

## Research Article

## THE STUDY OF PHYSICAL ACTIVITY THROUGH GAMES TO PREVENT ELDERLY PEOPLE FROM DEMENTIA OF WAT PHRIK COMMUNITY IN PHITSANULOK

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**Abstract**

The study of physical activity through games to prevent elderly people from dementia of Wat Phrik Community in Phitsanulok was an experimental research. The objectives were 1) to examine physical activity through games to prevent elderly people from dementia and 2) to survey the satisfaction of the use of physical activity through games to prevent elderly people from dementia. The volunteer sampling was used to get 37 elders of Wat Phrik Community in Phitsanulok. The research instruments consisted of 1) a test of physical activity training through the use of games to prevent dementia and 2) a questionnaire on elderly people's satisfaction with applying games to prevent dementia. The data analysis was calculated through mean, standard deviation, and dependent t-test. The findings revealed that the post-test score of using games to prevent elderly people from dementia was higher than the pre-test score at a .05 level of statistical significance. Additionally, the elderly people were satisfied with the use of physical activity through games to prevent dementia, with the average score at a high level ( $\bar{X} = 4.33$ ,  $SD = 0.42$ ).

**Keywords:** Physical Activity, Games, Dementia, Elderly People

**Statement of the Problems**

National Strategy 20 years 2018-2037, devised by National Strategy Secretariat Office (2018), has specified the Strategy for Human Capital Development and Strengthening. This aims to develop Thai people of all ages in a multidimensional manner to become good, skillful, and quality citizens. It also prepares Thai people and society to serve as a strong foundation for the country with physical, mental, intelligent readiness, and internationalization. The vital frameworks are to promote the development of human potential throughout life, to support the growth of the country, to promote good health, and to enhance the well-being and happiness of Thai families. It results in economic and social development nationally, respectively. This corresponds to the Twelfth National Economic and Social Development Plan 2017-2021 formulated by Office of the National Economic and Social Development Board (2016), concerning "Sustainable Development" through the use of "People-Centered Development" to serve as "Strengthening and Developing the Potential

of Human Capital as well as Reducing Inequality". The aims are to reduce health risk factors and encourage people to gain good health behaviors: in other words; to promote the development of understanding in health care, and to improve exercise forms and adequate diet for people of all ages. This corresponds to the Sixth National Sports Development Plan 2017-2021, prepared by Office of the Permanent Secretary, Ministry of Tourism and Sports (2017), in Strategy 2 that encouraging people of all groups, genders, and ages to exercise and participate in sports activities to enhance physical activity. Exercising or playing sports will improve health, lower medical costs, reduce social problems, and aid in the treatment of drug addiction. As Thailand is becoming an aging society, access opportunity is available for exercise and sports activities, and all groups of people are provided with infrastructure and facilities thoroughly, including senior citizens. Presently, the elderly ratio (aged 60 years and over) of the population in Thailand is as high as 10.7%, considering Thailand has been an aging society. According to the Statistics Registration Systems of the Department of Provincial Administration, the growth rate of elderly people in 2017 increased by 1.51% compared to the number of elders in 2016. Based on the basic information of elderly schools in Phitsanulok, most elders were faced with chronic diseases, including high blood pressure, diabetes, memory loss, and behavior change. These problems corresponded to Tanasukarn and Neelapaichit (2016)'s survey of health literacy of patients with high blood pressure and diabetes in Tak, Phitsanulok, Phetchabun, and Uttaradit. The findings revealed that 14.8% of patients with high blood pressure, diabetes, memory loss, and behavior changes passed access skills but were unable to cope with their own health issues. To overcome those problems, they also needed a future potential development for themselves in terms of preventing and controlling chronic diseases. Thus, memory loss and behavior change in elderly people were considered a part of the chronic diseases resulting in dementia that might happen in the future. Dementia also causes a loss of awareness, intelligence, thought, and decision-making abilities. Moreover, memory issues and behavioral changes are two of the most common difficulties seen in dementia patients. Short-term memory loss will occur first in elder people, followed by long-term memory loss. Regarding the memory loss, it can be a concern for caregivers, leading to arguments, paranoia, and hostile behavior among family members. Another case is forgetting because elder people usually ask or do activities. Since memory loss can cause annoyance, anxiety to caregivers, and common problems such as the loss of ability to care for oneself, doing daily routines, as well as the ability to make decisions, caregivers and families are put under a lot of pressure to keep an eye on elders to prevent accidents. The aforementioned issues have a wide range of consequences for both the elderly and their caregivers, particularly mental health, as they can cause stress and depression.

