong et al, 2005) moreover, the preliminary study of Lokachet et al (2015), suggest that resulting in 37 subjects who underwent randomization , from which 19 people were placed in the intervention group and 18 people were in the control group comparing within each group after practicing Ruesi Dat Ton an hour per day for 4 days can ameliorate the cognitive function. Very few studies in people have compared the effects of Ruesi Dat Ton practice on cognitive function ,but the practice of Rue si Dat Ton is low impact exercise , some are similar to Mental training or Mental activity consist of slow movement one or several parts of the body into required positions included stretching while holding breath for a short period of time like a Tai Chi exercise , Mental training, Respiratory training, Mind-Body practice, Yoga that have many evidences from previous studies on psychological effect especially cognitive functions. The finding of Linda et al (2012) compared the effectiveness of 24 forms Tai Chi versus stretching and toning exercise in Chinese elders at risk of cognitive decline. After one year, participants completed the intervention, the investigators revealed that the intervention group had greater improvement in delay recall. Similarly, Lam et al(2011) examined the effects of Tai

Chi on cognitive function in Chinese older persons with either a Clinical Dementia Rating (CDR 0.5) or amnesic-MCI participated in an exercise program. At 2 months after completion of training, both Intervention group and Control group subjects showed an improvement in global cognitive function, delayed recall and subjective cognitive complaints. Leandro et al (2015) investigated the effect of aerobic physical exercises and respiratory training. After 6 months of training period, they found that aerobic exercise and respiratory training were effective in improving the pulmonary parameter including better cognitive function. Better cognitive performance was observed for the breathing group as regards abstraction and mental flexibility. Similarly, in older adults, Fabre et al.(2002) investigated the effects of aerobic and mental training on cognitive function and to determine if the association of the two techniques shows better results. Thirty-two healthy elderly subjects (60 - 76 years) were assigned to one of four groups: aerobic training, mental training, combined aerobic and mental training and a control group. All subjects took two cognitive tests and an incremental exercise test before and after the training period. After 2 months of training period, they found evidence pointing to an advantage of combined aerobic and mental training over using in a memory quotient. Verena et al (2010) reported that beneficial impacts of mental and physical activity in old age .After 6 months, they showed improved delayed story recall, word recall and working memory as opposed to the control group that showed a decline. Chan et al(2005) determined comparing the effect of Mind-Body practice or cardiovascular exercise demonstrated better cognitive function and less

decline with age. One hundred forty adults aged 56 and older, who practiced Mind-Body or Cardiovascular exercise for 1 year demonstrated a similar level of memory function, and their learning and memory was better than that of individuals who did not exercise regularly. Lam et al (2009) conducted population survey mind-body exercise was associated with better cognitive function by had higher scores in most cognitive tests in Hong Kong older person. Therefore, practicing Thai Hermit exercise might be claimed that to improve cognitive function.

The Institute of Thai Traditional Medicine at the Ministry of Public Health requires all of their curriculum. In these classes, students learn some of the self-massage techniques as well as 15 poses and exercises. While based on Reusi Dat Ton, these 15 techniques are actually newly created modifications thought to be safe and easily practiced by anyone. In Bangkok, The Wat Po School of Traditional Medicine offers a formal Reusi Dat Ton certification course in which students learn 18 of the poses and exercises. The Massage School Chiang Mai offers a formal Reusi Dat Ton certificate course, which is accredited by the Thai Ministry of Education. Their course is based on the same 15 poses and exercises as taught by the Ministry of Public Health. There are also a number of other places offering Reusi Dat Ton classes. Most of these programs teach either one or a combination of both of the two different programs, as taught by the Ministry of Public Health and Wat Po. There are also a number of commercially available Reusi Dat Ton books and videos. Today in Thailand, there are

a dwindling number of true Reusis and few young people are interested in learning the traditional arts and sciences in their authentic forms. Much of the traditional knowledge of the Reusi traditions is in danger of being lost. Nowadays, most modern day students and teachers of Reusi Dat Ton have learned from second or third hand sources such as commercially available books, videos and classes. They have not had access to primary sources such as actual Reusis or even the Samut Thai Kao. If this trend continues, there is a danger of Reu si Dat Ton becoming diluted and distorted like Yoga. Yoga has become in today's popular culture. Today we may well be seeing the last generation of teachers with an actual living link to the ancient traditions of the past and who are able to transmit the authentic teachings of Reusi Dat Ton. Serious students of Reusi Dat Ton would do well to seek out actual Reusis who have themselves learned from older Reusis who serve as a living link in the lineage of this ancient tradition. The students of Thai Massage and Thai Traditional Medicine to attend Reusi Dat Ton classes as part.

2.7.3 The postures of Thai hermit

The hermit doing body contortions is a part of Thai wisdom in which the characteristic feature is the moving of the body to reach a certain posture and remaining still for a short period of 5 to 10 seconds. In doing that, pains or discomfort in various parts of the body will be relieved.

The following nine exercises are adapted from the pictures and the poetry in the folded page book of the hermit doing body contortions published by the

committee compiling articles and chronicles for the commemoration of the 80th birthday of King Bhumipol, 5 December 2007. One may find that these exercises are helpful in relieving symptoms commonly occurring in daily life; when doing them regularly which can keep the body healthy. There are 15 postures that included into the hermit doing body contortions and this study selected by Thai traditional medicine experts for 3 postures that involve with cognitive functions.

1. The posture to relieve face muscle, includes 7 postures.

1.1 To push hair

1.2 To spread powder



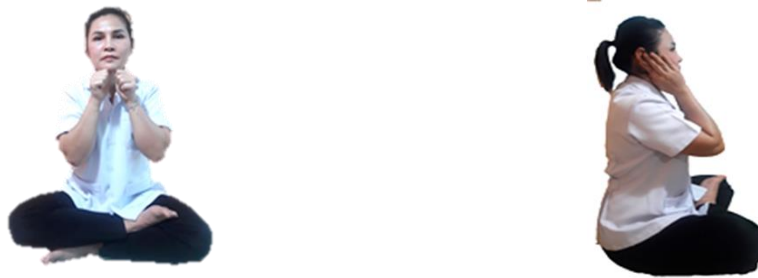
1.3 To wipe mouth

1.4 To wipe shin



1.5 To press under the shin

1.6 To rub front ear and back ear



1.7 To slap occiput



Figure 3 Exercise with the posture to relieve face muscle

2. The posture to relieve laziness

Preparatory posture: Sit on the floor with the legs crossed.

Steps of the exercise:

1. Put your hands together, fingers interlocked in front of your chest
2. Breathe in while stretching out your arms slowly to the left until your arms are fully stretched, with both hands still locked together and with your palms outward. Keep your trunk straight and chin up. Stay in this posture while holding your breath for about 10 seconds; then breathe out and return to the preparatory posture
3. Breathe in while stretching out your arms slowly to the right until your arms are fully stretched with both hands still locked together and with your palms outward.

Keep your trunk straight and chin up. Stay in this posture while holding your breath for about 10 seconds; then breathe out and return to the preparatory posture

4. Breathe in while stretching out your arms slowly to the front until your arms are fully stretched with both hands still locked together and with your palms outward. Keep your trunk straight and chin up. Stay in this posture while holding your breath for about 10 seconds; then breathe out and return to the preparatory posture

5. Breathe in while stretching out your arms slowly above the head until your arms are fully stretched with both hands still locked together and with your palms upward. Keep your trunk straight and chin up. Stay in this posture while holding your breath for 10 seconds. Downward both arms and turn palms upward until touch the head while holding your breath for 10 seconds; then Breathe out and return to the preparatory posture.

Repeat the exercise by stretching your arms and hands to the left, right, front and above, respectively. This counts as one set. Do 3-5 sets.



1



2



3



4



5



6



7

Figure 4 Exercise with the postures of hermit doing body contortions: the posture to relieve laziness.

3. The posture to relieve headache, blur vision and general weakness.

Preparatory posture: Sit on the floor with legs crossed

Steps of the exercise

1. Put your hands together, fingers interlocked in front of your chest
2. Turn the palms upward. Slowly bring them to the center until they touch each other over the head , keeping the shoulders stretched out
3. Breathe in while stretching out your arms slowly above the head until your arms are fully stretched with both hands still locked together and with your palms

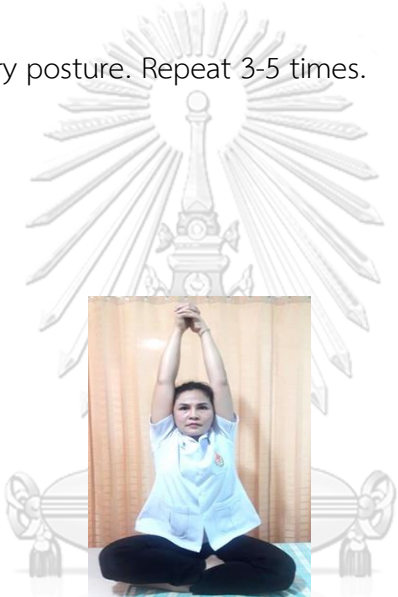
upward. Keep your trunk straight and chin up. Stay in this posture while holding your breath for 10 seconds.

4. Breathe while abduction both hand. Downward both hand and fist hand to touch and press on the waist. Stay in this posture while holding your breath for 10 seconds.

5. Breathe out and slowly decrease the force of the fist against the waist and return to the preparatory posture. Repeat 3-5 times.



1



2



3



4



5



6

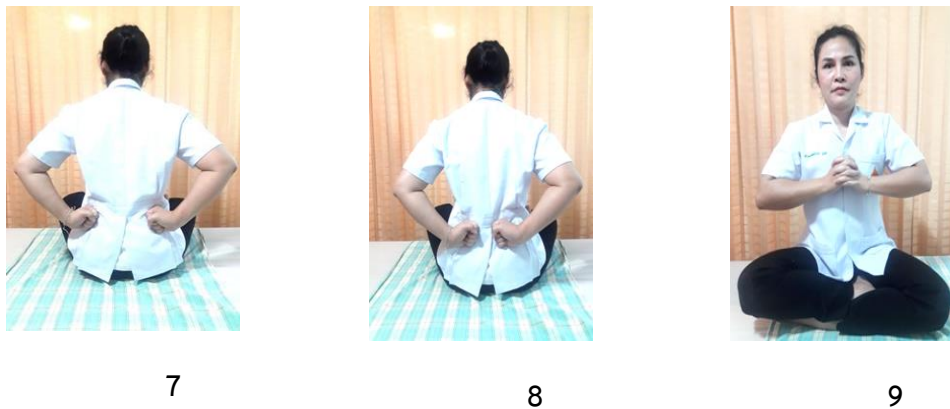


Figure 5 Exercise with the postures of hermit doing body contortions: the posture to relieve headache, blur vision and general weakness.

2.8 Randomized Controlled trial (RCT)

Randomized Controlled Trial (RCT) is a scientific which is a form of research question in the best way. RCT is the research approach, introduced in the mid 20 th century, has had a profound effect on researcher's power to determine whether a cause effect relationship exist between treatment and outcome and it integral component in the hierarchy of evidence which guides the practice to health research (Chaiya, 2013). RCT is considered the gold standard of clinical trials; often used to determine the effectiveness and efficiency of health service or health technologies such as medical services or surgical methods. RCT used in patients who represent the

statistical population and to gather other information about potential negative of the treatment such as adverse drug reaction.

Characteristics of RCT are as follows (Nichol et al., 2010)

1. After the evaluation of the selected trial participants; before start treatment participants were classified in to two groups at random. One group will receive the treatment that is the subject of study, another group will receive another treatment as a control or comparison

2. Grouping RCT in really complicated

3. The most important aspect the of RCT that was done is reduce the level allocation bias

4. RCT help balance the prognostic factor of the patients either knowingly or unknowingly between treat groups.

5. RCT shows the process participants in the experimental group or a control group in order to reduce the level of bias

Moher et al., (2010) explanation that the power of RCT rests on its use of the experimental method to identify causation in that manipulation of the independent variable has caused a measurable change in the dependent variable. RCT is a research design with three elements: manipulation, control and randomization. Manipulation involves the introduction of an intervention to participants to participants by researcher. A control group of participants who do not receive the intervention is always included. The other important element is the randomization or random

assignment of participants, where they are either assigned to the intervention or control group on a random basis (Polit & Beck, 2008).

