

Effectiveness of Brain Exercise Program (SING-COGNI-CISE) for Elderly People with Mild Cognitive Impairment in Singburi Province, Thailand: Cluster Randomized Control Trail

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Abstract— Mild cognitive impairment (MCI) causes a slight but noticeable and measurable decline in cognitive abilities, including memory and thinking skills. This study was a cluster randomized control trail aimed to appraise the brain exercise program (SING-COGNI-CISE) for elderly people with mild cognitive impairment in Singburi province, Thailand. A total of 70 elderly people with mild cognitive impairment and voluntarily participated in this study. They were divided into 2 group: intervention group (n=35) who were received the brain exercise program (Sing-Cogni-Cise) and control group (n=35) who were received the health educational booklet about MCI by cluster random sampling technique. Socio-demographic and economic data was recorded and found that both groups were homogenous. All of the participants were measured the Thai Mental State Examination (TMSE) at the baseline and after 3-months intervention program. The Chi-square test, Paired sample t-test and Independent t-test were used for comparison before and after a 3-month intervention program within the group and between group. The results revealed that the TMSE Score, Knowledge on MCI were increased significantly within the intervention group and control group ($p < 0.001$). The finding suggests that should be implemented continuously with brain exercise program (Sing-Cogni-Cise) to increases the cognition competency and promote to get the better quality of life.

Keywords— Elderly People, Mild Cognitive Impairment, Brain Exercise.

I. INTRODUCTION

The change of the structure of Thai population in the past 2-3 decades reveals that the number and the proportion of older population have been increasing swiftly while the proportion of childhood population has been decreasing. The life expectancy at birth have increased to be 73.5 and 80.5 years old in man and woman, respectively [1]. In Thailand, the proportion of older population is 12.5% in 2020 [1], it is projected that Thailand will have the proportion of older persons increasing from 11.9 % (8 million people) in 2010 to be 25 % (18 million people) in 2030, or increase more than 2-fold [2]. This situation makes Thailand being an “Aging Society” with the proportion of the population 60 years old or

older increased to be over 10% [3]. The rapid increase of older population affects the healthcare support which needs to be improved and developed in Thai society. Older population is a group that needs more attention because older persons have multi-dimensional changes physically, psychologically, and socially. The physical fitness and resistance to diseases decrease in older people. This leads to an increase in health problems especially chronic diseases such as diabetes mellitus, hypertension, cardiovascular disease, cancer, dementia and etc. [4]. Also, older people suffer mental health problems especially mild cognitive impairment (MCI)

MCI is the stage between the expected cognitive decline of normal aging and the more serious decline of dementia. It's characterized by problems with memory, language, thinking or judgment [5]. MCI is increasing the risk of dementia or other neurological conditions. But some people with mild cognitive impairment never get worse, and a few eventually get better [6]. Brain is like the rest of your body; it will change as grow older. Many people notice gradually increasing forgetfulness as they age. It may take longer to think of a word or to recall a past or current event in their life. Cognitive issues may go beyond what's expected and indicate possible MCI if the elder have s experienced any or all of the following [6]: forget things more often, forget important events such as appointments or social engagements, feel increasingly overwhelmed by making decisions, planning steps to accomplish a task or understanding instructions, having trouble to find the way around familiar environments. The elderly with MCI had cognitive characteristics similar to the normal elderly who were have general amnesia similar to early dementia, it is difficulty to classify. According to the 2010 Dementia research study in the worldwide, the proportion of MCI is approximately 36.5 million people and increasing to be 65.7, million in the year 2030 [7]. From the Thailand nation survey on 2017, showed that the prevalence of MCI in the older adults ranged from 3.0 to 26.4% [8-9] by the elderly who were have MCI will develop to dementia during 6 months (35.3%) [10]. Conclusion, it is important to prevent and delay the progression of MCI for maintaining a good quality of life in elderly which the cognition function consisted of 6 aspects:

1) attention or concentration 2) learning and memory 3) language use 4) ability to perceive about surrounding environment 5) relational dimension and 6) cognitive management [11]

In Thailand, for evaluating the elderly who were have MCI can be used the Thai mental state examination: TMSE to screen older person whether they have mild cognitive impairment. It was developed by Train the Brain Forum Committee [12]. The TMSE as an instrument to measure the older people whether they had cognitive impairment because it is easy, quick (less than 10 minutes), sensitive, reliable and validated in Thai. The score of less than or equal to 23 points means mild cognitive impairment. According to a literature review about the factors associated with MCI in older patients, there are several factors that are associated with MCI which are older age, lower education status, pre-stroke, cognitive and functional status, and history of diseases as risk factors for MCI [13]. According to the statistical survey, Singburi province has a total of 48,836 elderly people. Older persons have to encounter with several changes in their life physically, physiologically, and psychosocially that could affect their mental condition. The important changes and significant factors contribution to mild cognitive impairment [14].