Dementia in elderly people can be caused by several factors such as smoking, diabetes, current occupation, low participation in social activities, and age. To be more precise, smoking increased the risk of dementia in elderly women by 7.7 times compared to non-smokers. Elderly women with diabetes had a 2.5-fold higher risk than those without diabetes. Unemployed employees had a 2.3-fold higher risk of dementia than employed workers. Over 2.2 times of low social participation had risk of dementia with statistical significance. Furthermore, people over the age of 70 had a 2.2 times higher risk of dementia than those under the age of 70 (Panakorn et al, 2015). People suffering from this condition needed a variety of treatments,

including brain tonics, modifying thoughts and behaviors, electroshock, reminiscing activities, enhancing memory, relaxation, and exercise. These treatments not only reduced the agony of the elderly but also improved their memory and cognitive abilities. However, there appeared to be no cure for dementia. Nowadays, there are a few ways to slow down dementia to minimize memory loss. The proper brain activation allows elders to have a better memory although they get older. Brain activation is considered a guideline for improving memory more efficiently and slowing down memory change. As a result, the elderly were able to assist themselves as long as possible and had a better quality of life.

Most of the research studies on how to keep elders fit and healthy has been conducted, and exercise is one of the significant elements to maintain strength. A light exercise for elderly people is physical activity in which the muscles are used for the movement or partial body functions as well as higher energy metabolism than at rest. Examples of physical activity are carrying things, house working, walking, cycling, and doing recreational activity. Saejiw (2016) stated that most physical activities of elders were related to working. There are some recreational activities, and the sedentary activities took 3.31 hours a day. It found that cardiorespiratory endurance, as well as muscle strength and agility, was in the norms. The upper-body flexibility and body mass index were below the norms. Only flexibility of lower-body was above the norms. Thus, elderly people should be encouraged to engage in physical activity to have better physical fitness. Furthermore, dementia would be reduced if physical activity and brain activation were exercised together.

Recognizing the significance of slowing down dementia, the researchers sought a way to increase memory by designing physical activities and brain exercise games. Furthermore, the researchers intended to develop methods to suit the lifestyles of the senior citizens in Phitsanulok. The physical activities and brain exercise games were designed to prevent elderly people in Phitsanulok from dementia, as well as brain activation was applied to increase memory in the elderly with mild cognitive impairment. As a result, elders in Phitsanulok would have better memory, be able to perform everyday tasks properly, and adapted to live in the community appropriately.

## **Research Objectives**

1. To examine physical activity through games to prevent elderly people of Wat Phrik in Phitsanulok from dementia.
2. To survey the satisfaction of the use of physical activity through games to prevent elderly people of Wat Phrik in Phitsanulok from dementia.

## **Scope of Study**

The study of physical activity through games to prevent elderly people from dementia of Wat Phrik Community in Phitsanulok was experimental research.

### **Population scope**

The population of the study was 120 senior citizens of Wat Phrik in Phitsanulok, and the volunteer sampling was used to get 37 elderly people.

### Variable scope

1. Independent variable was the use of physical activity through games to prevent the elderly from dementia.

2. Dependent variables were as follows:

2.1 The results of using physical activity through games to prevent dementia in the elderly.

2.2 The satisfaction on applying physical activity through games to prevent dementia in the elderly.

### Content scope

The content used in the study was exercise and stretching. It mainly focused on the movement of different parts of the body and the functioning of the skeletal muscles, which resulted in energy metabolism. Brain exercise games contained content for brain activation, especially the corpus callosum, which connects two hemispheres of the brain, information transferring and learning of the two hemispheres, and games used to sharpen the brain to slow dementia.

### Research Instruments

1. Physical activity through games to prevent the elderly from dementia was divided into three topics. The following were the procedures for creating and finding the quality.