Blinding is another essential element of an RCT design because, it prevents the systematic biases. For example, such a bias can result from participants having an awareness of the research hypothesis and the assigned intervention or treatment. Blinding includes concealing information from participants, data collector, care provider, intervention agents and data analysis. The participants are not aware of whether they are getting an experimental drug, then outcome cannot be influenced by expectations they may have about its efficacy. But unlike allocation concealment, blinding is not always possible: drug studies often lend themselves to blinding, but many nursing interventions do not. The interpretation of terms such as singled-blinded and double-blinded, vary greatly. And for this reason, an important aspect of reporting RCT is the explicit identification of the groups blinded and how they blinded (Moher, et al. 2010).

The intention to treat analysis (ITT) approach is also used to avoid various misleading biases. Every participant allocated to a treatment group is considered to be part of trial. ITT is used as an attempt to avoid potential bias and identify the true effect of the intervention, if the research design is based on the principles of randomization (Nichol et al., 2010)



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CHAPTER III

RESEARCH METHOD

3.1 Research design

This study has been issued typical to use randomized control trial (RCT), and also included the use of consort statement (Moher, Schulz, & Altman, 2001), and the guideline has been developed that ensured quality report of RCT. This study was included in the following criteria : (1) design: randomized controlled trial (RCT); (2) sample population: older adults (aged 60 and older) with Mild Cognitive Impairment (MCI); (3) intervention : Thai hermit exercise (Ruesi dad ton) combines slow stretching moving one or several parts of the body into required positions while holding breath for a short period of time (Tanasugarn et al., 2015). and (4) outcome: improvement of cognitive function determine by Verbal Fluency Test, Trail Maker B test and Digit Span Test There are many advantaged and the most appropriate way in powerful method by causal relationships can be inferred, and this was the approach selected to investigate the effect of Rue si dad ton practice on Mild cognitive impairment's patients.

The aim of this study was to determine the effect of 10 weeks of Thai hermit exercise (Ruesi dad ton) to improvement cognitive function for MCI. A case study design was collected before and after intervention.

The intervention group undertook a Thai hermit exercise practice protocol, while a control group received usual care. Baseline test was performed on all participants in each group before randomization to intervention groups, and then follow up tests were carried out on all participants in weeks 10 of the intervention period.

This allowed the effect on the participant's variables after the Thai hermit exercise intervention to be compared with the same variables measured in a similar group residing in the same environment who had received usual care.

3.2 Population and setting

This study will be elaborated at the multicenter. The target population of this study was a participant who had been formally diagnosed with Mild Cognitive Impairment (MCI) and treated in King Chulalongkorn Hospital, Bangpli elderly club, Thai traditional medicine clinic at Ramkhamheang university. There are 84 patients which selected by simple random sampling. The subject will be selected based on the inclusion and exclusion criteria as follow:

3.3 Recruitment

The following procedure will be used to recruit participants. This study is a multi-center, randomized with two parallel arms and an active control. This study will be conducted in three centers in Thailand. The researcher first contact in each multicenter .to obtain permission to undertake the research.. A meeting will be

convened to inform potential participants in neurocognitive clinic about this research project. The explanation of the study includes objectives, algorithm, benefit and the participants's right to freedom from harm and discomfort, and the right to protection from exploitation and risk, inclusion and exclusion criterias.

The researcher will be given a copy of inclusion - exclusion criteria and showed leaflets and handbook for practice Thai hermit exercise (Ruesi dad ton). The co-investigator and psychologists who obtained Clinical Dementia Rater (CDR rate) certificates will assist in the recruitment of participants by identifying potential participants who meet the inclusion criteria from among those who indicated they are willing to take part in the study. Potential participant and the legal representative meeting the criteria are then once more given a verbal explanation of the study at room. The potential participant and the legal representative are welcome to ask the questions about this study until they are satisfied before they will be asked to sign the consent form. Participant and legal representative can take time to decide whether he or she wants to take part in this study.

Finally, the director of each center give permission for each of selected residents to participate in the study. The director confirming that each participant had no medical condition precluding his or her participation.

Inclusion criteria:

1. Patients who diagnosed MCI of 60 years old and over
2. Able to read speak and understand Thai with no severe hearing and blinding

impairment.

3. Able to walk
4. willingness to participate in the study and able to provide informed consent

Exclusion criteria

1. Regular practice of Thai hermit exercise (Ruesi dad ton)
2. It has been diagnosed of severe osteoporosis
3. Emergence of newer symptom
4. Don't have previous cognitive impair by Medical illness
5. Don't have **any** sort of injury to your brain, skull, or scalp

3.4 Sample selection

The sample of this study is selected by using inclusion and exclusion criteria as presented at study population section. The sample size for this study was calculated that a total sample size, based on a previous study (Lokachet et al (2015), using power to detect 20% of effect size, with the power 80% and the alpha probability at 0.05. The G power computer application was applied to calculate the sample size. The print screen of the G-power presented on this following figure:

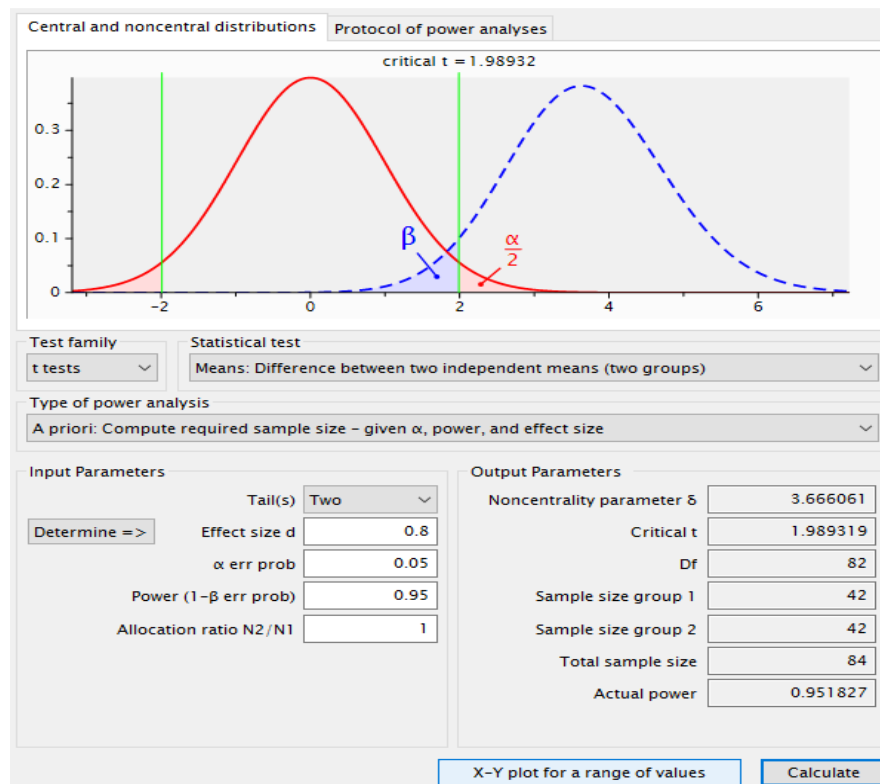


Figure 6 G-Power program display

The calculation result 84 subjects which are consist of 42 for intervention group and 42 for control group. The sample will be draw by using random number generated by using MS Excel.

Demographic details and all baseline measures were collected before the 84 participants were randomly allocated to either the intervention group or the control group.

Simple randomization was implemented to provide unpredictability of treatment assignment. In simple random allocation, treatment assignment is made by chance without regard to prior allocation (that is, it bears no relation to past allocations and it is not discoverable ahead of time). Participants were randomly assigned into

one of two parallel groups, either to an intervention group to receive the intervention or to a control group to receive usual care. Randomization was conducted as follow:

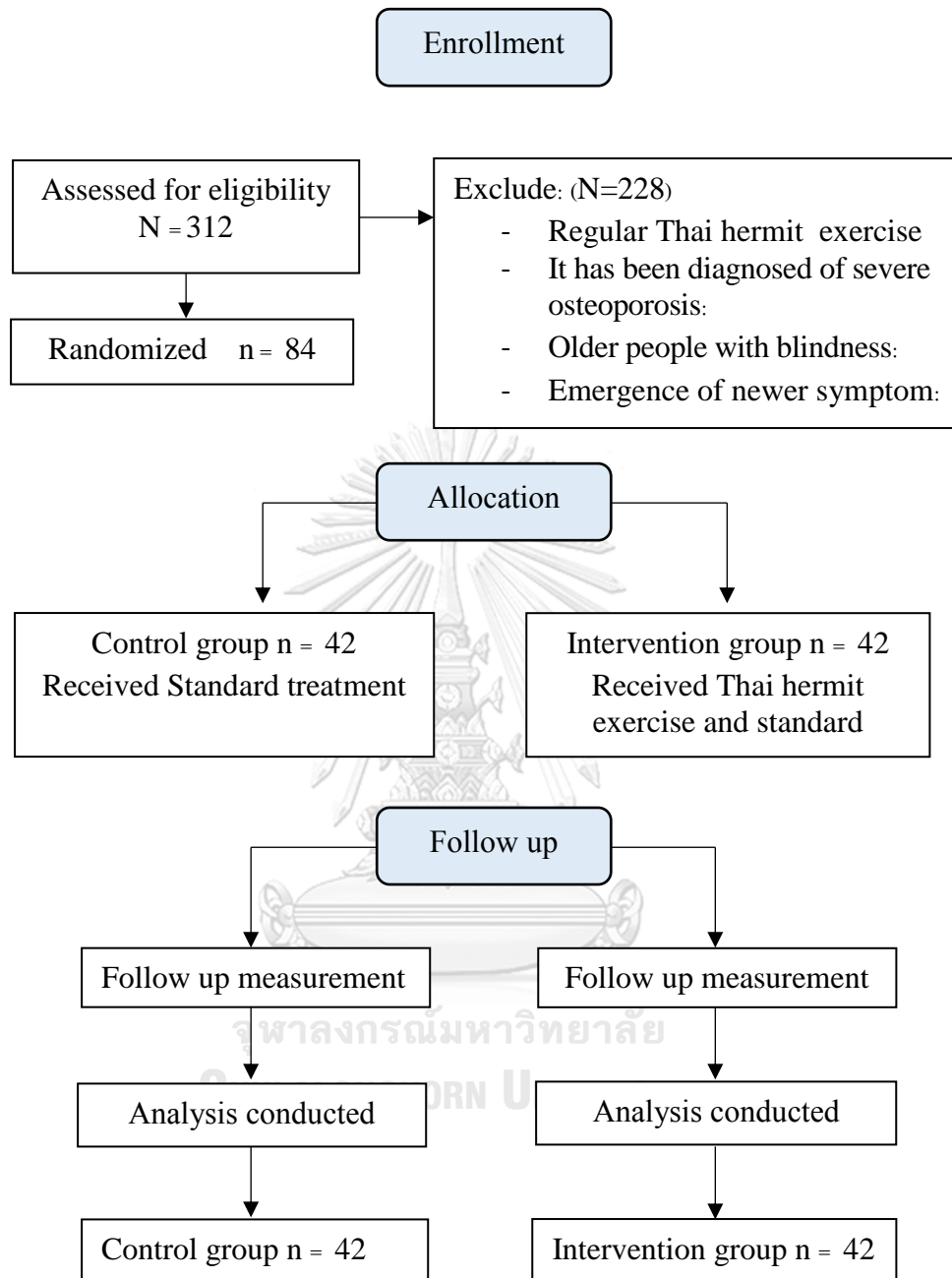
1) Sequence Generation

The researcher examines each of the returned baseline data questionnaires to ensure that all the forms had been fully completed for each person, and then allocated each person's completed questionnaire and corresponding to the order in which this checking was done. The randomization list was based on computer generate. The method could produce balance number of sample size. The randomization list will be generated by using random number from the Excel program. (Glazerman, M. Levy, & Myers, 2002).