Brain exercise program is the activity in parts of the brain that have to do with executive function and memory. The brain exercise program had options to improve mental functioning and prevent brain aging [15]. Brain exercise program was to help boost your memory, concentration, and focus can make daily tasks quicker and easier to do, and keep your brain sharp as get older.

However, to reduce the health risk caused to MCI, the brain exercise There is no the brain exercise program designed for completely to maintain or enhance the cognitive function effectively by themselves. Therefore, the brain exercise program (Sing-Cogni-Cise) which integrated promoting knowledge about MCI, building self-care skills along with brain exercise activities such as “brain gym” following six components of TMSE include orientation, registration, attention, calculation, language and recall and based on Atkinson-Shiffrin model [16], memory has 3 components; encoding, storage, and retrieval. The objective of this study was to compare the parameter namely the TMSE score, knowledge about MCI and self-care skill in elderly with MCI between intervention group and control group at baseline and after 3-months of program which the researcher would like to examine the effectively of the brain exercise program (Sing-Cogni-Cise) to increase the cognition function and promoting the better quality of life in elderly population.

II. METHADODOLOGY

This study is a cluster randomized control trial to evaluate the effectiveness of the brain exercise program (Sing-Cogni-Cise) in elderly people with mild cognitive impairment at Singburi province, Thailand for increasing the TMSE score, knowledge of MCI and self-care skill. It was separated in 2 groups: intervention group participants who were received the brain exercise program and control group participants who were received the health educational booklet about MCI. The

data will be collected from 6 May 2020 to 31 December 2020 through an interview and assessment forms. This program was designed to 2 months intervention and 3 months follow-up period and used single- blinded.

Participants: The brain exercise program was chosen the high prevalence of MCI in Thailand which from the provincial health report showed that Singburi province, Thailand is the highest prevalence of MCI [17]. So, the population is the all of 60 years old and older population who were measured by TMSE from 12-23 scores and lived in Singburi province, Thailand at least 6 months. The samples were taken from the 60 years old and older with MCI who are willing to participate in this study. The cluster random sampling technique was used to recruit the respondents as per the inclusion criteria and exclusion criteria consisted of 1.) the participants who had been diagnosed as having dementia (TMSE<12 points) 2.) the participants who had been diagnosed as having mental health disorder including stress, anxiety, depression by medical record 3.) the participant who were received another program in the study time or the previous three months.

A sample size of this study was calculated by the G-power program which using the confidence level was 95% (Error type I= 0.05), allowable error was 5% (0.05) and effect size was 0.80 [18]. After calculation the sample size by G-power program, this study was used 35 samples in each group. The all participants were 70 samples separated by using 1:1 ratio between intervention and control group.

Singburi Province is located at the capital of Thailand,. The Singburi Province proper covers an area of 822.478 sq.mi and it is the rural area which at 20.8 thousand people in 2020 with 4.88 thousand elderly people [19]. Singburi province is consisted of 6 Districts which this study was selected elderly people with MCI in Phromburi District as in intervention and Bangrachan District as in control group by cluster random techniques.

Procedures: The brain exercise program (Sing-Cogni-Cise) is proper stimulation to maintain cognitive capacity and protect they're against future cognitive decline. Lawrence K [20], he was explained that mental decline is not usually from loss of brain cells, but occurs from *loss of* communication between brain cells. He found that by doing the right kind of mental exercise, we can grow new dendritic connections and mentioned that the key to fully exercising your brain is to engage all the senses, sight, sound, touch, taste, and smell. This program consisted of funny and challenging activities or games; it can be turned into a good brain capacity. This program was developed by TMSE aspects; includes orientation, registration, attention, calculation, language and recall. The Sing-Cogni-Cise program was implemented in 2 months intervention and a follow up was used after 3-months.

The Sing-Cogni-Cise program was carried out at elderly school in of each district which is the most convenient and comfortable area for gathering of the participants and is consistent with the campaign of public health policy that is focusing on health promotion activities to improve their health status especially the cognition function. The details of Sing-Cogni-Cise program were designed in 2-months intervention which the researcher will use 1 times/week with 60 minutes a

day. The program was designed to using the regular physical exercise alternate with brain exercise. This program is a combination of multi-components for improving the cognitive functions, understanding on knowledge about mild cognitive impairment and enhancing the self-care skill in elderly people with MCI.