1.1 Study and review the literature about physical activities and games, stretching, principles, concepts, theories about designing physical training activity, brain activation, and games to prevent dementia.

1.2 Create and develop physical training activity on the movement or functioning of different parts of the body by using the skeletal muscles, resulting in a higher rate of energy metabolism than at rest. Stretching exercises for the elderly are basic, straightforward, and are usually performed while lying on the floor, which can be a soft carpet. The stretching exercises take about 10 minutes by starting with a standing position, and the parts of the body used include the neck, shoulders, back, and thighs.

1.3 The details of brain activation are as follows: Exercising under the part of the brain control, especially the corpus callosum nerve group, which connects the two hemispheres to coordinate strength and work fluently. Moreover, the exercises allow the information transfer and learning of the two hemispheres to be balanced, effective, and relax the tension, resulting in the mental state to be ready to learn. The brain waves affect a sense of humor by slowing down the Beta wave to the Alpha wave, the state in which the brain works most efficiently. The exercises of brain button and cross crawl are used in brain activation.

1.4 Specify the details of the brain exercise game such as its name and format. Brain exercise games are available in five different formats, including photo hunt game, Sudoku, Math plus puzzle game, maze games, and card matching game.

1.5 The games were calculated to get the qualitative data by three experts, including the experts of physical activity, brain exercise activity, and the content expert, to evaluate the physical activity through games to prevent dementia. The results showed that the games were suitable at a high level ( $\bar{X}$  = 4.34, SD = 0.15).

2. The schedule of physical activity through the use of games to prevent dementia was eight weeks and an hour per each, as follows:

2.1 Train the physical activity with stretching exercises for 30 minutes. The concept and theory were adopted from Khantharattanakun (2017) and Suphuttada (2016), alternating six exercises per week.

2.2 Train the brain activation for 15 minutes. The concept and theory of the exercises of the brain button, temporal button, auricle button and cross crawl adopted from Anothaisinthawee (2015).

2.3 Practice 15 minutes of brain exercise games on smartphones in line with the schedule.

The Item-Objective Congruence Index (IOC) of the learning management plan was used to assess the quality of the learning plan. Three experts evaluated the Item-Objective Congruence Index: a physical activity expert, a brain training activity expert, and a content expert. Item-Objective Congruence ranged from 0.67 to 1.00. In addition, the test was updated in accordance with the recommendations of the experts. For example, the text size was increased, as well as the clarity of the images, so that the content could be seen well.

3. The test of physical activity through games to prevent dementia was implemented. To test memorization, the test was to match the 15 pairs of 30 cards, alternating cards and placing them in a 5\*6 row. The test was examined by three experts who were qualified for physical activity as well as competence in content and research. The results obtained from the experts were analyzed to find the average of the questions, selecting the items with the Item-Objective Congruence Index of 0.50 or above. The Item-Objective Congruence obtained from the three content experts ranged from 0.67 to 1.00. In addition, the test was developed in line with the experts' advice. For example, the test should have both easiness and difficulty as well as the testing procedure.

4. The questionnaire on elderly people's satisfaction with applying games to prevent dementia was divided into five components, including guest speakers, physical activities, brain exercise games, timing, and application. The questionnaire was analyzed with a five-point Likert scale (very satisfied, satisfied, neutral, dissatisfied, and very dissatisfied). The three experts investigated the Item-Objective Congruence Index (IOC) to consider and suggest the use of language, clarity, and suitability. The questionnaire was consistent with the Item-Objective Congruence ranged from 0.67 to 1.00. As a result, the satisfaction questionnaire was considered appropriate, clear, and comprehensive.

## Data Collection

1. The elderly people were asked to do the pre-test of physical activity through games to prevent dementia.

2. Physical activity was implemented by the use of games to prevent the elderly from dementia for eight weeks and a week per hour. The following was the activity training schedule.