Implementation

The staff could inform the participants which group they had been allocated to, and could prepare those in the intervention group for their first session. While for the control group could continue their usual treatment. Practice program was performed in a separate room, so as to not unbind group assignment.

Participant flow



3.5 Intervention method

A professional trainer of Thai Hermit will be as an instructor in the Thai Hermit exercise section. The Thai hermit exercise program is designed for an elderly with the MCI. The details of how the intervention was carried out are set out as follow.

3.5.1 Setting Up

- (1) The control group will be located on the first floor where they will receive the usual standard care by giving health education (exercise, food, supplement, health behaviors) that suitable for MCI patients with the same length of time as the Thai hermit exercise group participated in the Thai hermit exercise activity and doing stretching exercises following an instructor.
- (2) The researcher prepared the environment for the Thai hermit exercise participants. The Thai hermit exercise class was held on the second floor of the multicenter.
- (3) All staff and the researcher had to check that the Thai hermit exercise participants were fixed in place before each class began.

3.5.2 The Thai hermit exercise phase

The exercise consists of some phases as follow: (Appendix A)

- Preliminary phase (5 minutes)
- Thai hermit exercise program which is around 40 minutes include: warming up (10 minutes), Thai hermit exercise (30 minutes).

3.5.3 Intervention duration

The intervention will be scheduled in several stages as follow:

- (1) Learning stage will be taken for first and second week
- (2) Practice stage, the practice stage will be scheduled for 10 weeks.

3.6 Research instrument

The data will be collected by using structural questionnaire which are developed by adapting the standard questionnaire from the Verbal Fluency Test, Trail MakerA- B test and Digit Span Test. These cognitive test no copyright required are general practice which can be used without permission. The following section presented the detail explanation.

3.6.1 Demographic information

The following demographic details were collected for 84 participants: their age, gender, ethnicity, religion, level of education, marital status, and length of time for Mild Cognitive Impairment's patients.

3.6.2 Verbal Fluency Test

The verbal fluency test (VFT) is a short screening test that evaluates cognitive function. It's often used by physicians and other practitioners if there is some concern that the person may have Alzheimer's or another type of dementia.

By its name, you might guess that the test has something to do with speaking and speed, and you would be correct. The test consists of giving the person 60 seconds to verbally list as many things as possible in a category.

Practitioners often use the verbal fluency test in two different ways:

Semantic / Category Subtest

The person is asked to list all of the animals he can think of in the next 60 seconds. Some variations include asking the test-taker to list all of the fruits, vegetables or the professions he can think of in 60 seconds.

Phonetic / Letter Subtest

In the phonetic subtest, a letter is chosen by the test administrator and the person is asked to name all of the words that begin with that particular letter. The most common letters chosen are F, A, and S. Some clinicians will have the individual do a 60 second test on each letter, and others will just choose one letter. One specific type of the phonetic subtest is the Controlled Oral Word Association Test (COWAT).

While the assessment scores are:



- To score the VFT, count up the total number of animals or words that the individual is able to produce.
- A score of under 17 indicates concern, although some practitioners use 14 as a cutoff. Typically, if someone scores less than 17, the test administrator will use additional tests to further evaluate cognition.

3.6.3 Trail Maker test partA-B

The Trail Making Test consists of 25 circles distributed over a sheet of paper. In Part A, the circles are numbered 1 – 25, and the patient should draw lines to connect

the numbers in ascending order. In Part B, the circles include both numbers (1 – 13) and letters (A – L); as in Part A, the patient draws lines to connect the circles in an ascending pattern, but with the added task of alternating between the numbers and letters (i.e., 1-A-2-B-3-C, etc.). The patient should be instructed to connect the circles as quickly as possible, without lifting the pen or pencil from the paper. Time the patient as he or she connects the "trail." If the patient makes an error, point it out immediately and allow the patient to correct it. Errors affect the patient's score only in that the correction of errors is included in the completion time for the task. It is unnecessary to continue the test if the patient has not completed after five minutes have elapsed.

The Results for both TMT is reported as the number of seconds required to complete the task; therefore, higher scores reveal greater impairment.

	<i>Average</i>	<i>Deficient</i>	<i>Rule of Thumb</i>
Trail A	29 seconds	> 78 seconds	Most in 90 seconds
Trail B	75 seconds	> 273 seconds	Most in 3 minutes

3.6.4 Digit Span Test.

Short-term memory is often measured by the Digit Span test that is part of the Wechsler intelligence scale for children (Wechsler Intelligence Scale for Children-Revised, WISC-R). A series of numbers spoken by the examiner with a rate of one number per second, and soon after, the children were asked to remember and repeat a series of numbers are good numbers forward (Digits Forward) or backward (Digits Backward) with a maximum value of 17 from the score of the sum of the numbers forward in adding the numbers retreat (Putranto, 2009).

Digit span must be one of the simplest tests ever devised. The examiner says a short string of the digits at the rate of one digit a second in a monotone voice, and then the examinee repeats them. The examiner then tries a string which is one digit longer, and continues in this fashion with longer strings of digits until the examinee fails both trials at that particular length that determines the number of digits forwards. Then the examiner explains that he will say a string of digits and the examinee has to repeat them backwards that is in reverse order. For example, 3-7 is to be said back to the examiner as 7-3. This continues until the examinee fails two trials at a particular length which determines the number of digits backwards.

The Digit Span test is scored by the amount of numbers the participant was able to remember in each test. The scorer must add the total number of correct sequences, backwards and forwards. This test is also scored differently for a range of ages. For an adult to score an average score is about six numbers both backwards and forwards. While above average is anything over seven. For a young child average is about three per sequence. Due to time limits, our computerized version will only measure the participant's ability to repeat back a number sequence in the forward order. The 15 minute time limit should not significantly impact the results. We will still have an accurate, just not as in depth, view of the participant's working memory.

3.7 Validity and Reliability

3.7.1 Validity

The validity can be defined as an extension of practical measurement which displays the concept's actual meaning. Carmines and Zeller (1979) stated that construct validity refers to the degree of a measure which is associated with other measures in a manner that is consistent with theoretically based concepts. Aaker et al. (2001) added that it represents an ability of the measurement instrument to measure a concept or construct. Content validity is somewhat close to face validity; even though it is subjective, it demonstrates a picture of measurement scaling in systematic assessment (Christensen H, Mackinnon A, Korten A, & A, 2001). In order to determine if the scale items fully represent the range of the construct, researchers or experts must review it. It is recommended that the scale items of each construct should be reviewed and corrected prior to starting the study (Cotman & Berchtold, 2002). Concerning to this study which employ the standard questionnaire, namely the Verbal Fluency Test, Trail Maker B test and Digit Span Test which have been tested the validity test, thus this study does not necessarily to elaborate validity test.

3.7.2 Reliability

Barbie (2001) described reliability as a specific technique that always produces the same result regardless of times used in the same object. Nunnally (1978) stated that in a research context, reliability is known as the extent to which the test's measurements are repeatable. Nunnally (1978) again mentioned that reliability as quantified consistency is commonly predicted by using coefficient alpha. Carmines and

Zeller (1979) concluded that higher value of reliability of measurement procedure is considered to be more consistent results in repeated measurements. Nunnally (1978) articulated that higher alpha value toward 1 means higher level of reliability. A coefficient alpha of 0.70 or higher can preferably be considered reliable (Nunnally, 1978). Computer application is utilized to help calculate the coefficient alpha value of each construct. Regarding to this study which employ the standard questionnaire namely the Verbal Fluency Test, Trail Maker B test and Digit Span Test which have been tested by reliability test, thus this study does not necessarily to elaborate reliability test.

3.8 Data collection

Baseline data for all participants was collected by the researcher and the research assistant (enumerator) using the Verbal Fluency Test (Troyer, Moscovitch, Winocur, Leach, & Freedman, 1998), Trail Maker B test (Tombaugh, 2004) and Digit Span Test instrument (Muangpaisan, Intalapaporn, & Assantachai, 2010) . A studies recommended that the effect of exercise emerge after 6 weeks (Titheridge, 2015) , accordingly this study would extend the observation until 10 weeks in order to find the effective time of the intervention. The Outcome will be assessed at the beginning of the exercise, week 6, week 8 and again at week 10. The Thai Hermit exercise will be done at 60 minutes and 3 times a week.

To avoid bias in data collection, the research assistants was trained about the following materials:

- (1) Explaining how to use the three measurement instrument questionnaires; how to elaborate the assessment, and ensuring that the research assistants had no difficulty understanding the questions.
- (2) Explaining clearly to the research assistants that they could not express their own individual opinions while collecting data.

Each assessment instrument questionnaire took approximately 20 minutes to complete. Data collection will be started after the approval from the IRB of the Faculty of Medicine, Chulalongkorn University:

- (1) The researcher will request a letter from Dean of College of Public Health Sciences Chulalongkorn University to King Chulalongkorn Memorial Hospital for explain the research purpose in order to get research permission.
- (2) The next step, meeting with the administrator from King Chulalongkorn Memorial Hospital to explain research objective and permission for data collection.
- (3) Research elaboration by starting to select patient from medical record of elderly who diagnosed of Mild Cognitive Impairment 60 years old and over by the co-investigator and psychologist. who obtained CDR Rater certificate.
- (4) Four Thai hermit exercise instructors who obtained Thai traditional massage license and psychologist will also be the staffs for data collection

3.9 Data Analysis

The demographic variables, the Verbal Fluency Test, Trail Maker B test and Digit Span Test scores were analyzed with descriptive statistics: Chi -square, frequencies, percentages, means, and standard deviations. Chi -square is used to summarize the relationship of variables. Frequencies and percentages were used to summarize the categorical variables. Means and standard deviations were used to summarize the continuous variables.

The demographic characteristics and baseline data of the intervention group were compared with those of the control group. Furthermore, the development of the Verbal Fluency Test, Trail Maker B test and Digit Span Test scores were employed the repeated analysis of variance (ANOVA). Repeated measures are repeated measurements on a set of objects or the same participants. In principle, the same Repeated Measures ANOVA with paired t-test to compare the average of two samples that are interconnected. The difference with ANOVA is the test sample is a sample repeated measurement, while ANOVA requires a free sample is a sample of the test sample are repeated measurements, while ANOVA requires a free sample. In this study the data will implement two-way repeated measures ANOVA to compare the two groups.

This method is used for several reasons. First, some research hypotheses require repeated measures. The measurement of the data is included in the longitudinal research, we measure each sample member at each of several period of

time (pre-test, week 6, week 8 and week 10). In this case, week period would be a repeated factor. Second, in cases where there is a great deal of variation between sample members, error variance estimates from standard ANOVAs are large. Repeated measures of each sample member provide a way of accounting for this variance, thus reducing error variance.

3.10 Ethical consideration

The ethical principle will be approved by ethic committee of King Chulalongkorn Hospital. The three primary ethical principles will be used as a guide for this study according to the “ Belmont Report” (Polit & Beck, 2010): beneficence, respect for human dignity, and justice. The participants were informed about these the information and baseline questionnaire package to assist potential participants to understand their rights and the ethical considerations taken into account for this study.

Beneficence

In line with the principle of beneficence, all information in the informed consent package highlighted the participants’ s right to freedom from harm and discomfort, and the right to protection from exploitation and risk. To help ensure this, the Thai hermit exercise program was conducted by a professional instructor, and during the intervention they were always accompanied by the staff and the researcher to ensure their safety. Participants were clearly informed that if they did not want to continue the intervention, or if they had negative response during the Thai hermit exercise intervention, they were free to stop immediately. The participants were

assured their rights would not be affected, that if they wished to they could withdraw from the study at any stage without needing to give any explanation and without any penalty, and they were assured that it was anticipated there was no harm associated with or resulting from participating in the study.

