

EXPLORING POSITIVE EMOTIONS AND GAMES TECHNOLOGY AMONG OLDER ADULTS WITH MILD COGNITIVE IMPAIRMENT

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ABSTRACT

Mild cognitive impairment (MCI) is one of the cognitive challenges confronting older adults. MCI interferes with the memory state and is closely related to feeling. MCI affects the emotional state of older adults. Identifying the exercises or brain training activities that contribute to positive feelings among older adults with MCI is therefore vital. The study investigates the use of games technology and its contribution to positive emotion on cognitive to older adults with MCI. Twelve older adult respondents aged 50 and above were chosen from two nursing homes to take part in this study. The Mini-Mental State Examination set of questionnaires was used to screen respondents to differentiate those with cognitive impairment. We conducted in-depth interviews to explore activities that contribute to positive effects in older adults with MCI. Results show that activities such as listening to old music, playing games, and social activities with family and recreation incrementally improve their positive feelings. Games technology has the potential to help older adults to train their cognitive and contributes to positive emotions. An innovative game design could be proposed with memory reminiscence therapy that may be advantageous to older adults in overcoming their cognitive and improving positive feelings.

Keywords: *Mild Cognitive Impairment, Older Adults, Technology, Positive Emotion*

1. INTRODUCTION

Mild cognitive impairment (MCI) is a potential side effect of aging. MCI is a cognitive issue that has emotional changes in older adults [20]. Emotional changes in older adults tend to be negative, which manifests as outrage or misery. In the unlikely event that such feelings are not addressed of carefully, they will affect older adults' cognitive state and daily activities [2]. Unsteady feelings can cause older adults to undergo cognitive decay, such as being frequently irate when overlooking something, which may be a sign of MCI [1]. MCI, if not treated legitimately, will lead to dementia [7]. The World Health Organization specified that cognitive impairment is expanding and is anticipated to continue doing so [18]. By 2050, the number of older adults above 50 years of age is projected to be approximately 2 billion and will comprise 22% of the world's population. Four-fifths of individuals over 50 will live in developing nations in Africa, Asia, or Latin America. A total of 35.6 million individuals are living with dementia in MCI cases worldwide, and the number will nearly

double. Of the overall number of MCI sufferers around the world, 57.7% lived in developing nations in 2010, which is anticipated to increase to 70.5% by 2050 [21]. As a result, wellbeing, mental, and cognitive issues will increase considerably [27].

Anticipation of MCI is essential to avoid dementia in older adults [38]. MCI influences the feelings of older adults, where they will frequently be pitiful, irate, and despondent [14]. MCI is characterized by cognitive brokenness in certain cognitive spaces, such as a disabled capacity to obtain and remember, impeded thinking and ability to process complex errands, and impeded visuospatial capacity, thereby hindering daily work [5]. Older adults must focus on observing their feelings, both positive and negative. Feelings do not necessarily extend to negative feelings. They can also emphatically affect older adults. To avoid these effects, older adults can try activities such as stretching, partaking in positive exercises that create positive emotions, and attempting to be an individual who continuously considers emphatically.

A few studies have detailed that cognitive issues related to feelings allude to a need for quality social connections [31]. Despite age being the foremost factor to indicate mild cognitive impedance, it is not an inescapable result of aging. Moreover, MCI does not solely influence older adults. MCI in younger adults (characterized as indications in people up to 50) accounts for up to 9% of cases [16]. Individuals can diminish their chance of MCI by honing their cognition and exercising their memory. Extra hazard variables include sadness, instructive fulfillment, social separation, being alone, and cognitive effects. The quick advancement of innovative games affects every angle of life.

The application of data and communication innovation can help wellbeing laborers in promoting wellbeing advancement and making a difference in older adults to optimize their wellbeing. The use of data frameworks and communication innovation can also offer assistance to older adults with cognitive issues. Innovative advancements, in conjunction with social and financial changes, have made associated devices commonplace, allowing for interaction [22]. A few surveys have focused on technology aiming to decrease cognitive issues and positive enthusiastic changes. [23] conducted a meta-analysis on game preparation for the MCI older adults but did not incorporate more up-to-date devices and unused play procedures. [24] analyzed innovation and information and communications technology. Gaming innovation has been found to increase cognition. Games such as cooking games, Nintendo, and Smartkuber have been used by analysts to assist older adults with MCI focus on cognition. However, according to [29], research on creating cognitive games by looking at positive feelings has been limited [6].