The procedures of the program consisted of the details as follows: 1) the researcher was conducted literature review the theories related to MCI and elderly and the previous study for developing the program for improving cognitive functions. 2.) the researcher developed the program and present to general specialist on MCI for approaching the program detail and suggestion the gap of study for given the completely program. 3.) the researcher was measured the validity by IOC scores was more than 0.70 and the reliability by Cronbach's alpha coefficient was more than 0.80 4.) the researcher was submitted the proposal documents to Human Research Ethics Committee for ethical approval in conducting the research. 5.) the researcher was collaborated with Provincial health office to PR of advertisements for recruiting the participants into the program by using line society, Health office public relations, Facebook and etc. The participants who were wanted to participate by voluntarily. 6.) the researcher will be trained the co-researchers, investigators, health staff team to recognize the detail of the model. This class was used 1 day for training. 7.) After the participants were joined to the program, the researcher was conducted the first meeting for orientation the program focused on explanation the objectives of the study, operations and procedures and the obstacle and benefit of the program. The subjects were explained that they could refuse or withdraw from the study at any time. When the subjects clearly understood the procedure, they were asked to sign the informed consent form or give verbal consent. 8.) First-time meeting before program started, the participants will be received the TMSE score, and they will measure the knowledge about MCI, the socio-demographic data, and self-care skill at the baseline. 9.) The researchers and co-researcher were done the Sing-Cogni-Cise program followed by the process and weekly timeline about program in 6 weeks intervention. 10.) The participant was received 3-months follow-up by measuring the outcome at baseline and 3-months follow-up. They were used the same procedures between intervention and control group. 11.) After finished the 3 months follow-up, the research will recheck the completely of the data collection, instrument and the outcome measuring.

The detail of program was conducted on 6-weeks. The activity of the program was design in difference detail included playing game, role play, singing, demonstration, using role model and etc. as follows:

Week I: The promoting activity on MCI knowledge: “Come on to know with MCI” this activity was designed to improve the knowledge about MCI which were included information on the definition of MCI, nature of MCI, diagnosed of MCI, factors associated or risk to MCI, the effect from MCI condition, treatment and prevent MCI and etc. The activity was applied to use the power point, VDO from the health promotion foundation office after that the participants and moderator will be shared and discussed together and

summarize the way to prevent the problem. Moreover, making the relationship between the participants and researcher by using funny activity and game.

Week II: Drawing picture: this activity was aimed to practice using both hands for drawing picture. The method of this step was used 2 hands to draw geometry picture. The benefit of this activity was managed the capacity of left and right brain side. The second activity was “Guessing important people” The benefit of this activity was to train the recall memory in the past.

Week III: The MCI motivation activity: This activity was aimed to motivate for changing the attitude with brain exercise and risk behaviors enhanced to occur MCI. The activity was used the video media and exchange of knowledge from individual experience. Encourages them to find ideas for starting to practice brain exercise. Moreover, the activity was applied the role model to share the experience and benefit from regularly brain exercise. Finally, there was set the goals to practice the activity for avoiding MCI. As well as the methods to achieve goal by planning on each person.

Week IV: “Throwback activity”. This activity was aimed to memory management which it was opened the song and musician picture after that the participants were guessed what are the name of them. The second activity is “Where is there?”. The activity was given the participant to recall and guessed that what we called on this picture. In addition, they had to know the name of place and given the detail and characteristics of the place which can make the relationship with each other.

Week V: “The Brain Exercise with Song”. This activity was used Medley Brain Gym which the participant had movement the body along with the song such as fingers, knees, legs, neck movement follow the brain exercise step.

Week VI: “Calculation”. This activity was trained to calculate the number for motivating brain system capacity. The second activity is “Close the eyes and Smelling” was aimed to activate the back side of brain. The method was to the participants closed the eyes, touch it or smell and guessed that what is that? The third activity is checkers' game. This game was aimed to activate the left-brain side. And the last activity is Medley Brain Gym which the participant had movement the body along with the song same as week V.

Instruments of this study: The Sing-Cogni-Cise program were used the measurement tool for screening and measuring Socio-demographic data, Cognitive Function and self-care skill. The instruments of this study will use the paper record form and the structural-interview form by face-to-face interviews. The details of this part can describe as follows:

Part I: The Socio-demographic data questionnaire: The total of this part was 8 questions. This part was to record socio-demographic data such as gender, age, marital status, education level, occupation, income sufficiency, living arrangement, caregiver member of elderly club and health problem condition.