**Table 1** The schedule for physical training activity through games to prevent the elderly from dementia

Week	Activities	Time	Note
1	1. The elderly people were asked to do the pre-test of physical activity through games to prevent dementia.	20 min	
	2. Stretching exercises such as neck stretch, back stretch, seated knee raise, standing calf stretch, hip extension, and hip flexion	30 min	
	3. Brain activation - The exercises of the brain button, temporal button, and auricle button - Cross crawl (finger counting to 10 interchange)	15 min	
	4. Brain exercise games - Photo hunt game	15 min	
2	1. Stretching exercises such as plantar flexion, knee extension, knee flexion, side leg raise, hip extension, and hip flexion	30 min	
	2. Brain activation - The exercises of the brain button, temporal button, and auricle button - Cross crawl (L posture)	15 min	
	3. Brain exercise games - Sudoku 1	15 min	
3	1. Stretching exercises such as neck stretch, back stretch, seated knee raise, standing calf stretch, hip extension, and hip flexion	30 min	
	2. Brain activation - The exercises of the brain button, temporal button, and auricle button - Cross crawl (the pinky thumb flip)	15 min	
	3. Brain exercise games - Sudoku 2	15 min	
4	1. Stretching exercises such as plantar flexion, knee extension, knee flexion, side leg raise, hip extension, and hip flexion	30 min	
	2. Brain activation - The exercises of the brain button, temporal button, and auricle button - Cross crawl (touch nose, pinch ear/the nose knows)	15 min	
	3. Brain exercise games - Math plus puzzle game	15 min	
5	1. Stretching exercises such as neck stretch, back stretch, seated knee raise, standing calf stretch, hip extension, and hip flexion	30 min	
	2. Brain activation - The exercises of the brain button, temporal button, and auricle button - Cross crawl (the pinky thumb flip)	15 min	
	3. Brain exercise games - Maze game 1	15 min	

Week	Activities	Time	Note
6	1. Stretching exercises such as plantar flexion, knee extension, knee flexion, side leg raise, hip extension, and hip flexion	30 min	
	2. Brain activation - The exercises of the brain button, temporal button, and auricle button - Cross crawl (ear acupressure)	15 min	
	3. Brain exercise games - Maze game 2	15 min	
7	1. Stretching exercises such as neck stretch, back stretch, seated knee raise, standing calf stretch, hip extension, and hip flexion	30 min	
	2. Brain activation - The exercises of the brain button, temporal button, and auricle button - Cross crawl (finger counting to 10 interchange and L posture)	15 min	
	3. Brain exercise games - Card matching game 1	15 min	
8	1. Stretching exercises such as plantar flexion, knee extension, knee flexion, side leg raise, hip extension, and hip flexion	30 min	
	2. Brain activation - The exercises of the brain button, temporal button, and auricle button - Cross crawl (ear acupressure)	15 min	
	3. Brain exercise games - Card matching game 2	15 min	
	4. The elderly people were asked to do the post-test of physical activity through games to prevent dementia.	20 min	

2.1 The researchers advised the elderly on regulations of training the physical activity through the use of games to prevent dementia in the elderly.

2.2 The elderly began training the physical activity with stretching their muscles in various positions for 30 minutes in line with the training schedule.

2.3 The elderly began doing brain activation activities such as the brain button, temporal button, auricle button, and cross crawl for 15 minutes in accordance with the training schedule.

2.4 In brain exercise games, the smartphone was used. The elderly people could choose to play a game under the rules and regulations for each game for 15 minutes in line with the schedule. Moreover, they could play unlimitedly after engaging in the activity. The objectives of five games were as follows:

2.4.1 Photo hunt game is a game that can be played by all ages. This game allows the elderly to improve their observation, resulting in the brain being awake. It also assists them to see new aspects through observation.

2.4.2 Sudoku stands for "Sujiwadokushinnikagiru" meaning that "numbers must have only one". It is a puzzle game in the form of a number table. The elderly had to fill in the blank grid with

the numbers 1-9, and a number was given the table as a hint. The rule is that each row, column and square (9 spaces each) needs to be filled out with the numbers 1-9, without repeating any numbers within the row, column or square. This game is excellent for their brain training. Additionally, both book formats and applications of the Sudoku game are available.

2.4.3 Math plus puzzle game is a simple mental Math calculation to improve carefulness and memory. For the item that cannot be done, the elderly can skip doing another item. This game can be found in Math game books, computer games, and online games or applications, such as Math Workout, Einstein Math Academy, or Brain Training.