The problems of the older adults who experience MCI are cognitive, and positive emotions with this problem indicate the need for brain training using technology. Training activities have the potential to improve cognition for older adults. Such activities are important to their cognitive enhancement. Their emotional state will decrease as they age, introducing declines in memory.

In this study, we explore the contribution of technology, especially digital games, toward positive emotions among older adults with MCI. Game innovation technology plays an important role in the cognitive and emotional training of older adults, helping them increase positive and cognitive emotions. Game technology can increase cognitive and positive emotions. Furthermore, reminiscence

approach therapy could be used to support in improving cognitive and positive emotions.

This paper aims to explore activities that contribute to positive emotions and propose technologies to help reduce cognitive impairment among older people with MCI. The major contributions of this paper are as follows:

- Understanding activities that contribute to positive emotions among MCI older adults;
- Exploring for an appropriate game technology approach that could help older adults who experience MCI;
- Propose game technology with a reminiscence therapy approach that potentially benefits older adults in overcoming their cognitive impairment and increasing positive emotion.

The remainder of this paper is structured as follows. Section 2 explains the previous work on game technology and emotion research for older adults. Section 3 describes the methodology used for this study, including the sample respondents and the methods used in data collection. This description is followed by activities that contribute to positive emotions that we derived from data collection and proposed conceptual diagrams of technologies for future work.

2. BACKGROUND WORK

2.1. Games Technology

Games innovation may be a potential arrangement for older adults managing cognitive issues [4]. The game is representative of playing, and playing is representative of amusement. The two are interconnected. Numerous analysts have focused on machine learning-based approaches [13]. The quick advancement of technology has resulted in devices that are able to address the wants of all people [17]. Games technology aims to entertain people, and the complex playing culture has changed [28]. The culture of playing with traditional equipment has been replaced with games with computer equipment. Digital games give opportunities for older adults to practice memory and engender positive feelings. Technology and media products give unlimited participation in possibilities, regardless of place or location and playing equipment. Positive emotions may be generated from a game. Such emotions include a sense of curiosity, optimism, creativity, and sometimes even love. Adrenaline obtained from playing games would produce positive emotions such as hope, excitement, and curiosity [37]. When an individual has many encounters within a game, they will feel more joyful. In addition to making an

individual feel more joyful, games can also offer assistance in social intelligence outside the game world [11]. These positive sentiments can, in some cases, help individuals overcome issues they might have in real life.

Gamers frequently feel cheerful about their accomplishments after they succeed in a game, particularly in difficult games. Such a feeling makes them feel more driven in their careers or lives because winning the games can allow a sense of belief. In brief, video games make people more joyful and aid in progress in real life [34]. Among the many factors that are anticipated to impede older adults from utilizing innovation is the need for information, such as mechanical information. Innovation gives extraordinary benefits [32]. However, older adults will most likely accept the innovation if find the innovation simple to use and important to them. At present, multi-platform advancement has ended up progressively well-known within the video game industry to improve cognitive and positive feelings. In addition, increasing activity by playing games is known to have health benefits against aging. Therefore, from early life to old age, people have distinctive fundamental mental needs when playing games. These needs require in adults a sense of consolation for themselves and within the existing environment. The level of satisfaction of these needs depends on the older adults, their families, and their environment. In the unlikely event that these needs are not met, problems will emerge within the lives of older adults, potentially diminishing their feelings and cognition. The level of happiness of older adults is one marker of accomplishing an ideal quality of life in old age. The lives of older adults include positive passionate components such as religion, exercises, social relations, well-being, and great relations with children, grandchildren, and other relatives. This action is one of the variables that can affect positive feelings in older adults.

The essential everyday exercises for older adults incorporate exercises that they prefer. These basic exercises can influence physiological health. The psychosociological effect could be a factor in changes in demeanors and conduct that accompany age. This hypothesis states that effective aging depends on how an older adult gains fulfillment in carrying out exercises. Maintaining these exercises is critical [10].