Human dignity

In line with respect for human dignity, this study adhered to the principle of non-coercion of the potential participants and adhered to respecting their right to self-determination and their right to full disclosure. All participation was voluntary: participants were free to decide whether they participated in this study or did not, and they were free to withdraw from this study at any time. The potential participants were assessed to ensure they were able to comprehend the information they were given about this study, principally to ensure that their rights were protected. The information sheet was given out before participation and this provided a description of the nature of the study, the participants's right to refuse, the responsibility of the researcher, and the benefits and risks to the participants. As well as each person being provided with an information sheet, the researcher verbally presented information to potential participants to assist them to understand the process of this research and to ensure any questions they might have were addressed before they signed the consent form

Justice

The principle of justice includes participants's right to fair treatment and to privacy. Participants all recieved the same fair treatment throughout the entire process

of this study. In particular, their health care and health services were not effected by their participation in the study. Both the experimental and control group participants received a Thai hermit exercise program DVD upon finishing the intervention. This enabled participants the opportunity to continue or begin practicing the Thai hermit exercise program. All participants's information was dealt with confidentially to ensure their right to privacy. For example, all questionnaires were identified with identification numbers, and individual's data were not shared with others all data were only accessed by the researcher and stored safely.

All necessary information about any potential harms and benefits of the intervention was made available for potential participants to enable them to make an informed decision about whether to volunteer for the study. An entire set of information was preparedto make available to their ethics committee and their permission was obtained to complete this study. Ethics approval was also obtained from the IRB of the Faculty of Medicine, Chulalongkorn University to commencement of the study (ethics approval registration number IRB No.601/60)

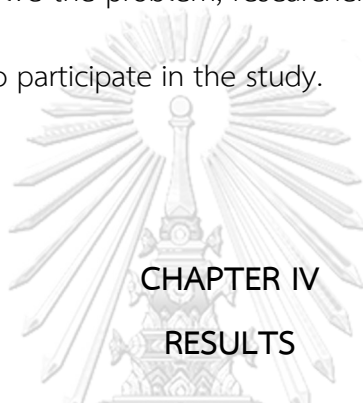
3.12 Expected benefit and Application

Firstly, the result of this study may help increasing the well-being those who has a problem to the Mild Cognitive Impairment (MCI). This study endeavors to benefit elderly persons and elders' families, community, and anyone who has interested in the topic.

Secondly, this study may give benefit to the medical practice, particularly to maintain the cognitive condition of elderly.

3.13 Obstacles and Strategies to solve the problem

The most difficult part of the data collection in this study is to assess the subjects and on how to motivate the subject to participate to the intervention program as planned before. To solve the problem, researcher proposes favors from care giver and family to motivate to participate in the study.



This Chapter consists of two parts: Part 1 contains information regarding the present demographic characteristics of MCI patients while part 2 deals with comparisons of Thai hermit exercises between the intervention or experimental group and the control group along the period of observation.

Part I – Demographic Characteristics of the MCI

Table 1 Comparisons of socio-demographic between the intervention group and the control group at pre-test

Characteristics	Control group		Experimental group		χ^2	P value
	N	%	N	%		
Sex						
male	6	14.3	7	16.7	0.091	0.763
Female	36	85.7	35	83.3		

Age						
60 - 65 years	20	47.6	17	40.5	8.142	.087
66 - 70 years	18	42.9	23	54.8		
More than 70 years	4	9.5	2	4.7		
Status						
Single	3	7.1	2	4.8	2.657	.617
Marry	36	85.8	36	85.7		
Divorce / Widow / Separation	3	7.1	4	9.5		
Education						
Primary school	29	69.1	10	23.8	4.663	.324
High school	8	19.0	25	59.5		
Bachelors degree	5	11.9	7	16.7		

(p < 0.05)

From the above table, Chi-Square Tests were not significantly correlated with the control and trial at 0.05, group it can be seen that the control group mainly consisted of female subjects which was about 36 people or up to 85.7 % whereas there were only about 6 male subjects or about 14.3%. The age range of most participated subject were between 60-65 years old which consisted of 20 people or about 47.6 % .The number of subjects between the age of 66- 70 years were about 18 people or about 42.9% and there was 4 people or about 9.5 % in the age group of 70 years and older. The Martial status of most of the subjects were married which consisted of 36 people or about 85.8% whilst the subjects who were single consisted of 3 people of about 7.1%. Divorcee, Widows/Separation subjects were also included in this research and there were also about 3 people or about 7.1% belonging to this category. The majority of the subjects which was about 29 people of 69.1% only

completed primary schools while about 8 subjects or 19.0% completed their High school and there were few subjects about 5 people or 11.9% completed their Bachelor degree. All of the 42 subjects (100%) worshipped Buddhist religion and are of Thai race.

The Experimental group mainly consists of 35 female subjects or about 83.3% and only about 7 male subjects or about 16.7%. More than half of the subjects were in the age group between 66-70 years old, which consisted of 23 people or about 54.8% .About 17 subjects or 40.5% of the subjects were in the age range between 60-65 years and there were only 2 subjects or 4.7% in the age range of 70 years and above. The Martial status of most of the subjects were married which consisted of 36 person or 85.7% and there were about 2 subjects or 4.8% whose status is single. Divorcee, Widows/Separation subjects were also included in this research and there were also about 4 person or 9.5% of the subjects. More than half the subjects about 25 people or 59.5% completed their high school while about 10 subjects or 23.8% completed their Primary school. 7 subjects or 16.7% completed their bachelor degree. All of the 42 subjects (100%) worshipped Buddhist religion and are of Thai race.

Part II - Effect of Thai hermit exercise between the intervention and control groups along the period of observation.

Table 2 Comparison between control group and experimental group on Verbal Fluency Test (Letters/categories), Trail Making Test (TMT) part A - B, Digit Span Test forward, Digit Span Test backward and Psychological status in the pre-test

Variable	Control group		Experimental group		t	P value
	\bar{x}	S.D.	\bar{x}	S.D.		
Letters						
พ	5.83	1.58	5.90	1.54	-0.21	0.834
อ	6.57	2.58	6.74	2.59	-0.30	0.768
ส	6.45	2.24	6.40	2.18	0.10	0.922
บ	6.43	2.12	6.33	2.30	0.20	0.844
Categories						
Animals	9.76	2.96	10.31	3.63	-0.76	0.451
Country	7.55	2.71	7.43	2.64	0.20	0.839
Fruit	8.14	3.20	8.36	2.78	-0.33	0.744
Food	6.93	2.66	7.10	3.75	-0.24	0.815
Trail Making Test (TMT) part A - B	5.24	1.01	5.26	0.89	-0.12	0.909
Digit Span Test forward	1.76	1.14	1.43	1.02	1.41	0.162
Digit Span Test backward	1.26	0.99	1.17	1.32	0.37	0.710
Psychological Status	3.76	0.32	3.63	0.34	1.81	0.074

($p < 0.05$)

According to the result from the above table (in the pre-test phase) it can be seen that there are no difference between control group and experimental group when the initial consonants were ฟ, อ, ส or บ at statistical significance of 0.05 ($p > 0.05$). In accordance to the category aspect of animal, country, fruit and food, there were no difference found either between the control group and the experimental group at a statistical difference of 0.05 ($p > 0.05$). In the aspect of the Trail Making Test (TMT) part A and B, there were no difference found either between the control group and the experimental group at a statistical difference of 0.05 ($p > 0.05$).

Both the forward and the backward digit span test had the same results in which there were no difference between the control group and experimental group at statistical significance difference of 0.05 ($p > 0.05$). Similarly the psychological status showed no difference either between the control group and experimental group at statistical difference of 0.05 ($p > 0.05$).

Table 3 Comparison of the differences between the control group and experimental group on Verbal fluency test (Letters/categories), Trail Making Test (TMT), Digit Span Test forward, Digit Span Test backward and Psychological Status after 6 weeks.

Variable	Control group		Experimental group		t	P value
	\bar{x}	S.D.	\bar{x}	S.D.		
Letters						
ฟ	5.88	1.63	6.17	1.86	-0.75	0.456
อ	6.60	2.57	7.02	2.98	-0.707	0.482
ส	6.48	2.24	7.02	2.33	-1.097	0.276
บ	6.45	2.13	7.05	2.37	-1.211	0.230
Category						
Animals	9.79	2.96	10.24	3.65	-0.623	0.535

Country	7.52	2.70	7.36	2.68	0.284	0.777
Fruit	8.12	3.19	8.21	3.10	-0.139	0.89
Food	6.90	2.66	6.98	3.82	-0.099	0.921
Trail Making Test (TMT) part A - B	5.33	0.87	3.57	0.91	9.026	0.00*
Digit Span Test forward	0.93	0.71	2.57	1.85	-5.381	0.00*
Digit Span Test backward	0.57	0.63	8.62	4.64	-11.143	0.00*
Psychological Status	3.66	0.52	2.38	0.37	13.04	0.00*

($p < 0.05$)

According to the results from Verbal Fluency Test (Letters/categories), Trail Making Test (TMT), part A – B, Digit Span Test forward, Digit Span Test backward and Psychological Status in the 6 weeks divided into control and experimental groups, it can be seen that there were no difference between the control group and experimental group when the initial consonants were ฟ, อ, ส or บ at statistical significance of 0.05 ($p > 0.05$). In accordance to the category aspect of animal, country, fruit and food, there were no difference found either between the control group and the experimental group at a statistical difference of 0.05 ($p > 0.05$). In the aspect of the Trail Making Test (TMT) part A and B, there were difference found between the control group and the experimental group at a statistical difference of 0.05 ($p > 0.05$). Both the forward and the backward digit span test had the same results in which there were differences between the control group and experimental group at statistical significance difference of 0.05 ($p > 0.05$). Similarly, the psychological status showed a differences between the control group and experimental group at statistical difference of 0.05 ($p > 0.05$).

Table 4 Comparison between control group and experimental group on Verbal Fluency Test (Letters/categories), trail Making Test (TMT) part A – B, Digit Span Test forward, Digit Span Test backward and Psychological Status after 8 weeks

Variable	Control group		Experimental group		t	P value
	\bar{x}	S.D.	\bar{x}	S.D.		
Letters						
ฟ	5.88	1.56	12.00	3.33	-10.784	0.00*
อ	6.64	2.57	13.02	3.22	-10.032	0.00*
ส	6.48	2.19	13.48	3.92	-10.113	0.00*
บ	6.45	2.11	13.33	3.87	-10.122	0.00*
Category						
Animals	9.76	2.78	15.36	4.55	-6.802	0.00*
Country	7.52	2.62	13.90	4.36	-8.14	0.00*
Fruit	8.12	3.10	14.45	4.05	-8.046	0.00*
Food	6.95	2.56	13.86	4.71	-8.344	0.00*
Trail Making Test (TMT) part A - B	5.24	0.96	3.24	0.69	10.97	0.00*
Digit Span Test forward	1.07	0.87	12.05	1.10	-50.706	0.00*
Digit Span Test backward	0.71	0.67	10.12	3.88	-15.488	0.00*
Psychological Status	3.75	0.50	2.25	0.39	15.278	0.00*

(p < 0.05)

According to the results on the Verbal Fluency Test (Letters/categories), Trail Making Test (TMT), part A – B, Digit Span Test forward, Digit Span Test backward and Psychological Status after 8 weeks it was discovered that there is a difference between

control group and experimental group when the initial consonants were ฟ, อ, ส or ุ at statistical significance of 0.05 ($p > 0.05$). In accordance to the category aspect of animal, country, fruit and food, there were also a difference found between the control group and the experimental group at a statistical difference of 0.05 ($p > 0.05$). In the aspect of the Trail Making Test(TMT) part A and B , there were difference found between the control group and the experimental group at a statistical difference of 0.05 ($p > 0.05$). Both the forward and the backward digit span test had the same results in which there were differences between the controls group and experimental group at statistical significance difference of 0.05 ($p > 0.05$). Similarly, the psychological status showed a differences between the control group and experimental group at statistical difference of 0.05 ($p > 0.05$)

Table 5 Comparison of the differences between the control group and experimental group on Verbal Fluency Test (Letters/categories) Trail Making Test (TMT) part A – B, Digit Span Test forward, Digit Span Test backward and Psychological status after 10 weeks.

