Technology Acceptance among Older Adults With Mild Cognitive Impairment

Nita Rosa Damayanti\textsuperscript{1,2*}, Nazlena Mohamad Ali\textsuperscript{1}, Ely Salwana Mat Surin\textsuperscript{1}

\textsuperscript{1}Institute Visual Informatics (IVI) Universiti Kebangsaan Malaysia Bangi, Malaysia
\textsuperscript{2}Universitas Bina Darma Palembang, Indonesia

* nita_rosa@binadarma.ac.id

Abstract. An increase in the population of older adults raises major and serious problems faced by developing countries, especially in the problem of decreasing memory function. With the increase in population of older adults, there is also an increase in the occurrence of a decline in memory which leads to the stage of diagnosis, namely a decrease in mild cognitive function called Mild Cognitive Impairment. However, technology use is among the population of older adults who should be able to help improve memory most of them do not know. This paper reports educating older adults about technology and technology acceptance in helping the memory of older adults. In-depth interviews were conducted with older adults to gather information about demographics, experiences, and their opinions about using technology to help memory. Thus, this study provides education about the technology in the reception of older adults to help memory. Respondents consisted of men aged 60-65 years and women aged 60-63 years were interviewed using a semi-structured interview method. The results of the study of all Older adults accept technology to help with cognitive function problems in preventing and reducing the risk of dementia, such as using technology is very helpful and not lazy to train the brain.

1. Introduction
Memory is a very important thing that must be taken care of by humans, but with increasing age the decrease in memory will occur, this will occur at the age of 60-65.\textsuperscript{5} Decline in memory is divided into three, namely normal cognition, mild cognitive cognition and dementia. The beginning of a decrease in memory is called Mild Cognitive Impairment. The risk of dementia has an impact on senility problems so prevention can be done in the initial phase of treatment called Mild Cognitive Impairment. In addition, Alzheimer's (AD) has become a public health problem that is serious and results in economic losses and extraordinary social burdens. By 2030 there are around 66 million people with AD or dementia worldwide and the number may reach 115 million by 2050 with an aging world population\textsuperscript{1}. Before a person experiences dementia they will experience a cognitive disorder called MCI (Mild Cognitive Impairment) but this cognitive disorder occurs without being offered, they can act like normal individuals. MCI sufferers have a high risk of developing dementia at a rate of 10-15\% per year. Cognitive disorders in the elderly can be associated with the normal aging process, or become a symptom of a decrease in memory. MCI in its clinical course is at high risk of dementia with a ratio of 10-12\% per year. It is estimated that with this ratio in 3-4 years half of the MCI subjects will become dementia. Decreasing cognitive abilities is not a normal part of the aging process. This decline will lead to damage to global cognitive functions that are usually progressive and
affect daily life activities. It is important for older adults to maintain their memories so they don't forget easily. A person's intelligence can be seen from his ability to remember it, it can be concluded that memory is very important to maintain. With the advancement of technology in the modern era, technology can also provide a stimulus to be able to train the memories of older adults and can provide increased memory. The number of older adults in 2000 was 7.28% and projected at 11.34% in 2020 (BPS, 1992). Data from the USA-Bureau of the Census, said that Indonesia is expected to experience the largest increase in older adults in the world, between 1990-2025, which amounted to 414%, and sufferers of Mild Cognitive Impairement are as follows, according to Alzheimer’s Association International Conference in 2011 stating that the prevalence of MCI in 6 developed countries, such as the USA, Australia, Germany, Britain, Switzerland and France is 15% -42%. The prevalence of MCI in Asian countries reaches 17.1%. According to the Directorate General of Medical Services of the Ministry of Health in 2017, the prevalence of MCI in elderly people in Indonesia is around 32.4%\textsuperscript{21}, hence the number of people with ill-forgotten illnesses is not small. This needs special attention in the country of Indonesia, because mirrored with developed countries in Europe aged 60-65, for example in America\textsuperscript{8}, they have prevented this disease from having an impact awfully. From the above explanation it is necessary for the Indonesian state to provide serious treatment of memory, forgetfulness that occurs at the age of 60-65, so from the problem that occurs in Indonesia, researchers want to provide solutions that can be an alternative to memory, forgetfulness by providing knowledge about technological advances such as virtual reality, computerized cognitive, serious games and video dance can train the memories of older adults. Technological progress is the right solution to help improve memory rather than drug dependence\textsuperscript{3}. The use of information and communication technology (ICT) is currently a tool of assistance in our daily lives, and its use is also rapidly growing in the health domain. There are only a few studies that investigate technology to help older adults improve memory finding that problems occur in older adults in their age, namely memory problems. Current technology is a good tool to help older adults, especially in cognitive function. Previous research has shown that the use of assistive technology and information communication technology (ICT) has the potential to enable older adults to improve their quality of life and reduce health care costs\textsuperscript{6}. One of the advances in information technology in the health sector is growing very rapidly. Increasingly positive technology have a positive impact on human life, especially in the health sector. Interestingly, virtual reality can help health Virtual reality is a new branch of ICT that has recently been suggested to be used in the neuropsychological field of cognitive impairment. Technology can help improve cognitive functioning older adults\textsuperscript{11}. Therefore, researchers propose older adults to use technology to train their brains in improving their cognitive functions of memory to prevent and reduce risk of dementia.