2.2. Emotion

Positive feelings are ones that people commonly find gratifying to experience. The

Oxford Handbook of Positive Psychology defines them as suitable situational responses wonderful from gratifying sensation and undifferentiated wonderful affect. This definition states that wonderful feelings are fine responses to the environment. By contrast, awful feelings are feelings that people do not find gratifying to experience. Negative feelings may be described as sad emotion, that is evoked in people to explicit a terrible impact closer to an occasion or person. On these bases, goal happiness may be measured by monitoring and collecting people's temporary reports of good and bad feelings [42].

People in middle age or above 50 are often afraid of not remembering, and forgetting names of people and things. MCI is defined as a cognitive impairment that is less severe than dementia and does not interfere with daily activities. Thinking slows, learning ability declines, and memory weakens. Physical changes that occur during the aging process of the brain affect cognitive decline. Technology also affects emotions. Belief in technology is the basis for persuading people to continue to adopt compelling technology [3]. Therefore, to enable change, persuasive technology influences the user's emotions. The user trusts the technology, incorporates the persuasive technology into their daily lives, and incorporates the technology into their daily lives for a long time.

3. MATERIALS AND METHODS

We use a qualitative survey, namely, a screening of interviews with medical health questions (Mini-Mental State Examination (MMSE)) to screen older people with MCI. We also conducted a focus group discussion (FGD) with older adults, care centers, and experts. The process activities are shown in Figure 1.

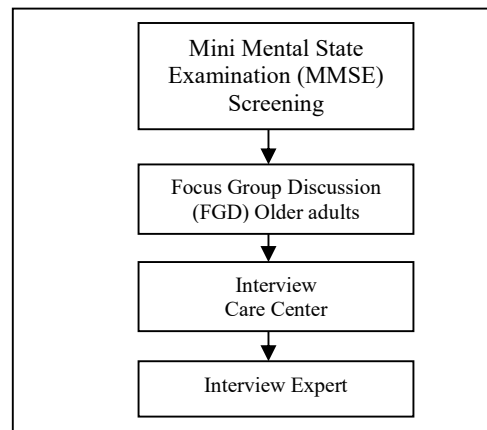


Figure 1: Research Activities

This study used a qualitative approach to data collection and a thematic analysis method by selecting a sample of older adults with MCI as respondents. The main data collection methods for this study were FGDs and detailed interviews with psychologists of older adults with dementia and MCI. The purpose of this study is to learn more about the emotions of older people with MCI.

In the FGD sessions, we asked for permission to record the session with a digital audio recorder. We ensured that the interview was done according to the proper procedure. In the first session, we screened older adults over 50 to determine the MCI category. Screening was performed using the MMSE method. The method is used to identify older people with MCI. Respondents between the ages of 50 and 65 were surveyed using the MMSE Question Set on memory. The MMSE is a cognitive test that is part of a routine test to establish an analysis of dementia. This test is especially indicated for older adults with impaired cognitive function, thinking ability, and ability to carry out daily activities. This process of deterioration is generally accompanied by changes in mental state (mood and emotion) and behavior. The MMSE is the test evaluation element used. It evaluates attention and direction, memory, registration, recall, arithmetic, language, and ability to draw complex polygons. The example of the MMSE question used in the study is the Malay version, as shown in Figure 2.

Soalan (Questions)	Markah (Score)
<p>i. <i>Orientasi masa</i> (Time Orientation)</p> <p><i>Hari ini hari apa?</i> (what day is today)</p> <div style="display: flex; justify-content: space-around;"> <input type="text"/> <input type="text"/> </div> <p><i>Betul</i> (True) 1 m <i>Salah</i> (False) 0 m</p> <p><i>Hari ini berapa hari bulan?</i> (What is today's date)</p> <div style="display: flex; justify-content: space-around;"> <input type="text"/> <input type="text"/> </div> <p><i>Betul</i> (True) 1 m <i>Salah</i> (False) 0 m</p> <p><i>Bulan ini bulan apa?</i> (what is the current month)</p> <div style="display: flex; justify-content: space-around;"> <input type="text"/> <input type="text"/> </div> <p><i>Betul</i> (True) 1 m <i>Salah</i> (False) 0 m</p>	

Figure 2: Part of Malay Version MMSE questions [40]

The demographics of selected respondents are shown in Table 1.