Variable	Control group		Experimental group		t	P value
	\bar{x}	S.D.	\bar{x}	S.D.		
Letters						
ฟ	5.88	1.58	16.81	3.60	-17.998	0.00*
อ	6.64	2.62	17.48	2.73	-18.537	0.00*
ส	6.50	2.26	17.88	3.22	-18.743	0.00*
ุ	6.55	2.12	18.29	3.61	-18.166	0.00*
Category						
Animals	9.88	2.96	19.33	3.72	-12.892	0.00*
Country	7.57	2.69	18.21	3.69	-15.119	0.00*
Fruit	8.12	3.10	18.24	2.97	-15.272	0.00*

Food	6.95	2.67	18.45	3.73	-16.251	0.00*
Trail Making Test (TMT) part A - B	5.31	0.95	2.00	0.00	22.585	0.00*
Digit Span Test forward	1.07	0.81	15.12	0.67	-86.715	0.00*
Digit Span Test backward	0.69	0.72	13.19	0.74	-78.69	0.00*
Psychological Status	3.67	0.33	1.84	0.15	32.466	0.00*

($p < 0.05$)

According to the results from Verbal Fluency Test (Letters/categories), Trail Making Test (TMT), part A – B, Digit Span Test forward, Digit Span Test backward and Psychological Status after 10 weeks, it was discovered that there is a difference between control group and experimental group when the initial consonants were ฟ, อ, ส or บ at statistical significance of 0.05 ($p > 0.05$). In accordance to the category aspect of animal, country, fruit and food, there were also a difference found between the control group and the experimental group at a statistical difference of 0.05 ($p > 0.05$). In the aspect of the Trail Making Test(TMT) part A and B , there were difference found between the control group and the experimental group at a statistical difference of 0.05 ($p > 0.05$). Both the forward and the backward digit span test had the same results in which there were differences between the control group and experimental group at statistical significance difference of 0.05 ($p > 0.05$).Similarly, the psychological status showed a differences between the control group and experimental group at statistical difference of 0.05 ($p > 0.05$).

Table 6 Comparisons within the control group and experimental group on Verbal Fluency Test letters at pre-test, after 6 weeks, after 8 weeks and after 10 weeks.

Verbal Fluency Test Letters	Control group		F	P value	Experimental group		F	P value
	\bar{x}	S.D.			\bar{x}	S.D.		
Letters ឃ								
pre-test	5.83	1.58	1.629	.200	5.90	1.54	197.639	0.00*
6 weeks	5.98	1.59			6.17	1.86		
8 weeks	6.10	1.50			12.00	3.33		
10 weeks	5.95	1.31			16.81	3.60		
Letters ឌ								
pre-test	6.57	2.58	.927	.407	6.74	2.59	182.808	0.00*
6 weeks	6.69	2.43			7.02	2.98		
8 weeks	6.64	2.57			13.02	3.22		
10 weeks	6.62	2.47			17.48	2.73		
Letters ឍ								
pre-test	6.45	2.24	1.114	.344	6.40	2.18	200.091	0.00*
6 weeks	6.52	2.19			7.02	2.33		
8 weeks	6.48	2.19			13.48	3.92		
10 weeks	6.50	2.26			17.88	3.23		
Letters ឃ								
pre-test	6.43	2.12	1.823	.162	6.33	2.30	184.774	0.00*
6 weeks	6.50	2.11			7.05	2.37		
8 weeks	6.45	2.11			13.33	3.87		
10 weeks	6.55	2.12			18.29	3.61		

($p < 0.05$)

According to the results from the above table on the Verbal Fluency Test letters (initial consonants ឃ, ឌ, ឍ and ឃ), it can be seen that there were no difference

in the control group at pre-test, after 6 weeks, after 8 weeks and after 10 week at statistical significance of 0.05 ($p > 0.05$). However it can also be seen from the above table that a difference was found in the experimental group (for pre-test, 6th week, 8th week and 10th week) when the initial consonants were ฟ, อ, ส and ุ at statistical significance of 0.05 ($p < 0.05$)

Table 7 Comparisons of the differences at pre-test, after 6 weeks, after 8 weeks and after 10 weeks on Verbal Fluency Test (Letters) in the Experimental group.

Verbal Fluency Test (Letters)	\bar{x}	pre-test	6 weeks	8 weeks	10 weeks
Letters ฟ					
pre-test	5.90	-	-.262	-6.095 *	-10.905 *
6 weeks	6.17		-	-5.833 *	-10.643 *
8 weeks	12.00			-	-4.810 *
10 weeks	16.81				-
Letters อ					
pre-test	6.74	-	-.286	-6.286 *	-10.738 *
6 weeks	7.02			-6.000 *	-10.452 *
8 weeks	13.02			-	-4.452 *
10 weeks	17.48				-
Letters ส					
pre-test	6.40	-	-.619	-7.071 *	-11.476 *
6 weeks	7.02		-	-6.452 *	-10.857 *
8 weeks	13.48			-	-4.405 *
10 weeks	17.88				-
Letters ุ					
pre-test	6.33	-	-.714	-7.000 *	-11.952 *
6 weeks	7.05		-	-6.286 *	-11.238 *
8 weeks	13.33			-	-4.952 *
10 weeks	18.29				-

($p < 0.05$)

As it can be seen from the table above that each letter for the Verbal Fluency Tests were taken into consideration.

Firstly for the letter ฟ, it can be seen that the pre-test did not differ from the 6th week at statistical significance of 0.05 ($p < 0.05$). However we could also see that the pre-test clearly differed from the 8th week and the 10th week at statistical significance of 0.05 ($p < 0.05$). Apart from that, the other comparison was done between 6th week to 8th and 10th week. It can be seen clearly from the table above that the 6th week differed from 8th and 10th week at statistical significance of 0.05 ($p < 0.05$). The last comparison was made between the 8th week and the 10th week in which the result clearly showed a difference between these two weeks at statistical significance of 0.05 ($p < 0.05$).

Secondly for the letter อ, it appeared that the pre-test did not differ from the 6th week at statistical significance of 0.05 ($p < 0.05$) but it did differ from the 8th and the 10th week. For the second comparison it can be clearly seen that the 6th week differed from the 8th and the 10th week at a statistical significance of 0.05 ($p < 0.05$). For the third comparison we could also see that the 8th week differed from the 10th week at a statistical significance of 0.05 ($p < 0.05$).

Thirdly for the letter ส, it appeared that the pre-test did not differ from the 6th week at statistical significance of 0.05 ($p < 0.05$) but it did differ from the 8th and the 10th week. For the second comparison it can be clearly seen that the 6th week differed from the 8th and the 10th week at a statistical significance of 0.05 ($p < 0.05$). For the third comparison we could also see that the 8th week differed from the 10th week at a statistical significance of 0.05 ($p < 0.05$).

Lastly for the letter ุ, it appeared that the pre-test did not differ from the 6th week at statistical significance of 0.05 ($p < 0.05$) but it did differ from the 8th and the 10th week. For the second comparison it can be clearly seen that the 6th week differed from the 8th and the 10th week at a statistical significance of 0.05 ($p < 0.05$). For the third comparison we could also see that the 8th week differed from the 10th week at a statistical significance of 0.05 ($p < 0.05$).

Table 8 Comparison between the control group and experimental group on Verbal Fluency Test categories at pre-test, 6th weeks, 8th weeks and 10th weeks.

Verbal Fluency Test categories	Control group		F	P value	Experimental group		F	P value
	\bar{x}	S.D.			\bar{x}	S.D.		
Animals								
pre-test	9.76	2.96	.901	.372	10.31	3.63	156.3 92	0.00*
6 weeks	9.79	2.96			10.24	3.66		
8 weeks	9.67	2.76			15.36	4.55		
10 weeks	9.86	2.50			19.33	3.72		
Country								
pre-test	7.55	2.71	.953	.350	7.43	2.64	202.3 58	0.00*
6 weeks	7.52	2.70			7.36	2.68		
8 weeks	7.67	2.32			13.90	4.36		
10 weeks	7.57	2.69			18.21	3.69		
Fruit								
pre-test	8.14	3.21	.903	.400	8.36	2.78	173.7 93	0.00*
6 weeks	8.19	3.06			8.21	3.10		
8 weeks	8.31	2.89			14.45	4.05		
10 weeks	8.12	3.10			18.24	2.97		
Food								
pre-test	6.93	2.66	.217	.812	7.10	3.75	160.0 03	0.00*
6 weeks	7.02	2.62			6.98	3.82		
8 weeks	7.07	2.12			13.86	4.71		
10 weeks	7.00	2.01			18.45	3.73		

(p < 0.05)

According to the results from the above table on the verbal fluency test letters(initial consonants Animals, Country, Fruit and Food), it can be seen that there were no difference in the control group at pre-test , after 6 weeks, after 8 weeks and after 10 week at statistical significance of 0.05($p > 0.05$). However it can also been seen from the above table that a difference was found in the experimental group (for pre-test, 6th week, 8th week and 10th week) when the initial consonants were Animals, Country, Fruit and Food at a statistical significance of 0.05 ($p < 0.05$).

able 9 Comparisons between the pre - test, 6th weeks, 8th weeks and 10th weeks in Verbal Fluency Test (Categories) for the Experimental group

Verbal Fluency Test categories	\bar{x}	pre-test	6 weeks	8 weeks	10 weeks
Animals					
pre-test	10.31	-	.071	-5.048 *	-9.024 *
6 weeks	10.24		-	-5.119 *	-9.024 *
8 weeks	15.36			-	-3.976 *
10 weeks	19.33				-
Country					
pre-test	7.43	-	.071	-6.476 *	-10.786 *
6 weeks	7.36		-	-6.548 *	-10.857 *
8 weeks	13.90			-	-4.310 *
10 weeks	18.21				-
Fruit					
pre-test	8.36	-	.143	-6.095 *	-9.881 *
6 weeks	8.21		-	-6.238 *	-10.024 *
8 weeks	14.45			-	-3.786 *
10 weeks	18.24				-
Food					
pre-test	7.10	-	.119	-6.762 *	-11.357 *
6 weeks	6.98		-	-6.881 *	-11.476 *

8 weeks	13.86			-	-4.595 *
10 weeks	18.45				-

($p < 0.05$)

As can be seen from the table above, each categories for the Verbal Fluency Test was taken into consideration. Firstly, for the animal group, it can be seen that the pre-test did not differ from the 6th week at statistical significance of 0.05 ($p < 0.05$). However we could also see that the pre-test clearly differed from the 8th week and the 10th week at statistical significance of 0.05 ($p < 0.05$). Apart from that, the other comparison was done between 6th week to 8th and 10th week. It can be seen clearly from the table above that the 6th week differed from 8th and 10th week at statistical significance of 0.05 ($p < 0.05$). The last comparison was made between the 8th week and the 10th week in which the result clearly showed a difference between these two weeks at statistical significance of 0.05 ($p < 0.05$).

Secondly, for the Country categories, it appeared that the pre-test did not differ from the 6th week at statistical significance of 0.05 ($p < 0.05$) but it did differed from the 8th and the 10th week. For the second comparison it can be clearly seen that the 6th week differed from the 8th and the 10th week at a statistical significance of 0.05 ($p < 0.05$). For the third comparison we could also see that the 8th week differed from the 10th week at a statistical significance of 0.05 ($p < 0.05$).