2.4.4 Maze game is played by the players drawing a line to find the exit of the maze. This game is not only for children to enjoy but adults can also play to develop planning and spatial abilities.

2.4.5 Card matching game is a game that requires observation and memorization. The game starts from an easy to difficult level that starts from 2,4,8,16,32 and 64 cards respectively. They choose two cards at a time and attempt to locate two identical cards. If it's not a pair, the cards will be turned over. They continues until all the cards are matched and count the points. The number of times that the fewest cards are shown will get the highest points.

3. Once the elderly participated in the activities, they were asked to complete the post-test through the use of games to prevent dementia.

4. In addition to the post-test, they were asked to complete the questionnaire on elderly people's satisfaction with applying games to prevent dementia.

5. The data gained from the elderly people was calculated and analyzed through the use of computer programmer such as mean, standard deviation, and dependent t-test. Finally, the research study was delivered as an oral presentation.

## Data Analysis

1. Analyzed the differences between the findings of pre-test and the post-test scores of the use of games to prevent elderly people from dementia with a mean and standard deviation.

2. Analyzed the elderly's satisfaction through the use of games to prevent dementia with a mean and standard deviation.

## Conclusion

1. The findings revealed that the average mean score of the pre-test through the use of games to prevent the elderly from dementia was 37.34 while the average mean score of the post-test was 62.97. It can be concluded that the post-test score was higher than the pre-test score.

**Table 2** The mean, standard deviation, and t-test of the pre-test and post-test score through the use of games to prevent the senior citizens of Wat Phrik community in Phitsanulok from dementia (n=37)

Results	$\bar{X}$	SD	t-test
Pre-test	37.34	13.59	12.591*
Post-test	62.97	14.37	

\*p &lt; .05

As shown in Table 2, the average score of the pre-test through the use of games to prevent the elderly from dementia was ( $\bar{X} = 37.34$ , SD = 13.59) whereas the average score of the post-test was ( $\bar{X} = 62.97$ , SD = 14.37). The findings revealed that the post-test score of using games to prevent elderly people from dementia was higher than the pre-test score at a .05 level of statistical significance.

2. The findings revealed that the elderly people were satisfied with the use of physical activity through games to prevent dementia in the elderly, with the overall score at a high level. ( $\bar{X} = 4.33$ , SD = 0.42).

**Table 3** The questionnaire of the satisfaction on applying games to prevent dementia of the elderly people of Wat Phrik community in Phitsanulok

Items	$\bar{X}$	SD	Level
1. Guest speakers	4.37	0.44	High
2. Physical activities	4.35	0.38	High
3. Brain exercise games	4.32	0.50	High
4. Timing	4.30	0.12	High
5. Application	4.35	0.60	High
<b>Average score</b>	<b>4.33</b>	<b>0.42</b>	<b>High</b>

As shown in Table 3, the elderly people of Wat Phrik community in Phitsanulok were satisfied with the use of physical activity through games to prevent dementia in the elderly, with an average score of ( $\bar{X} = 4.33$ , S.D. = 0.42). To be more specific, the experts had a highest average score ( $\bar{X} = 4.37$ , S.D. = 0.44). The physical activities and the application were the second and third highest average score of ( $\bar{X} = 4.35$ , S.D. = 0.38,  $\bar{X} = 4.35$ , S.D. = 0.60), respectively. Furthermore, the timing was the lowest average score of ( $\bar{X} = 4.30$ , S.D. = 0.12).

## Discussion

1. Regarding the testing score towards the utilization of physical activity through games to prevent dementia in the elderly, the average score of pre-test was ( $\bar{X} = 37.34$ , SD = 13.59) while the average score of post-test was ( $\bar{X} = 62.97$ , SD = 14.37). The results found that the post-test score of using games to prevent elderly people from dementia was higher than the pre-test score at a .05 level of statistical significance. According to preventing dementia in elderly citizens, the use of physical activity through an appropriate variety of exercise was significant to the elders' health care. This corresponded to Furuno (2017)'s qualitative research