Part II: The Family Relationship Evaluation Form: it was used to measure family relationship. It was designed by Chinsangnet, P. [21] based on theory of Friedman [22] and Morrow & Wilson [23] for evaluating feeling and opinion of

older patients regarding family relationship. The instrument was conducted by the interview in multiple aspects such as love and care, interaction among family members, respect among family members, unity among family members and relaxation among family members. The instrument form contained 15 questions consisting of 12 positive questions and 3 negative questions. Each question has 3 answer choices: “Yes”, “Unsure”, and “No”. The score ranged from 15-45 points. The high total scores indicated good family relationship. The scores were rated in three levels as follows: scores 15-26 points represented poor family relationship, scores 27-36 points represented moderate family relationship and scores 37-45 points represented good family relationship.

Part III: Thai Mental State Examination: TMSE; Thai Mental State Examination is the measurement to be used for examining the cognitive impairment in older person It was developed by Train the Brain Forum Committee [12]. This examination is the question and order to practice by dividing into 6 parts as follows: 1.) Orientation 2.) Registration 3.) Attention 4.) Calculation 5.) Language and 6.) Recall. The score of less than or equal to 23 points means mild cognitive impairment.

Part IV: The Modified Barthel Activities of Daily Living Index (MBAI). This instrument was used for measuring or evaluating self-care skill. It was developed by Jitapunkul et al. [24], which was translated and adapted from Mahony and Barthel [25]. The instrument originally consisted of 10 questions for evaluating basic activities such as feeding, personal hygiene, bathing, dressing, stair climbing, defecation control, urination control, toilet use, walking, and moving. It was evaluated through the observation/interview by the researcher. The scores were rated in three levels as follows: 0-8 points was meant older patient had poor self-care skill, 9-11 points was meant older patient had moderate self-care skill and 12-20 points was meant older patient had good self-care skill.

Part V: The Knowledge Questionnaire about Mild cognitive impairment: This study was used the questionnaire from review literature about MCI. The questionnaire is yes or no question consisted of 7 questions. This part will use to access knowledge by face-to-face interview at baseline and 3-months follow up. The scores were rated in three levels based on standard as follows: scores 0-3 (<60%) points represented low knowledge of MCI; scores 18-24 (60-80%) points represented moderate of MCI and scores 25-30 (>80%) points represented high knowledge MCI.

The Sing-Cogni-Cise program was used the standard instruments for measuring the outcomes. The validity was measured by the peer form 3 expert of the model and reporting the IOC values. The IOC was more than 0.5. The reliability was tested in 30 elderly people in other administration region, Singburi which it was not the sampling administration region whose characteristics were similar to those of the samples. The reliability of Cronbach’s alpha coefficient was more than 0.8, it was the acceptable of instruments.

Ethical Considerations: We will submit research proposal for ethical approved to The Ethics Review Committee for Research Involving Human Research Subjects, Health Science

Group. Before interviewing the participant, the researcher and assistance researcher gave clear verbal explanation on the purpose and process of the study. Each participant would also be informed that participation in this study is completely voluntary and they can withdraw at any time and which would not affect them by the treatment term. The informed consent obtained from the participants who were writhing to participate in this study. The welfare of the participant would be protected in this study. The results in this study would be presented on total picture, no identifying information would be gathered and protected the anonymity of the participants.

Statistical Analysis: Demographic data were analyzed by using frequency, percentage, mean, min-max and standard deviation for description the socio-demographic and other factors. The Chi-square test and Pearson’s correlation coefficient were used to estimate baseline characteristics between-group differences. The Kolmogorov-Smirnov Goodness of Fit was used for normality test. The results showed that there was normal distribution in all variables. The main objective was to compare the mean score of TMSE, knowledge of MCI and Self-care skill between intervention and control group at the baseline and 3-months follow-up. Data were analyzed with independent t-test used for comparison at baseline and after 3-month intervention. The significance level of this study was defined at 0.05.