Thirdly, for the fruit category, it appeared that the pre-test did not differ from the 6th week at statistical significance of 0.05 ($p < 0.05$) but it did differ from the 8th and the 10th week. For the second comparison it can be clearly seen that the 6th week differed from the 8th and the 10th week at a statistical significance of 0.05 ($p < 0.05$). For the third comparison we could also see that the 8th week differed from the 10th week at a statistical significance of 0.05 ($p < 0.05$).

Lastly, for the food category, it appeared that the pre-test did not differ from the 6th week at statistical significance of 0.05 ($p < 0.05$) but it did differ from the 8th and the 10th week. For the second comparison it can be clearly seen that the 6th week differed from the 8th and the 10th week at a statistical significance of 0.05 ($p < 0.05$). For the third comparison we could also see that the 8th week differed from the 10th week at a statistical significance of 0.05 ($p < 0.05$).

Table 10 Comparisons between the control group and experimental group on Trail Making Test (TMT) part A – B, Digit Span Test forward, Digit Span Test backward and Psychological Status at pre-test, after 6 weeks, after 8 weeks and 10 weeks.

Trail Making Test (TMT) part A - B	Control group		F	P value	Experimental group		F	P value
	\bar{x}	S.D.			\bar{x}	S.D.		
pre-test	5.24	1.01	1.027	0.335	5.26	0.89	167.388	0.00*
6 weeks	5.33	0.87			3.57	0.91		
8 weeks	5.14	0.87			3.24	0.69		
10 weeks	5.31	0.95			2.00	0.00		
Psychological Status								
pre-test	3.76	0.32	0.659	0.543	3.63	0.34	306.233	0.00*
6 weeks	3.66	0.52			2.38	0.37		
8 weeks	3.75	0.51			2.25	0.39		
10 weeks	3.67	0.33			1.84	0.15		
Digit Span Test forward								
pre-test	1.76	1.14	2.300	0.113	1.43	1.02	1384.740	0.00*
6 weeks	1.36	0.85			2.57	1.85		
8 weeks	1.40	0.77			12.05	1.10		
10 weeks	1.48	0.92			15.12	0.67		
Digit Span Test backward								
pre-test	1.26	0.99	1.468	0.233	1.17	1.32	135.665	0.00*
6 weeks	1.33	0.87			8.62	4.64		
8 weeks	1.45	0.77			10.12	3.88		
10 weeks	1.57	0.91			13.19	0.74		

($p < 0.05$)

According to the results from the above table on Trail Making Test (TMT) [Part A-B ,Digit Span Test forward, Digit Span Test backward and Psychological Status] , it can be seen that there were no differences in the control group at pre-test, after 6

weeks, after 8 weeks and after 10 week at statistical significance of 0.05 ($p > 0.05$). However, it can also be observed that a difference was found in the experimental group (for pre-test,6th week,8th week and 10th week) for the Part A-B, Digit Span Test forward, Digit Span Test backward and Psychological Status at a statistical significance of 0.05 ($p < 0.05$).

Table 11 Comparison of the differences observed in pre-test , 6 weeks, 8 weeks, 10 weeks for the Trail Making Test (TMT) part A – B, Digit Span Test forward, Digit Span Test backward and Psychological Status in the experimental group

Variable	\bar{x}	pre-test	6 weeks	8 weeks	10 weeks
Trail Making Test (TMT) part A - B					
pre-test	5.26	-	1.690 *	2.024 *	3.262 *
6 weeks	3.57		-	.333 *	1.571 *
8 weeks	3.24			-	1.238 *
10 weeks	2.00				-
Psychological Status					
pre-test	3.63	-	1.252 *	1.386 *	1.796 *
6 weeks	2.38		-	.134 *	.544 *
8 weeks	2.25			-	.410 *
10 weeks	1.84				-
DIGIT SPAN TEST (FORWARD)					
pre-test	1.43	-	-1.145 *	-10.619 *	-13.690 *
6 weeks	2.57		-	-9.474 *	-12.546 *
8 weeks	12.05			-	-3.071 *
10 weeks	15.12				-
DIGIT SPAN TEST(BACKWARD)					
pre-test	1.17	-	-7.452 *	-8.952 *	-12.024 *
6 weeks	8.62		-	-1.500 *	-4.571 *
8 weeks	10.12			-	-3.071 *
10 weeks	13.19				-

($p < 0.05$)

As can be seen from the results in the table above, the TMT part A - B showed that the pre-test differed from the 6th, 8th and 10th week at a statistical significance of 0.05 ($p < 0.05$). In addition, the 6th week differed from the 8th and the 10th week at a statistical significance of 0.05 ($p < 0.05$). Furthermore, the 8th week differed from the 10th week at a statistical significance of 0.05 ($p < 0.05$).

Similarly, the psychological status showed that pre-test results differed from the 6th, 8th and 10th weeks at a statistical significance of 0.05 ($p < 0.05$) while the 6th week differed from the 8th and 10th weeks at statistical significance of 0.05 ($p < 0.05$). The 8th week was also seen to differ from the 10th week at a statistical significance of 0.05 ($p < 0.05$).

For the Digit Span Test forward, the results highlighted that the pre-test differed from the 6th, 8th and 10th weeks at a statistical significance of 0.05 ($p < 0.05$). In addition, the 6th week differed from the 8th and 10th weeks at a statistical significance of 0.05 ($p < 0.05$) while the 8th week also differed from the 10th week at statistical significance of 0.05 ($p < 0.05$).

Lastly, from the results of the Digit Span Test backward, it can be observed that, the pre-test differed from the 6th, 8th and 10th weeks at a statistical significance of 0.05 ($p < 0.05$). Moreover, the 6th week differed from 8th and 10th weeks and the 8th week differed from the 10th week at a statistical significance ($p < 0.05$).

CHAPTER V

DISCUSSION, CONCLUSION AND RECOMMENDATION

DISCUSSION

The present study determined to examine the condition of MCI patients by using a verbal influence test, a trail Maker B test and a Digit Span Test before and after the Thai Hermit exercise. Particularly, the aim was to examine the influence of psychological condition (stress) toward the advance of the Thai hermit exercise. In addition, this research aimed to compare the effect of Thai hermit exercise between the intervention and the control groups along the time period of observation.

Findings from the research suggested that the control group mainly consisted of female subjects (85.7%) while there were only 6 male subjects (14.3%). Most subjects were in the age range of 60 – 65 years old (47.6%) followed by 42.9% in the age range of 66 – 70 years old and only 9.5% of participants were aged 70 years old or above. Their marital status was mainly married (85.8%) followed by single and divorce/widow/separation (7.1%). The majority of them, 29 subjects or 69.1% graduated at elementary level followed by high school graduated (19.0%) and those that held a bachelor's degree (11.9%). However, all of the participants were Buddhist and Thai citizens.

The experimental group consisted of 35 female subjects or 83.3%. Most participants were in the age range of 66 – 70 years old (54.8%) followed by 40.5% in

the age range of 60 – 65 years old while only 4.7% were 70 years old or above. Their marital status was mainly married (85.7%) followed by divorce/widow/separation (9.5%). In addition, majority of the participants (59.5%) had graduated high school level followed by elementary school graduates (23.8%) and those that held a bachelor's degree (16.7%). Just like the control group, all the participants were Buddhist and Thai citizens.

The results of the present study are consistent with previous studies. Several studies have suggested that physical activity can prevent or counteract cognitive decline. The results from Verbal Fluency Test (Letters/categories), Trail Making Test (TMT), part A – B, Digit Span Test forward, Digit Span Test backward and Psychological Status were divided into control and experimental groups as shown in Chapter IV. In addition, it was discovered that there were differences between the control group and the experimental group for most of the examined tests such consonant recognition (ฟ, อ, ส or บ), name of animal, country, fruit or food, Trail Making Test (TMT) part A and B and forward digit span test. Similarly, the psychological status showed differences with statistical significance between the control group and experimental group. As a result, this study supports a previous study, which demonstrated that poor baseline physical performance results in cognitive impairment or dementia (Van Kan G et al., 2008). Furthermore, two other studies are in line with these findings, stating the fact that good physical performance seems to play a protective factor against cognitive decline (Gallucci et al., 2008). Furthermore, increasing evidence gathered via prospective

studies indicate that regular exercise is able to reduce the risk of MCI and dementia (Ahlskog, Geda, Graff-Radford, & Petersen, 2011).

Among patients with dementia or MCI, RCTs and cross-sectional studies show improvements in cognitive scores after 6 months -1 year of exercise, increase in volume of the hippocampus and improved spatial memory (Suzuki et al., 2012). Neuroimaging studies of cognitive networks also show that regular exercise improves connectivity and increases neuroplasticity which translates into better learning skills (Erickson & Kramer, 2009). Aerobic exercise was seen to be the training regimen in most of the trials showing significant improvement in global cognitive function while isolated resistance training was studied in trials that showed significant effects on memory (Foster et al., 2011). While it is still unclear what type of exercise is most beneficial and at what age it has to start, much more research seems to be required to understand dose response linkages between exercise and cognitive effects.

A recent meta-analysis study regarding cognitive intervention conducted by (Sherman et al., 2017) was able to determine that interventions with memory and multidomain forms of content appear to be particularly helpful, with memory-based approaches possibly being more effective than multidomain methods. Currently, the American College of Sports Medicine recommends that exercise programs for older adults include both aerobic and non-aerobic physical activities, such as resistance training, balance training, and stretching for optimal general health. However to date, no standardized form of exercise intervention or measurement is currently available.

This present study found statistically significant results for the Digit Span Test forward and Digit Span Test backward which showed that pre-test values differed from the 6th, 8th and 10th weeks. In the same way, older adults can benefit tremendously from a combination of exercise that can build strength, maintain bone density, improve balance, coordination and mobility, reducing the risk of falling and helping maintain independence in performing activities of daily life. Even moderate exercise can improve the health of people who are frail or who have diseases associated with aging. Several explanations for the protective effect of physical activity on cognitive functions have been suggested (Cespón, Galdo-Álvarez, Pereiro, & Díaz, 2015). Possible mechanisms underlying the relationship between physical activity and cognition are indirect, though the positive effect of physical activity on brain vascularity have been demonstrated, which include pressure reduction, improvement of the lipoprotein profile, increased perfusion, preservation of the neuronal structure and major changes in hippocampus plasticity (Foster et al., 2011).

Furthermore, the present study discovered that the observed psychological status at pre-test differed from that at the 6th, 8th and 10th weeks with a statistical significance ($p < 0.05$). Additionally, the results from the 6th week differed from the 8th and 10th week as well as the results from the 8th week differed from that of the 10th week at a statistical significance for the psychological status category ($p < 0.05$). This is similar to results found in a study conducted by (Lam, Chan, Leung, Fung, & Leung, 2015). Would older adults with mild cognitive impairment adhere to and benefit from

a structured lifestyle activity intervention to enhance cognition? A cluster randomized controlled trial, whereby the authors reported a significant decrease in depressive symptoms after a 12-month group-based multi-modal exercise program compared with the pre-test level.

Consistent physical activity can help maintain cerebral blood flow and may increase the supply of nutrients to the brain (Yaffe et al., 2001a). Neurotrophic factors play an important role in the beneficial effects of exercise. Neurotrophic factors are mainly comprised of brain derived neurotrophic factor (BDNF), as it can improve the resilience and growth of several types of neurons, including neurons glutamatergic. In addition, BDNF acts as a major mediator of synaptic efficacy, linking nerve cells and nerve cell plasticity (Cotman & Berchtold, 2002). As such, findings from this study indicate that physical activity achieved via the Thai hermit exercise regimen over a period of 10 weeks, showed a statistically significant improvement in the cognitive functioning of the experiment group as compared to the control group when measured using the Verbal Fluency Test (Letters/categories), Trail Making Test (TMT) and the Digit Span Test (forward and backward).