2. Related Work
There are only a few studies that investigate technology to help older adults improve memory found that the problem occurred in older adults in their age, namely memory problems. Some studies have investigated that technology can help memory. Several studies have investigated technology in helping older adults and found that technology plays an important role in helping cognitive function to exercise the brain function\textsuperscript{17}. at the same time, several studies argue that Information and Communication Technology (ICT) has benefits for older adults. It is said that ICTs can improve social support, cognitive function of memory, quality of life and reduce symptoms of depression. Information and communication technology (ICT) is now a tool for everyday life and its use is growing rapidly also in the health domain, which can increase brain stimulation Technology information that is used to help older adults in cognitive function including:

A. Virtual Reality
Virtual Reality is a technology that refers to simulations that create an image of a world that seems to us like seeing the real world. Virtual reality as a medium for humans to interact with the virtual world\textsuperscript{9}. Sherman and W craig\textsuperscript{20}mention that virtual reality: A medium composed of interactive computer simulations that sense the participant’s position and actions, providing synthetic feedback to one or more senses, giving the feeling of being immersed or being present in the simulation.Virtual
Virtual reality has been applied by researchers and doctors for training and rehabilitation of cognitive function in the elderly. Interestingly, with virtual reality can help health. Virtual reality is a new branch of ICT that has been suggested recently to be used in the neuropsychological field of cognitive impairment. Virtual reality has several components which are mainly visual, touch and kinesthetic perception sensations. The use of the VR system offers the possibility of simulating immersive and interactive real-life scenarios to generate the sensation of being there. "VR also offers the ability to carry out tests in an adaptive environment that can be adjusted according to various patients. The use of VR systems for the treatment of diseases has been explored in several fields, such as brain damage, post-stroke intervention, musculoskeletal recovery, and so on. An immersive VR environment has also been used for neuropsychological assessment. and CR therapy such as phobia, stress, anxiety, exercise, and memory problems, virtual reality is able to achieve the expected training goals for people who are affected by age-related cognitive impairments. Older adults are an important target group of VR technology because of cognitive aging. When the human brain and cognition change throughout life, VR can be applied to an aging population. To help people with various types of disorders. The use of VR in cognitive intervention is a new field that is increasingly increasing interest in cognitive psychology and Neuropsychology. So far computer technology has advanced, most VR has been used to assess cognition in older adults. Examples of exercises, but still a little research using VR for older adults. In addition to the use of VR in cognitive assessment, in older adults this technology can also be used for training and rehabilitation purposes. Various VR applications are currently discussing cognitive training in MCI. Cognitive training with the use of new technology shows that such training is at least as effective or even more effective when compared to traditional training conducted in a laboratory environment with non-computer methods. However, several studies say that the need for the development of VR technology is better to help older adults in cognitive function.

B. Serious Games

Serious Games are not primarily focused on entertainment, but for other purposes such as exercising cognitive memory functions. Michael and Chen define "serious games are games where training the brain (in its various forms) is the main goal, not entertainment". The effectiveness of serious games is built on the principle of the occurrence of activities that are unlikely to increase if combined with activities that might occur. Therefore, activities that are impossible and uncomfortable, such as regular physical or cognitive training, can be associated with inclined and enjoyable activities such as playing games. Playing games is part of human nature and many people play regularly, therefore they are suitable to be associated with sports or training. However, the field of cognitive training is still less explored.