III. RESULTS

A total number of 70 participants were consisted to 35 participants of intervention group and 35 participants of control group. The socio-demographic and economic data and outcome variable were similar between both group and shown in table 1 ($p>0.05$). The results showed that the general characteristics of the participants and found that a total number of 70 participants were 69. 69.1 ± 7.10 years old and the participants were female more than male (77.1% and 22.9%, respectively). The majority of the samples were married (68.6%) followed by widowed/separated and single (18.6% and 15.7, respectively). Most of them finished primary school (55.7%) followed by uneducated and graduated on secondary school (24.3% and 20.0%). Their occupational who were agriculturist followed by unemployed and merchants (38.5%, 32.9% and 28.6%, respectively) with 90% of them had member of elderly club. When considering the income, the majority of samples had insufficiency of income (%) and major income source came from their children (47.7%), followed by pension and saving (40.0% and 8.0% respectively). They mostly had sufficiency of family income (60.0%). They mostly had moderated/poor family relationships (64.3%) followed by poor family (35.7%). The majority of the elderly people had diseases/ health problems. Frequent diseases were hypertension, followed by dyslipidemia, diabetes, Peptic Ulcer/dyspepsia and osteoarthritis (64.4%, 33.2% and 32.4%, respectively). (see TABLE 1)

TABLE 1 Socio-demographic and economic characteristics and variables at the baseline and 3-months intervention between intervention and control, p-value=0.05.

Variables	Total	Intervention group	Control group	p-value
Age (Years)				
Mean± SD.	69.1±7.10	71.8±6.69	67.9±7.23	0.453
Gender				
Female	54 (77.1%)	30 (85.7%)	24 (68.6%)	0.090
Male	16 (22.9%)	5 (14.3%)	11 (31.4%)	
Marital status				
Married	48 (68.6%)	24 (68.6%)	22 (62.9%)	0.882
Widowed / Separated	13 (18.6%)	8 (22.8%)	5 (14.2%)	
Single	11 (15.7%)	3 (8.6%)	8 (22.9%)	
Educational Level				
No Education	17 (24.3%)	10 (28.5%)	7 (20.0%)	0.298
Primary School	39 (55.7%)	16 (45.7%)	23 (65.7%)	
Secondary School	14 (20.0%)	9 (25.7%)	5 (13.3%)	
Occupational				
Unemployed	23 (32.9%)	8 (22.9%)	15 (42.8%)	0.078
Merchants	20 (28.6%)	10 (28.6%)	10 (28.6%)	
Agriculturist	27 (38.5%)	17 (48.5%)	10 (28.6%)	
Member of Elderly Club				
Yes	63 (90.0%)	33 (94.3%)	30 (85.7%)	0.210
No	7 (10.0%)	2 (5.7%)	5 (14.3%)	
Caregiver				
Yes	63 (90.0%)	33 (94.3%)	30 (85.7%)	0.309
No	7 (10.0%)	2 (5.7%)	5 (14.3%)	
Income Sufficiently				
Yes	28 (40.0%)	16 (45.7%)	12 (34.3%)	0.566
No	42 (60.0%)	19 (54.3%)	23 (65.7%)	
Health problem*				
Hypertension	50 (71.4%)	22(62.9%)	28 (80.0%)	0.632
Dyslipidemia	25 (35.7%)	15 (42.7%)	10 (28.6%)	
Diabetes	21 (30.0%)	12 (34.3%)	9 (25.7%)	
Peptic Ulcer/dyspepsia	10 (18.6%)	8 (22.8%)	5 (14.3%)	
Osteoarthritis	8 (11.4%)	5 (14.3%)	3 (8.6%)	
No Co-morbidity	7 (10.0%)	3 (8.6%)	4 (11.4%)	
Family Relationship				
Poor	25 (35.7%)	14 (40.0%)	11(31.4%)	0.422
Moderate/good	45 (64.3%)	21 (60.0%)	24(68.6%)	

Data were analyzed with Chi-square test and independent t-test. *Statistically significant level at the 0.05 level (p<0.05).

The mean change of all parameters (mean± SD.) within group and between group after 3-months intervention program were compared, the results showed that 2-parameter (TMSE scores (p<0.001), knowledge of mild cognitive impairment (p<0.001)) between the intervention group and control group increased significantly, 1 parameter (self-care skill) was decreased but it was not significant (p=0.373) between 2-group.

TABLE 2. Mean difference of all parameter between intervention and control group by using independent t-test, p-value= 0.05.

Variable	Baseline (Mean± SD.)	3-months Intervention (Mean± SD.)	p-value (a)
TMSE score			
Intervention group	20.97± 1.80	29.48± 0.56	<0.001*
Control group	19.85± 2.26	28.62± 0.97	<0.001*
p-value (b)	0.076	<0.001*	
Knowledge about MCI			
Intervention group	4.85± 1.48	6.97± 0.16	<0.001*
Control group	4.28± 1.93	6.20± 0.86	<0.001*
p-value (b)	0.165	<0.001*	
Self-care skill			
Intervention group	17.65± 2.46	17.88± 2.20	0.453
Control group	16.97± 2.14	17.45± 1.91	0.090
p-value (b)	0.219	0.373	

REMARK: Data were analyzed with paired sample t-test within group (p-value (a)) and independent t-test between group (p-value (b)) *Statistically significant at the 0.05 level p-value<0.05.