Table 1 : Demographics of respondents

Demographics		(N)
Age	50 Year and over	12
Citizen	Malaysian	12
Education Stage	SPM and below	4
	STPM/Diploma	6
	Degree	2
	Master	-
	Doctor of Philosophy	-

After the MCI category was identified, we conducted an FGD with respondents. The purpose of this FGD is to identify activities that allow older people to experience positive emotions and to see if they have good skills and other activities. Respondents then attended an FGD session to investigate their emotions and the technology they were using. Respondents were divided into three smaller groups, with four respondents in each group. During the FGD session, we asked about activities that we think can generate positive emotions, frequently experienced negative emotions, technical approaches that can be used as problem-solving tools, and gaming techniques.

Analyzing qualitative data collection surveys begins with identifying and understanding the data, generating initial code, searching for the right themes, evaluating these themes, defining and naming the themes, and creating reports. This research also aims to understand the importance of technologies such as gaming applications. The sampling used in this study was intentional sampling. We used sampling methods to identify the appropriate respondents for the interview. A sample of study respondents was selected based on the main objectives of this study to collect input and evidence of positive emotions in older adults with mild cognitive impairment. In this study, we recruited twelve respondents from two older adult nursing home care centers, namely, Al-Fikrah and Darul Insyirah, both located in the town of Kajang in Selangor, Malaysia. The analysis of theme qualitative data was carried out using thematic analysis. The objective of the FGD was to find activities related to positive emotion, the challenges, and potential technology that can be used to create positive emotions.

After conducting the FGD, we continued to conduct in-depth interviews with the two care nursing home centers. The purpose of these interviews is to find out the social activities and programs taking place in the nursing home, as well

as the social activities that lead to the positive emotions of the older adults. The results were triangulated by the factors that contributed to the positive emotions found during the FGD session. We also conducted in-depth interviews with three health psychologist experts to enhance the information gained about the positive emotions of the older adults and the benefits of using technology and to respond to emotional changes.

4. RESULTS AND DISCUSSION

Based on the results of the interviews and observations conducted in the previous section, we obtained information on (i) FGDs, (ii) nursing home care centers, and (iii) experts.

4.1 FGD

To conduct an FGD session, the MMSE procedure was used to assess the older adults. The purpose of the screening was to identify older adults who could be classified as having MCI based on their area score. Table 2 shows the results obtained after screening the older adults involved in the study.

Table 2: Screening score from the Mini-Mental State Examination

Respondent	MMSE Screening Scores
R 1	21
R 2	22
R 3	21
R 4	24
R 5	21
R 6	22
R 7	21
R 8	24
R 9	23
R 10	21
R 11	21
R 12	22
**MMSE total scores range: Severe (0-9), Moderate (10-17), MCI (18-26) and Normal (27-30)	

The FGD was conducted to investigate the positive emotional and technical benefits of respondents to older adults. Daily activities such as social activities (such as gardening) are carried out together in nursing homes and spiritual activities related to religious seminars and discussions. Findings show that older adults in nursing homes enjoy nostalgic music and have positive emotions

for those affected by MCI. Some of the respondents' comments from the FGD are:

"At this age, it is essential to get closer to the Creator (God), as is studying the Quran. The Al Quran is the composition of human life that teaches every aspect of life. And religious lectures can strengthen the faith." [R4].

"Activities in nursing homes are exciting and fun, so it is better to be religious because you can study the Quran and learn with someone close to the Creator (God)." [R2].

As people grow into older adults, being more religious becomes of utmost importance. Everyone certainly wants longevity, but not everyone is ready for old age. Understandably, some people are not ready to meet old age because they experience various physical weaknesses as they become older adults. Some psychological changes accompany this decline. These psychological symptoms also affect a variety of psychological aspects, as evidenced by the behavioral patterns older adults exhibit. The effect of this reduction in physical capacity means that older adults feel that they are no longer worthwhile or are underestimated. The main problem for older adults is the inner conflict between wholeness and despair [15]. Therefore, they tend to remember past achievements, and older adults are generally satisfied with their religious activities. As a result, the religious life of older adults generally increases. Based on the research conducted by [43], older people generally tend to accept religious opinions from others and become increasingly aware of the reality of the afterlife.

"Being with the family can improve harmony while being with busy children. Happiness always comes from being with family, relieving stress." [R8].

Studies in [12] show that older people can use social opportunity as a place for families to meet and share their experiences as they build unity with the whole family.