exploring the types of exercise for elderly people in Bangkok. The data collection was gathered from a variety of sources, including academic journals, participant and non-participant observation, and interviews, which included an in-depth interview and focus group discussion. The participants were senior citizens who were 60 years or older, including males and females based on chronological age, and they lived in Bangkok's public and private sectors. The findings indicated that the elderly people who exercised regularly could develop work capability and lead to a better quality of life. The suitable types of exercise should be simple and relaxing to perform, should be done on a regular basis, and should help them maintain their physical fitness, muscle strength, as well as lung and heart health. In addition, the exercise enabled the elders to have better results in health, brain, and memory. It was understandable that the elders took a longer time than adolescence, and it would be 6-10 weeks for the outcome. Therefore, exercise had several advantages. For instance, it allowed the life span to proceed efficiently and live independently. It also made them feel good for themselves, their lifestyles, and their mind, which were considered the desires of every senior citizen. According to the brain activation, it started with the activation of the brain button, temporal button, auricle button, and cross crawl from easy to difficult level. These activities should be done simultaneously to brain exercise games such as photo hunt game, Sudoku, Math plus puzzle game, maze game, and card matching game. The senior citizens would have greater memorization after completing the activities for 8 weeks. This corresponded to Sripan (2012)'s research investigating brain exercise games for elders by using web application for memory support and mental health. The study aimed to present the guideline for the elders' memory and mental health. This was done by evaluating the results of memory improvement after playing brain exercise games with two groups of web-study applications. The purposive sampling was used to get 21 elders from Songkhla Geriatrics Health Center, Songkhla Hospital. The participants were separated into 11 for individual games and 10 for group games. The tools of the research consisted of 1) demographic data form, 2) The Mini-Mental State Examination (MMSE) in Thai version (2002), 3) the 7 Minutes screen of the Memory test 4), memory memo, 5) stress assessment, and 6) brain exercise games for elders by using web application. The concept gained from Atkinson and Shiffrin collaborated with five cognitive performances, including calculation, collocation, connection, imagination, and mnemonic encoding as significant .71. In addition, those enhanced mental health and communication skill with listening to music, enjoying the scenery, practicing the meditation. Statistics used in data analysis was the percentage, mean, standard deviation, t – test, and ANOVA. The findings revealed that 1) brain exercise games for elderly people through the use of web application had an impact on memory improvement after training, which was found that the elders' memory was higher than before training at the .01 level of statistical significance, 2) there was no difference in the effectiveness between elderly people playing group games and elderly people playing individual games at the 0.1 level of statistical significance, 3) the stress level of the elders were reduced after playing the brain exercise games on web application at the .01 level of statistical significance, and 4) the elders playing the group games were able to relieve stress more effectively than the others at the .01 of statistical significance. Additionally, physical activity training and brain activation could stimulate memory. This was similar to Kansri et al. (2017)'s quasi-experimental research investigating the effect of brain exercise on memory enhancement in the elderly with mild cognitive impairment. The subjects were

22 elders with mild cognitive impairment in one of the villages in Muang, Chainat, Thailand. The subjects were provided with the program of brain activation adapted from the procedure for implementing the guideline of the Ontario Nurses' Association of Canada (Registered Nurses Association of Ontario). It included five procedures, 10 activities, and two days per week continuously for five weeks. The Mini-Mental State Examination (MMSE) in Thai version (2002) was utilized in evaluation. Data were analyzed through the use of descriptive statistics and paired t-test. The results revealed that the average memory score of the elderly with mild cognitive impairment after training the brain activation was higher than those of before training at the .01 level of statistical significance. The findings could be applied as a guideline for enhancing the memory retention of the elderly with mild cognitive impairment and preventing dementia.