Furthermore, physical activity allows maintaining brain vascular health by lowering blood pressure, improve the lipoprotein profile, support the production of endothelial nitric oxidation and ensure sufficient cerebral perfusion. Similarly, emerging evidence of an association between insulin and amyloid show that the benefits of aerobic activity on insulin resistance and glucose intolerance, perhaps this is another

mechanism in which physical activity can prevent or delay a decline in cognitive function (Weuve et al., 2004). Previous study elaborated by (Yao et al., 2008) in the United States shows an increase in cognitive value associated with improved physical function. Importantly, the study conducted by (M. Matthews & W H., 2004) using Tai chi exercises in participants aged 68-84 years old showed a positive relationship.

In addition, recent studies found that older MCI adults who regularly participated in physical exercise showed immediate recall improvement and reduced whole brain cortical atrophy (Zuendorf et al., 2013). A randomized controlled trial of multicomponent exercise in older adults with mild cognitive impairment. PLoS One 8, e61483] which could be associated with reduced cholesterol and increased BDNF (Baker LD et al., 2010). Effects of aerobic exercise on mild cognitive impairment: a controlled trial. Arch. Neurol. 67, 71–79.] found that a six-month aerobic exercise intervention had beneficial effects on cognition in individuals with amnesic MCI (aMCI). These studies suggest that although executive functions decrease in older MCI adults (Bennys K, Portet F, Touchon J, & G., 2007), they still exhibit cognitive and neural plasticity and physical exercise seems to play a protective role by attenuating the progression of cognitive impairments in MCI.

From the overall results obtained in this study, it can be inferred that the Thai hermit exercise is a useful tool in helping the elderly population from obtaining the benefits of both physical exercise as well as retaining cognitive function. Another such study conducted by (Tanasugarn et al., 2015) evaluated the effects of the Thai hermit

exercise on the improvement in movement of the shoulder joint as well as the cognitive function of the participants in a randomized controlled pilot trial. The authors determined that the Thai hermit exercise was useful in improving the movement in the shoulder joints. However, more extensive trials are necessary to determine concrete results.

CONCLUSION

This study was successful in showing statistically significant results for the use of Thai hermit exercise as a tool for the improvement of cognitive functioning in individuals with MCI. Future research should seek to identify population traits (such as age at which physical activity began, intervention duration, and baseline activity level) and intervention characteristics (such as type, frequency, duration, and intensity) that trend toward positive outcomes among these trials. Studies then could be designed appropriately to test identified characteristics for research and knowledge purposes. In addition, long-term trials that enroll younger adults with interventions sustained for longer periods would benefit the field and provide important insight on prevention. Although a physically active lifestyle often is proposed as a way to prevent cognitive decline and reduce risk for cognitive impairment and dementia, some studies find that the evidence is not enough to determine whether single component physical activity interventions offer cognitive benefits. However, clinical practice largely encourages physical activity to prevent or manage other chronic conditions, and this practice should continue, because it may offer benefits for preventing cognitive decline as well.

RECOMMENDATION

Suitability of posture the Thai hermit exercise. The finding of this study provide information regarding the important influence of Thai hermit exercise on cognitive function and stress of MCI patients. The integrity of intervention was an important consideration and this form of Thai hermit exercise was selected as a suitable exercise for MCI patients because, it is easy to learn and easy to perform, moreover, it can improve the cognitive function that may be have prevent the development to dementia. This minimized the possibility of participants having a frustrating experience giving them a sense of failure or heightened sense of their own frailty and limited and /or deteriorating physical and co-ordination abilities. The success of Thai hermit exercise use for this research should consider providing this form of original Thai hermit exercise and opportunity to increase exercise for older people with potential to improve cognitive function of residents.

Physical exercise, Thai hermit exercise in particular, benefits global cognition in MCI patients. The evidence of physical exercise on domain-specific cognitive function and psychological outcomes remains unclear, more trials with rigorous study design are necessary to provide the evidence.

LIMITATION

Due to the limitation of the research coverage, this study potential to produce a selection biases because this selection focused on only patient who join at multicenter. The selection did not included, who did not want to be interviewed for

research and who did not register to the King Chulalongkorn Hospital, Thailand. Importantly, related to the research method which this study implement the experimental model, however we cannot impede the subject to communicate each other and tell the intervention training to the control subjects.



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APPENDICES

Appendix A

Thai hermit Exercise Protocol

The procedures for the recruitment of participants, the Thai hermit exercise intervention, and the data collection are as follows:

Table 12 Recruitment of Participants

Procedure	Work completed
1. The researcher contacted the administrator of the information about the study that can be displayed or given to participants.	
2. The administrator invited the researcher to hold an information session for patients who have indicated their Interest in participating in this study. Information regarding the background, aims and objectives, expected involvement and duration of the research study were presented during the Information session. Patients are given the opportunity to Raise any questions or concerns about the study. Patients were provided with an information sheet as well as the consent form	
3. The staff identified potential participant according to the inclusion criteria and exclusion criteria. Inclusion criteria (1) Patients who diagnosed MCI of 60 years old and over (2) Able to speak and understand Thai with no severe hearing impairment. (3) Able to walk	
(4) willingness to participate in the study and able to provide informed consent	

Procedure	Work completed
<p>Exclusion criteria</p> <ul style="list-style-type: none"> (1) Regular practice of Thai hermit exercise (Ruesi dad ton) (2) Unable to sit cross-legged and to kneel on the floor (3) Unable to folding legs underneath thighs while resting the buttocks on the heels (4) It has been diagnosed of severe osteoporosis (5) Older people with blindness (6) Emergence of newer symptom (7) Don't have previous cognitive impair by Medical illness (8) Don't have any sort of injury to your brain, skull, or scalp 	
<p>5. Patients who met the inclusion criteria were invited to participate in this study, and those patients who did not meet the inclusion criteria were informed that they could not participate.</p>	
<p>6. The researcher required participants to receive written permission to participate from their medical professional. Potential participants who do not receive this permission will not be able to participate.</p>	

Intervention

The Thai hermit exercise. The program is designed for Mild Cognitive Impairment's patients. Details of how the intervention was carried out are set out below.

Setting Up

1. The control group was to be located on the first floor where they would receive

The usual standard care for the same length of time as the Thai hermit exercise group

Participated in the Thai hermit exercise activity and doing stretching exercises following an instructor on a DVD.

2. The researcher prepared the environment for the Thai hermit exercise participants. The Thai hermit exercise class was held on the third floor of the hospital.

3. All staff and the researcher had to check that the Thai hermit exercise participants were fixed in place before each class began.

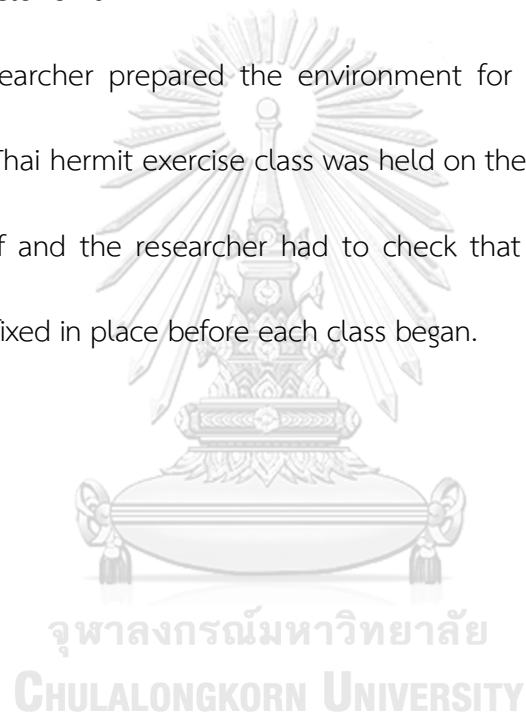


Table 13 The Thai hermit exercise intervention

Action	Explanation	Time	Conducted by
Welcome questions	How are you today? Are you ready to enjoy doing Thai hermit exercise?	1 min	Researcher
Positioning	1. The patients were positioned in 3-4 rows with 4-6 people in each row. 2. The Reacher in front of the participants. All participants could therefore see the upper part of instructor's body and her movements clearly; staff checked this detail.	2 min	Researcher and staff present
Explanation given	1. Explained that Main exercise will take around 30 minutes and Thai hermit exercise will take around 30 minutes. 2. Encouraged participants to learn, and do Thai hermit exercise during the class. 3. Explained to participants that if they experience any negative responses during the Thai hermit exercise, they will need to immediately stop participating and indicate this to the researcher or one of the staff just nearby and then seek medical advice (simply making eye contact would be sufficient to result in someone going over to ask what was troubling them).	2 min	Researcher

Table 14 Thai hermit exercise phase: 40 minutes, including warm-up and Thai hermit exercise following Thai hermit exercise Schedule conducted by Researcher

Activity	Details	Time
Warm up	<p>1. This consisted of seven movements for muscle:</p> <p>(1) <i>Fist And Open</i> Make the hands into fists then open the hands and spread the fingers wide apart. Repeat 3- 4 times.</p> <p>(2) <i>Sholder Circles</i> Bend the arms touch the sholders and circle sholders around. 3 or 4 times in the same direction. Repeat 3 or 4 times circling in the other direction.</p> <p>(3) <i>Wrist Circles</i> Bend at each wrist and circle the hands around 3 or 4 times in the same direction. Repeat 3 or 4 times circling in the other direction.</p> <p>(4) <i>Arm and Shoulder Stretch</i> Interlace the fingers and straighten the arms in front of the body with the palms of the hands facing away from the body. Repeat 3-4 more times.</p> <p>(5) <i>Knee circles</i> . Bend at each knee and circle the knees around 3 or 4 times around. 3 or 4 times in the same direction. Repeat 3 or 4 times circling in the other direction.</p> <p>2. The movements from (1) to (5) to finish the warm-up phase.</p>	10 minutes
Thai hermit exercise	<p>1. Thai hermit exercise consisted 3 movements:</p> <p>(1) The posture to relieve face muscle</p> <p>(2) The posture to relieve laziness</p> <p>(3) The posture to relieve headache, blur vision and general weakness.</p>	30 minutes

Post Thai hermit exercise class

1. Thank the participants for doing their best.

2. Encourage the participants to drink warm water.
3. Remind the participants to dry their bodies.
4. Remind the participants to come back to the next exercise session.



Appendix B**Demographic Data Form**

The following questions ask for some information about you, such as your age, gender, ethnicity, religion, level of education, marital status, and occupation status.

1. Gender:

(1) Male

(2) Female

2. Age: _____ years. (Date of Birth: d/ m/ y/)

3. Highest Education Level:

(1) None

(2) Primary School

(3) Secondary School

(4) High School

(5) College or University

4. Current Marital Status:

(1) Married

(2) Divorced

(3) Single

(4) Widowed

(5) Separated



Appendix C

Verbal fluency test (Letters/categories)

Make an effort by the patient and imagine saying a word out as much as possible in a limited time. (Top to 1 minute), the topic vocabulary to speak out. Can be used as-

Letter verbal fluency:

Letters

To say the words that begin with the letter as required. By having a word with

For example, a literal meaning. Like the rooster crows back pocket, so to have the greatest number. Unique in the first minute after changing a character such as a letter.

If this is so foreign patients can use.

Letters	Word
F	
A	
S	
B	

Category verbal fluency

The words spoken in the same category as determined. For many species as possible in one minute, for example. In the category of animals such as birds, chickens, dogs, cats, cattle, etc. After that, enjoy. Other categories, such as fruit or province name.

Category	Word
animals	
Country	
Fruit	
Food	

Appendix D

Trail Making Test (TMT) partA-B

Instruction:

Both parts of the Trail Making Test consist of 25 circles distributed over a sheet of paper. In Part A, the circles are numbered 1 – 25, and the patient should draw lines to connect the numbers in ascending order. In Part B, the circles include both numbers (1 – 13) and letters (A – L); as in Part A, the patient draws lines to connect the circles in an ascending pattern, but with the added task of alternating between the numbers and letters (i.e., 1-A-2-B-3-C, etc.). The patient should be instructed to connect the circles as quickly as possible, without lifting the pen or pencil from the paper. Time the patient as he or she connects the "trail." If the patient makes an error, point it out immediately and allow the patient to correct it. Errors affect the patient's score only in that the correction of errors is included in the completion time for the task. It is unnecessary to continue the test if the patient has not complete after five minutes have elapsed.