The comparison of all the parameters (mean± SD.) within the intervention group found that the TMSE score was at 20.97± 1.80 and increased significantly to 29.48± 0.56 (p<0.001). The knowledge about mild cognitive impairment (MCI) score was at 4.85± 1.48 increased significantly to 6.97± 0.16 (p<0.001). The comparison of all the parameters (mean± SD.) within the control group found that the TMSE score was at 19.85± 2.26 and increased significantly to 28.62± 0.97 (p<0.001). The knowledge about mild cognitive impairment (MCI) score was at 4.28± 1.93 increased significantly to 6.20± 0.86 (p<0.001) but the self-care skill factor within the intervention and within control group was not significant (p>0.05).

IV. DISCUSSION

The study design was cluster-randomized control trial. This program was designed to increase the TMSE score, knowledge of MCI and self-care and to prevent risks of dementia. The brain exercise program (Sing-Cogni-Cise) is proper stimulation to maintain cognitive capacity and protect them against future cognitive decline. This program consisted of funny and challenging activities or games; it can be turned into a good brain capacity. This program was developed by TMSE aspects; includes orientation, registration, attention, calculation, language and recall. The Sing-Cogni-Cise program was implemented in 2 months intervention and a follow up was used after 3-months. The program was designed to use the regular physical exercise alternate with brain exercise. This program is a combination of multi-components for improving the cognitive functions, understanding on knowledge about mild cognitive impairment and enhancing the self-care skill in elderly people with MCI. The majority of the samples were aged range 60-69 years old (61.4%) with female (77.1). At baseline measure, they mostly had the TMSE score was at 20.97± 1.80 of intervention group and had the TMSE score was at 19.85± 2.26 of control group. In addition, after 3-months intervention program, they mostly had TMSE score was at 29.48± 0.56 in the intervention group and had the TMSE score was at 28.62± 0.97 in the control group. The mean change of TMSE score (mean± SD.) between group after 3-months intervention program were compared, the results showed that increased significantly (p<0.001). This finding might explain that; firstly, the majority of the older patients in the community had several comorbid diseases or health problems. It was found that 95.0% of older patients had more than one disease and they mostly had comorbid diseases or health problems more than five diseases (32.8%), followed by three diseases and four diseases (26.0% and 21.8%). Secondly, mild cognitive impairment is likely to occur as the elderly age and most often found in the age of 60 years and over. They mostly had few interests about their health status. Therefore, if the elderly people were trained to exercise the brain properly, have fun in their life, and having to intention on brain exercise, this can lead to improve the cognitive function or improve the TMSE score and prevent to risky of dementia. The result is consistent with the study of Wannakam, P. [14] whose study was the effectiveness of holistic care program for elderly risky for

dementia. It was found that the comparison of cognitive score between group was increased significantly after they were joined with program ($p < 0.001$).

The knowledge about mild cognitive impairment (MCI) was significantly differences between intervention and control group at the baseline and after 3-months intervention. The result is consistent with the study of Undara, W [26] whose study dementia, knowledge and prevention of dementia and mild cognitive impairment in elderly association of Royal Thai air force nursing college. The study found that knowledge was significantly associated to dementia and mild cognitive impairment in elderly people ($p < 0.001$). It could be explained that they mostly had moderate level of knowledge about MCI at the baseline and increasing to be high level after 3 months intervention for intervention group. This finding might explain that when the elderly had the proper knowledge about MCI and preventive of dementia and MCI to help the elderly people had the good behavioral to take care their health status and decision to express their appropriately health behavior [27]. It is association with studies from department of mental health [28]. Whose studies guidelines of caring for the elderly with dementia and mild cognitive impairment. This study found that appropriate food taken into choosing healthy food can help the elderly to face dementia and MCI. Therefore, avoid smoking and alcoholic beverages, getting enough rest, stress relief, use of thought and participation in social activities can stimulate brain motor and nerve. It is classified as primary prevention of dementia and MCI. For secondary prevention, the screening for elderly people with mild cognitive impairment to delay Alzheimer's Disease [29]. In addition, regularly brain exercise with 30 minutes at least 3 times/week will reduce the risk to dementia [30].