C. Computerized Cognitive

Computerized cognitive training (CCT) has generated considerable attention as a safe, relatively inexpensive and measurable intervention that aims to maintain cognition in older adults. CCT involves guided practice and practice on standard tasks designed to load on certain cognitive processes, usually without memory teaching or problem solving strategies. Memory, cognitive training can stimulate neuroplasticity so that it increases cognitive reserves and the brain. The commercial brain training program is computerized. However, the literature evaluating the efficacy of commercially available computer-based cognitive training programs for elderly healthy adults has not systematically evaluated the quality of individual studies and does not review follow-up studies. Therefore, the potential benefits of commercial computerized cognitive training in improving cognition in healthy adults remain unclear.

D. Video Dance

Recent studies have shown that dance intervention may be more effective in preventing and slowing the development of MCI because it combines physical, social, and cognitive activities together and reduces anxiety and depression. In 2003, a study published in the New England Journal of Medicine found that dancing can reduce the incidence of dementia. The study of elderly people, aged 75 and older, was led by Albert Einstein's School of Medicine in New York City, which was funded by the
National Institute on Aging. They measured each participant's mental alertness as a way to monitor the level of dementia, including Alzheimer's disease. The researchers studied various cognitive and physical activities, such as reading; writing; doing crossword puzzles; playing cards; playing a musical instrument; dance; walk; tennis; swimming and golf. Surprisingly, dancing is an activity that is good for the mind, significantly reducing the risk of dementia. Dance reduces the risk of dementia by 76%, two times more than reading\textsuperscript{19}. Doing crosswords at least four days a week reduces the risk by 47%, while biking and swimming do not provide any benefit at all. But, not all dance forms offer the same cognitive benefits. Working on a memorized sequence can improve your performance, but it doesn't create new neural pathways. The theory is that the more pathways your brain has, the easier it is to access the information stored and the better your memory will be. The results of a recent study show that some ICT-oriented brain stimulation tends to increase the affective effect in stimulating memory, cognitive function. One advantage of ICTs is that it is possible to stimulate the brain in thinking.

3. Methods
To understand health technology knowledge among the population of older adults, a qualitative approach through semi-structured interviews was chosen, because we wanted to have an in-depth understanding of how older adults think if technology was used to help improve memory cognitive functions.

A. Participant
Our study focuses on adults aged 60 years and above. Regardless of age, based on previous research\textsuperscript{2}, because the purpose of this study proposed technology as a tool to train the brain. We took a sample of older adults who had a Mild Cognitive Impairment MMSE Test (Mini Mental Examination) used in this study to find out older adults who experienced Mild Cognitive Impairment. We disseminate information about this Hospital Myria Panti Wardha Dharma Bakti a week before and those who want to participate, sign and are chosen to participate based on the MMSE test classified as MCI. Participation in this project is voluntary and written approval is required before participation. All data is collected for 1 month from October 2018.

B. Procedure
Because older adults are a group of participants who are vulnerable and may experience difficulties they are given an explanation of the purpose of the study, the problem of decreasing memory of cognitive function memories in daily activities and proposing technology to help memory problems. Each participant was told that the interview session would consist of four parts demographic assessments (part A), memory loss (part B) health and emotional (part C) and willingness to accept technology to help sufferers of Mild Cognitive Impairment (part D).

D. Data Analysis
Consisting of several questions about each participant such as age, daily activities, experiences of forgetting something in daily activities then analyzed using qualitative descriptive data analysis. The data is then recorded and then transcribed and manually analyzed using thematic analysis techniques.

4. Results And Discussion
The following section summarizes the demographic information of participants involved in this study.

A. Demography
Out of ten participants came from male and female groups. men aged 60-65 years and women aged 60-63 years. They were selected after doing the MMSE (Mini Mental State Examination) test and classified as MCI (Mild Cognitive Impairment). The test results can be seen in Table I.
Table 1. Profil Demography Respondents

| Category | MMSE | No MCI | MCI | Severe MCI |
|----------|------|--------|-----|------------|
| Sex      | Age  |        |     |            |
| M        | 60-65| -      | √   | -          |
| W        | 60-63| -      | √   | -          |

B. Problem Memory Loss

Older adults have problems with memory loss, forgetting something in their daily activities. Among these forgetfulness.