2. Concerning the elderly's satisfaction towards the use of physical activity through games to prevent dementia, the average score of the elderly of Wat Phrik community in Phitsanulok was high. To be more specific, the level of satisfaction with the highest average was the guest speakers. The second and third highest average satisfaction scores were for physical activities and application, respectively. The timing received the lowest average satisfaction rating. Therefore, if the guest speakers led them to play physical activities and brain exercise games, the elderly would be more willing to cooperate. Additionally, physical activity is regarded as one of the recreational activities the elderly enjoy. This corresponded to Akincano et al. (2016)'s research investigating the personal factors of service users, the elders' satisfaction towards the recreational activity provision of Khon Kaen Social Welfare Development Center, and the users' recommendation towards the provision of recreational activity. A questionnaire was utilized to gather information from 219 subjects. The data were analyzed and processed by computer for percentage, mean and standard deviation. The results found that 1) the overall satisfaction score of the elders towards recreational activity provision was high ( $\bar{X} = 3.91$ ). To be more precise, health promotion activities, as well as social and cultural events, received a high overall score and 2) the recommendations towards the provision of recreational activities were as follows: concerning the health promotion and social activities, the scores of the recommendation on both appropriate activities were higher than the recommendation that the experts should be available to provide each element understanding. Regarding the cultural activities, the appropriate activities had more scores than philanthropy on important days in the vicinity or upcountry. In addition to the physical activity that the elderly people enjoy, doing continuous activities allowed their brains to work effectively and have better memorization. This corresponded to Saejiw (2016)'s research examining the physical activity and physical fitness of exercising elders in Muang, Chonburi. The participants were 347 exercising elderly people ranging between 60 and 80 years old. The data collection were Global Physical Activity Questionnaire: GPAQ and the Senior Fitness Test: SFT. Data analysis was calculated by the use of mean and standard deviation. Most elders revealed that physical activity related to working was moderate. The vigorous-intensity activity related to working was 1% while moderate-intensity activity was 20%. The travel physical activity had a moderate-intensity activity at 42%, and the recreational activity featured a 95 moderate-intensity activity. Moreover, the sedentary activities took 3.31 hours a day. Regarding the elders' physical fitness, cardiorespiratory endurance, as well as muscle strength and agility, was in the norms. The upper-body flexibility and body mass index were below the norms. Only lower-body flexibility was above

the norms. It could be summarized that the intensity level of activities of this elderly group was moderate. The travel physical activity and recreational activity were moderate, whereas the sedentary activities were high. Cardiorespiratory endurance, as well as muscle strength, lower-body flexibility, and agility, were in the norms. The body mass index and upper-body flexibility were below the norms. Concerning physical activities, the elders were greatly interested in stretching exercises and brain activation. These activities could be done simultaneously with brain exercise games that were interesting and challenging. Moreover, the elderly people could do all the activities at home. To summarize, the elderly people were satisfied with the use of physical activity through games to prevent dementia, with the average score at a high level. This corresponded to Nakhrua and Phangbubpha (2019)'s research on brain exercise games for the elderly with mild cognitive impairment. The purposes of the quasi-experimental research were to study the level of satisfaction and to compare MoCA scores after playing brain exercise games for the elderly with mild cognitive impairment, who attended for treatment at the Out-patient Department of Health Promotion Hospital under Regional Health Promotion Center 5 in Ratchaburi. The findings revealed that the overall satisfaction of the participants towards brain exercise games was high, which was equal to 90.0%. From high to low, the elderly people expressed their satisfaction on the following issues: easily comprehensible instructions, challenges, a number of games, a variety of games, everyday life practicality, level of enjoyment, and the frequency of assignment, which were equal to 100.0, 96.7, 83.3, 80.0, 66.7, 60.0, and 56.7, respectively. Furthermore, 60% of the participants expressed moderate satisfaction with the difficulty of the game styles. It could be concluded that physical activity, including brain activation and brain exercise games, enabled elderly people's brains to work more effectively and have better memorization. In other words, these games could prevent the elderly people from dementia.

## Recommendations

### 1. Recommendations for applying the research results

1.1 Physical activities and brain exercise games should be trained more and used in daily life.

When it became a habit, pass it on to the neighbors to keep the memory fresh.

1.2 To apply the training of the elderly with movement disabilities, some activities must be

modified so that they can engage in the activities and be able to follow.

### 2. Recommendations for further research

2.1 Physical activities should be developed to be applicable to the elderly with movement disabilities so that they can improve in other areas simultaneously.

2.2 The games should be designed to encourage memorizing in many forms, such as colors and shapes, in order to strengthen the elderly's memory skills and allow them to continue learning.

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