The self-care skill was not significantly difference for intervention group at the baseline and after 3-months ($p > 0.05$). According to the study, it was found that the majority of the older patients had good/moderate functional ability (64.3%). It could be explained that when older change developed in many aspects simultaneously, especially in physical changes. It results in the impairment of performance in the body system, which leads to the functional ability. As a result, it could affect the thoughts that older process makes them have less ability. Furthermore, the older patients may have reduced functional ability which is caused by their illnesses such as heart disease. The finding may be explained that when the older patients had stroke, they would have symptoms of muscle weakness, problems with balance and communications, numbness or pain on one side, tiredness easily as well as having trouble swallowing, inability to control urine or feces and might be immobilized. Thus, the patient loses the ability to perform various functions as well as loses the ability to perform daily activities. In addition, the functional ability in their living life will change, it should take a long time to change. This program was conducted into 6 weeks intervention and was used 3-months follow-up. It is difficult to express the changing of functional ability effect. This finding was associated to Piyaphon, P. [11] whose study factors to associated with mild cognitive impairment among the elderly in ChingRai Province. The results found that the elderly with

MCI were able to perform the functional ability both of basic activity daily living (BADL) and instrumental activity daily living (IADL).

V. LIMITATIONS AND RECOMMENDATIONS

This study had the recommendations of implication for clinical practice. Firstly, this intervention (Sing-Cogni-Cise) was effectively to implement for brain management program among elderly people with mild cognitive impairment and can be used for managing health care status and prevent the risk to develop dementia in the future. In addition, the recommendation of future study should be extended from 3-months follow-up to be 6-months follow-up to measure fitness more clearly. Secondly, the future study should study and add the confounding factors including health behavior affecting to mild cognitive impairment, drug taken, co-morbidity and etc. Thirdly, the next research should be used other measuring tool to compare the results from each tool and compared the accuracy of result. This study had some limitation. Firstly, they mostly had low education and income. The majority of the participants was the early elderly group, it should set the proportion of early, middle and late of elderly group. Secondly, this study did not recruit the participants from the general population but only specific group of mild cognitive impairment in rural population were selected. Thirdly, whether it is possible to conduct this research at the rural area whose rural lifestyle limit free time to do brain exercise program because of they must to do the occupation and had limitation on low education.

VI. CONCLUSION

This study which used the intervention program and the parameter including TMSE score, was one of the few studies conducted in community-based population in Thailand which mostly had conducted on hospital-based population. All the parameter chosen in this study were proven to be precise and accurate to identify the health status of the participants. The intervention program was effective in significantly reducing the TMSE score and knowledge of mild cognitive impairment and is suitable for individual brain exercise without the equipment since it can be performed in a limited space anywhere.

ACKNOWLEDGMENT

The researcher is grateful to all the part for their willing participation in the study. The author would like to express the gratitude to the Head of SingBuri Province Office and health staff from the primary health care unit at Phomburi and Bangrachan districts and co-researcher for collaborating the conveniences and consolations. Moreover, the researcher would like to thankful the statistician for helping to analyze the data and parameter of this study.

REFERENCES

- [1] Institute for Population and Social Research. "Mahidol population gazette. Bangkok", 2020.
- [2] Foundation of Thai Gerontology Research and Development Institute. "Situation of the Thai elderly 2020", Bangkok, 2020.