[R2] “I forget something almost every day, sometimes I forget to put the car key”
[R5] “Sometimes I forget about the schedule of activities that are in my daily activities”
[R4] “Always when I meet a friend I forget his name but I remember his face, sometimes it’s hard to remember”

With increasing age, the level of memory decline has worsened, in interviews conducted by researchers. Respondents have very poor forgetfulness in daily activities. This risk of decreased memory can lead to increasingly ineffective life in daily activities. This also has an adverse effect on health. The initial symptoms of a decrease in memory level called MCI forgetfulness that occurs in daily activities and still in normal circumstances are expressed\(^{12}\). This situation must be helped by brain training so that memory decline does not have a bad impact. Lack of awareness in yourself makes older adults just forget. from these results, it was found that there was a decline in memory in daily activities in older adults. they feel confused and try to recall when they forget. they also argue that memory is very important.

C. Health And Emotion

To identify whether memory decline is related to health and emotions among older adults, we ask older adults about diseases that are experienced and are easily emotional. Their perception that they are lazy to regulate their eating patterns and emotions is not stable. Older adults say that:

[R1] “I have high blood pressure, but I don’t regulate my diet because I’m lazy”
[R4] “Because I have high blood pressure sometimes my emotions are always out of control, if there are friends who insinuate me, I think negative and angry”

Most of the older adults experience high blood pressure, but they have never been able to manage their diet. Emotions that are increasingly increasing causing them to have emotions that are not stable as a result they experience irritability, negative thinking. This is supported Timiras\(^{15}\) saying that the influence of health and emotional has an impact on the cognitive function of increasing memory.

D. Lack of knowledge about technology to help improve memory

In addition to health and emotions older adults argue that age is a factor in memory loss. they argue that the more age increases, the less memory and other factors they do not know that technology is the right solution to help improve memory. They have no solution to help prevent and reduce the risk of dementia in themselves.

[R7] “I think that forgetting what happened is an age factor because of increasing age, I also don’t have a solution because I think that this is an age factor”. “I do not know that technology can help”
[R10] “Age factor that affects memory decline when I always forget something, really technology can help! because I don't know that technology can help with memory reduction solutions. I think this is the influence of age and unfortunately I think it's normal, I don't think the solution to reduce forgetfulness”

Older adults only think that forgetting is an age factor, the lack of a level of self-awareness makes them increasingly suffer from memory loss. they don't know that technology is the right solution to help improve memory. This problem is related to\(^{10}\), who found that older adults still know little about
the use of technology for health. Apart from that, technology to help older adults improve their memory is still little researched. The problem of older adults in technology knowledge is still lacking. this causes older adults, not to have the motivation to help their memory problems.

E. Technology acceptance
Of the problems experienced by older adults belonging to the Mild Cognitive Impairement researchers provide knowledge to them that technology can help improve memory. Following are the opinions of older adults including:

[R1] “I agree that technology can help with this memory reduction problem”
[R3] “I accept that the presence of technology can be the right solution to help train memory”

Technological advances in the health sector have a very important role. The researcher educates older adults about technology that can help cognitive, cognitive functions such as virtual reality, serious games, computerized cognitive, and video dance. they accept that in the future technology will be there to help improve memory. other than that according to research Caprani et al 2012 says that technology is growing very rapidly, so the alternative solution in improving memory is to use technology.

5. Limitation
The number of participants was very limited in this study. Therefore, it is necessary to do with a larger sample of older adults and we will conduct further research, Technology that will be able to help improve brain training in cognitive function to improve memory and prevent the risk of dementia.

6. Conclusion
Although there are various studies that investigate the use of technology among older adults, we find that most of the problems of older adults in increasing age are memory loss. We realize that not a lot of research really tries deeply to improve cognitive function of memory. We argue that this is a very important problem to understand, especially the brain in training the brain to train to reduce and prevent the process of dementia. We believe that doing more in-depth research will productively help older adults to help sufferers of Mild Cognitive Impairment. Among the main obstacles to the decline in memory of older adults is that there is no motivation in themselves to train the brain. Lack of awareness in yourself affects the lazy older adults train the brain. In addition, there is a lack of information on technology and technology use among older adults. However, researchers have explained to older adults that technology can help with solutions to improve cognitive function of memory. Therefore, we believe that older adults will most likely use technology to help train the brain to reduce the risk of dementia. Then researchers provide knowledge to older adults to improve memory through technological developments such as virtual reality, serious gaming, computerized cognitive and video dance. This technology would be acceptable to all people of older adults, especially in Indonesia, so that MCI and Dementia disease could be reduced.

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