- Step 1: Give the patient a copy of the Trail Making Test Part A worksheet and a pen or pencil.
- Step 2: Demonstrate the test to the patient using the sample sheet
- Step 3: Time the patient as he or she follows the “trail” made by the numbers on the test.
- Step 4: Record the time.

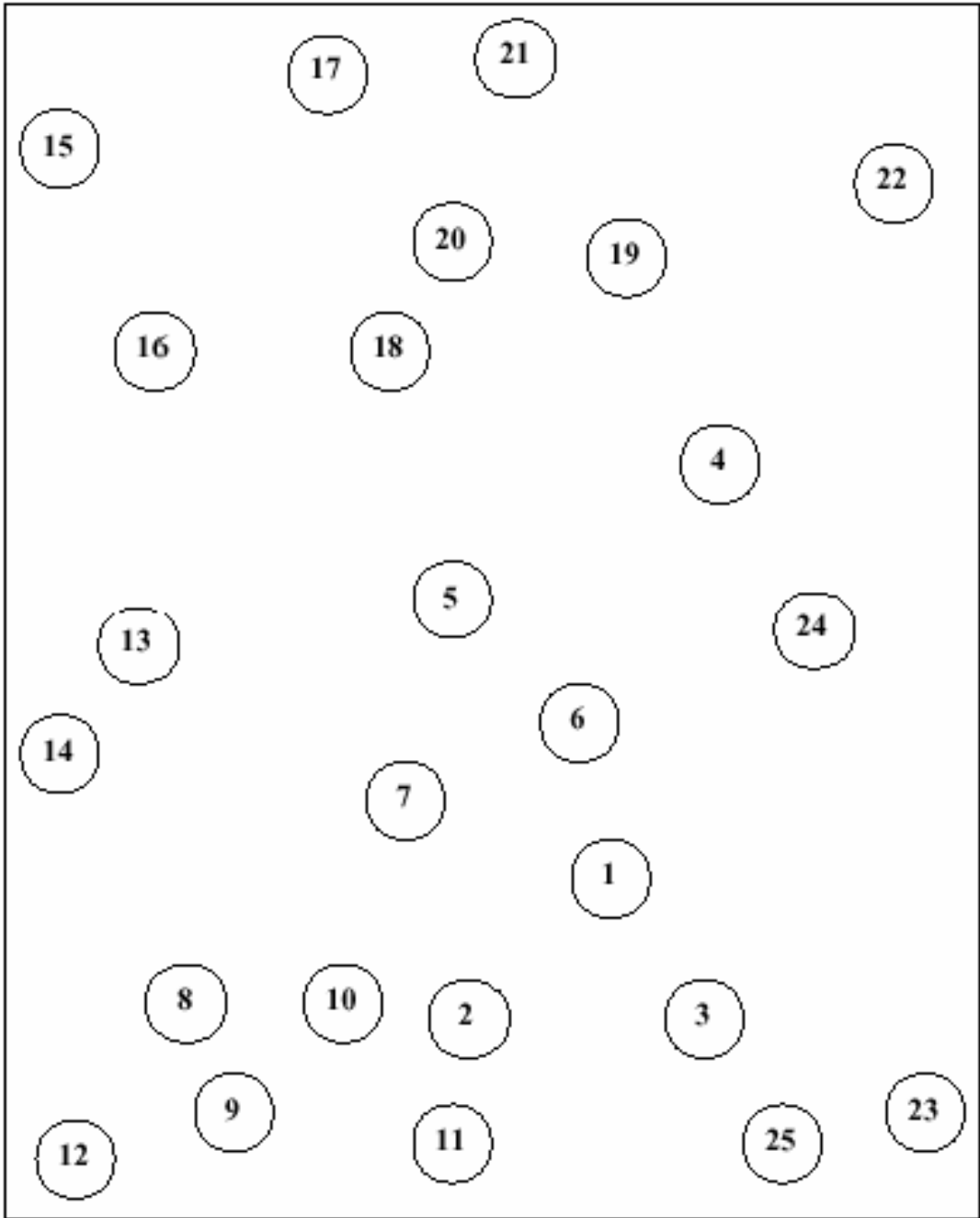
Scoring:

Results for both TMT A and B are reported as the number of seconds required to complete the task; therefore, higher scores reveal greater impairment.

	Average	Deficient	Rule of Thumb
Trail A	29 seconds	> 78 seconds	Most in 90 seconds
Trail B	75 seconds	> 273 seconds	Most in 3 minutes

Trail Making Test Part A

Patient's Name: _____ Date: _____



Trail Making Test Part B

End

10

13

9

4

I

8

C

D

3

Start

5

1

7

B

H

12

จุฬาลงกรณ์มหาวิทยาลัย
CHULALONGKORN UNIVERSITY

A

J

G

2

E

L

6

K

F

11

Detailed description: The diagram is a square field containing 13 numbered points (1-13) and 12 lettered points (A-L). A watermark of Chulalongkorn University is centered in the background. The 'Start' point is at the center, and the 'End' point is at the top-left corner. The points are arranged in a non-linear pattern, with some points clustered together and others isolated. The letters A-L are placed at various locations around the field.

APPENDIX E

DIGIT SPAN TEST - - *FORWARD*

After saying the instructions administer the digit spans in order.

Do not repeat a span once read.

Administer both spans of the same length regardless of how the participant performs.

Say the digits at a rate of 1 digit about every 1 sec.

Use a monotonic voice; without inflections at the end.

Discontinue after failure on both trials of any item (e.g., 5a and 5b).

Examiner: *"I am going to say some numbers. Listen carefully, and when I am through say them right after me. For example, if I say 7-1-9, what would you say?"*

- If the participant responds correctly (7-1-9), say: *"That's right,"* and proceed to Item 1.
- If the participant fails the example, say: *"No, you would say 7-1-9. I said 7-1-9, so to say it forwards you would say 7-1-9. Now try these numbers. Remember, you are to say them forwards. 3-4-8."*
- Whether the participant succeeds or fails with the second example (3-4-8), proceed to Item 1. Give no help on this second example or any of the items that follow.

Scoring: Each span is scored '1' (Pass) or '0' (Fail). Only discontinue test when participant has failed both trials of the same span length (e.g., 5a and 5b).

	Item	Digit Span	Pass	Fail
1	a.	1-7		
	b.	6-3		
2	a.	5-8-2		
	b.	6-9-4		
3	a.	6-4-3-9		
	b.	7-2-8-6		
4	a.	4-2-7-3-1		
	b.	7-5-8-3-6		
5	a.	6-1-9-4-7-3		
	b.	3-9-2-4-8-7		
6	a.	5-9-1-7-4-2-8		
	b.	4-1-7-9-3-8-6		
7	a.	5-8-1-9-2-6-4-7		
	b.	3-8-2-9-5-1-7-4		
8	a.	2-7-5-8-6-2-5-8-4		
	b.	7-1-3-9-4-2-5-6-8		

DIGIT SPAN TEST - - BACKWARD

Use a monotonic voice; without inflections at the end

Say the digits at a rate of 1 digit about every 1 sec.

Administer both spans of the same length regardless of how the participant performs.

Do not repeat a span once read.

Administer the digit spans in order.

Examiner: *"Now I am going to say some numbers, but this time when I stop I want you say them backwards. For example, if I say 7-1-9, what would you say?"*

- If the participant fails the example, say: *"No, you would say 9-1-7. I said 7-1-9, so to say it backwards you would say 9-1-7. Now try these numbers. Remember, you are to say them backwards. 3-4-8."*
- If the participant responds correctly (9-1-7), say: *"That's right,"* and proceed to Item 1.
- Whether the participant succeeds or fails with the second example (3-4-8), proceed to Item 1. Give no help on this second example or any of the items that follow.
- Discontinue after failure on both trials of any item (e.g., 5a and 5b)

Scoring: Each span is scored '1' (Pass) or '0' (Fail). Only discontinue test when participant has failed both trials of the same span length (e.g., 5a and 5b)

	Item	Digit Span	Pass	Fail
1	a.	2-4		
	b.	5-7		
2	a.	6-2-9		
	b.	4-1-5		
3	a.	3-2-7-9		
	b.	4-9-6-8		
4	a.	1-5-2-8-6		
	b.	6-1-8-4-3		
5	a.	5-3-9-4-1-8		
	b.	7-2-4-8-5-6		
6	a.	8-1-2-9-3-6-5		
	b.	4-7-3-9-1-2-8		
7	a.	9-4-3-7-6-2-5-8		
	b.	7-2-8-1-9-6-5-3		

.APPENDIX F

PSYCHOLOGICAL STATUS INDICATORS QUESTIONNAIRE

This questionnaire will show how stress affects different parts of your life. Circle the response which best indicates how often you experience each stress indicator during a typical week which apply the counseling team international. (<http://thecounselingteam.com/training-courses/mental-health/>)

When you have answered all the questions add the point totals for each section.

5- Almost Always (on five days a week)

4- Most of the time (on three days a week)

3- Some of the time (on one and one-half days a week)

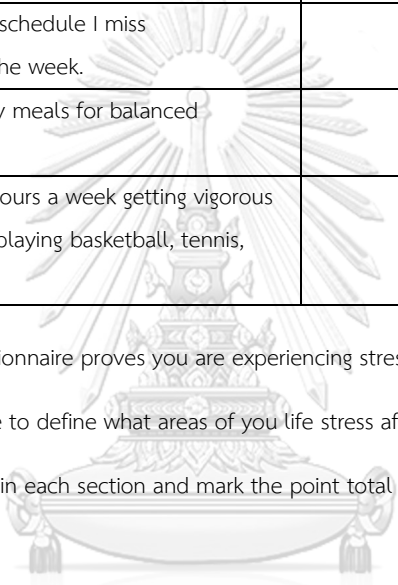
2- Almost never (less than two hours a week)

1- Never

Psychological Status	Almost always	Most of the time	Some of the time	Almost never	Never
1. My body feels tense all over.					
2. I have a nervous sweat or sweaty palms.					
3. I have a hard time feeling really relaxed.					
4. I have severe or chronic lower back pain.					
5. I get severe or chronic headaches.					
6. I get tension or muscle spasms in my face, jaw, neck or shoulders.					
7. My stomach quivers or feels upset.					
8. I get skin rashes or itching.					
9. I have problems with my bowels (constipation, diarrhea).					
10. I need to urinate more than most people.					
11. My ulcer bothers me.					
12. I feel short of breath after mild exercise like climbing up four flights of stairs.					
Psychological Status	Almost always	Most of the time	Some of the time	Almost never	Never

13. Compared to most people, I have a very small or a very large appetite..					
14. My weight is more than 15 pounds higher than what is recommended for a person my height and build					
15. I smoke tobacco.					
16. I get sharp chest pains when I'm physically active.					
17. I lack physical energy.					
18. When I'm resting, my heart beats more than 100 times a minute.					
19. Because of my busy schedule I miss at least two meals during the week.					
20. I don't really plan my meals for balanced nutrition.					
21. I spend less than 3 hours a week getting vigorous physical exercise (running, playing basketball, tennis, swimming, etc).					

No single question in this questionnaire proves you are experiencing stress, but by looking at the results of groups of questions, it may be possible to define what areas of your life stress affects the most. To determine these areas, add the circled numbers in each section and mark the point total for each section with an "X" on the appropriate dotted line below.



 PERSONAL STRESS LEVELS

 Very Low Medium High Very High Danger

Physical Indicators

Point Total 22.....30..... .38..... .48..... 54+

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