- [3] National Statistical Office. "Report on the 2019 survey of older person in Thailand", 2019.
- [4] Siripanich, B. "Thailand elderly", Moh-chao-Ban Publishing House, Bangkok, 2001.
- [5] Jitima, D. and Siriphan, S. "Effect of Thinking Training Program on Cognitive Function of Function of Patients with Critical Thinking in Government Nursing Home". *Journal of Police Nurses*, vol 10, issue 1, pp. 12-20, 2019.
- [6] Jintapitch, K. and Soraphat, H. "Effect of Characterization activities on River Rock to ability of brain management among elderly with mild cognitive impairment in Brian Training Center, Chulalongkorn University". *Chulalongkorn Medical Journal*, vol 1, issue 6, pp. 581-592, 2019.
- [7] Chaimongkol, S., et al. "Effects of the Cognitive Rehabilitation Program of the Elderly Risk of brain impairment in Wang Hin, Tha Phra Sub-district, Mueang District, Khon Kaen Province". *Journal of Health Sciences and Community Public Health*, vol 1 issue 1, pp. 94-105, 2018.
- [8] Natcha, R., et al. "Effects of Brain Potential Development Program on Cognitive Function in Older Persons with Cognitive Disorder". *Journal of Nursing and Health Care*, vol 36, issue 2, pp. 114-122, 2018.
- [9] Tasanee K., et al. "Health status of elderly with cognitive impairment". *Journal of Nursing Council*, vol 34, issue 1, pp. 104-121, 2019.
- [10] Phannathat, T., et al. "Prevalence and Factors associated to Cognitive Impairment among Older Persons in Rural District, Khon Kaen Province". *WICHCHA Journal*, vol 38, issue 2, pp. 64-79, 2019.
- [11] Piyaphon, P. "Factors Associated to Mild Cognitive Impairment in elderly at ChiangRai Province". *Journal of the Nursing Council*, vol 32, issue 1, pp. 64-80, 2017.
- [12] Train the Brain Forum Committee. "Thai Mental State Examination (TMSE)". *Siriraj Medical Journal*, vol 45, pp. 359-374, 1993.
- [13] Panthiva, K. "Cognitive Status, Cognitive Thinking and Memory of The Elderly". *Journal of MCU Humanities*, vol 5, issue 1, pp 64-71, 2019
- [14] Pitsamai, W., et al. "Effectiveness of Holistic Health Care Programs among Elderly with Mild cognitive impairment". *Journal of Health Research and Nursing*, vol 35, issue 3, pp. 1-12, 2019.
- [15] Phaijit, P., et al. "Effects of Cognitive Stimulation Program on Cognitive Ability and Perform Activity daily Life among Elderly with Mild Cognitive impairment". *Journal of the Southern College of Nursing and Public Health Networks*, vol 7, issue 1, pp. 270-280, 2020.
- [16] Atkinson, R.C., & Shiffrin, R. M. "Chapter: Human memory: A proposed system and its control processes". *Academic Press Journal*, vol 2, pp. 89-195, 1968.
- [17] Skawanet, S. and Wanlapa, A. "Effects of Group Activity to Promote Awareness and Knowledge about Mild cognitive Impairment among Elderly with Mild Cognitive Impairment". *HCU Journal of health Science*, vol 22, issue 3, pp. 166-179, 2020.
- [18] Sawitree, J., et al. "Effects of Cognitive Stimulation Program on Cognitive Performance in Memory in the Elderly with Mild Cognitive Impairment". *Journal of the Faculty of Nursing, Burapha University*, vol 26, issue 2, pp. 30-39, 2018.
- [19] SingBuri Provincial Health Office. "Population Statistic in SingBuri Province", SingBuri, 2020.
- [20] Lawrence, K. "Cognitive Training and Transcranial Direct Current Stimulation for Mild Cognitive Impairment in Parkinson's Disease: A Randomized Controlled Trial". *Parkinson's Disease Journal, Special issue*, pp. 1-12, 2018.
- [21] Chinsangnet, P. "Life Satisfaction of the elderly and Its Relation with Self-care Behaviors and the Family Relationship in Eastern Seaboard of ChonBuri Province". M.S. thesis, Mahidol University, 1995.
- [22] Friedman, M.M. "Family nursing: Theory and Assessment". Appleton-Century Craft, New York, 1986.
- [23] Morrow, W.R. and Wilson, R.C. "Family relation of bright high-achieving and under achieving high school boy". *Child Development*, vol 32, pp. 501-510, 1961.
- [24] Jitapankul, S., et al. "The Validity and Factors analysis of the geriatric Depression Scale using in Thai Elderly". *Chulalongkorn Medical Journal*, vol 38, pp. 383-389, 1994.
- [25] Mahony, F.J. and Barthel, D.W. "Functional evaluation: The Barthel Index". *Maryland State Medical Journal*, vol 14, pp. 61-65, 1965.
- [26] Undara, W. "Dementia, Knowledge and Prevention of Dementia and Mild Cognitive Impairment in Elderly Association of Royal Thai Air Force Nursing College". *Journal of the Police Nurse*, vol 8, issue 1, pp. 23-33, 2016.
- [27] Jirapongsuwan, A. and Sawangpol, P. "Factors Related to Self-Care Behaviors of Patients with Diabetes in Lardlumkaew Hospital, Laedlumkaew, Pathumthani Province". *Journal of Public Health and Development*, vol 9, issue 2, pp. 130-142, 2011.
- [28] Department of Mental Health. "Mental Health and Psychiatric Articles: 10 ways to escape the dementia". *Healthy Today Magazine*, vol 10, issue 118, pp. 22, 2011.
- [29] Weerasak, M. "Internal Medicine: Care of Dementia Patients". Moh-chao-Ban Publishing House. Bangkok, 2009.