"I also like old music. I listen to old music every day, and old songs can bring back memories, which makes my heart happy." [R10] [R12].

We have found that music has an emotional effect on older adults. According to [30], music stimulates the release of endorphins and serotonin, making the body more relaxed and affecting tension and relaxation in older adults.

"We have gardening activities together and like to grow vegetables." [R5].

Studies have shown that gardening can not only keep older people active but also improve their mental health and well-being. One possibility is

gardening at home [16]. As some respondents showed, the negative emotions they felt in nursing homes included the loss of family, children, and grandchildren.

"We are sad because we lost our wives and husbands. We are alone here because no one wants to see us here." [R7].

Losing someone or something makes people feel like they have lost half of our soul, and continuing to accept the event as a person who has lost their physical spirit is difficult. During the FGD session, we introduced game technology to respondents and saw if they could evoke positive emotions. We selected some simple and easy-to-play games and applications such as Candy Crush and cooking applications. The former was chosen because of the elderly's interest in the easy-to-play game [10]. Interestingly, we found that some respondents had already downloaded Candy Crush on their mobile phones and always played in their free time. They felt that playing it made them happy.

"Candy Crush is my favorite game. I downloaded it to my phone and played it, and the game is fun and makes me happy. It is easy to understand." [R11] [R4] [R8].

Candy Crush is an exciting game with refreshing colors [9]. We also found that the daily activities of respondents such as social media, video calls, YouTube, and games are interesting and create a positive atmosphere, especially for social and spiritual events.

"We watch videos, play games, and enjoy mobile phones." [R6].

Older adults are encouraged to use technology to improve their health, and technology helps them support their daily lives.

4.2 Nursing Home Care

This session aimed to explore what activities have been carried out at the nursing home care centers and whether those activities can create wonderful feelings in MCI older adults. We interviewed caregivers from nursing home care centers. Table 3 shows the demographics of the caregivers.

Table 3: Caregiver demographics of Centre 1 and Centre 2

Gender	Age	Working Experience as Caregivers
[C1] F	32	4 years
[C2] M	31	6 years

The results of the data analysis showed that certain aspects contributed to the effective activities at the centers. These are activities that make older people happy (positive emotions), care that nursing homes provide to make older adults happy (positive emotions). An activity was included. Caregivers provided information on how to encourage positive emotions in older adults with MCI. Such processes include participating in positive activities such as spiritual programs, exercises, gardening, and playing games (Table 4).

Table 4: Analysis of Nursing Home Care

Themes	Activities
Activities that are effective in MCI elderly to become emotionally positive	-spiritual/religious learning -listening to old music/song -physical exercises -outdoor gardening -motivational talk

Feedback from caregivers agreed that the program implemented at the center had significant positive benefits.

"Here you will find spiritual research, lectures, and gardening. The purpose of this activity is to improve the lives of older people when their families leave them behind. Many people have been expelled from the hospital because of conflict. With these activities, they can expect to create a better life. How do you make older adults happy when you are sad? I always motivate them to live a life that is not always sad. Even if you have problems in the past, you have to think positively. But you can't think much and have to try to erase the memory of the problem. Instead of thinking about the problem first, focus on it now." [C1].

"Many activities are carried out at these centers, including Al-Quran studies (religious), lectures, simple physical exercises, leisure activities, and chess or puzzle games. Once a month, health checkpoints assess the health goals of these programs. Older people are no longer looking for anything. They only want something useful in life. I encourage and motivate these older adults because they have nothing but religion and intimacy with the Creator (God) and need to be motivated." [C2].

Feedback from caregivers agreed that the program implemented had significant positive

benefits. According to information provided by nursing home caregivers, positive emotions can be influenced by a person's motivation that can be produced by encouragement or motivation. Active activity brings many benefits to MCI for older adults.

Information provided by nurses in nursing homes suggests that positive emotions can be influenced by a person's motivation that can be produced by encouragement or motivation. Active activity brings many benefits to MCI aging.

4.3. Expert validation

We performed an in-intensity interview with three psychologists to identify the cognitive troubles suffered by the older adults with MCI and the way that wonderful feelings affect them. These experts are professionals working as lecturer specialists in the university, with working experiences of more than five years.

Table 5 shows the demographics of the selected experts. The interview was conducted after the psychologist gave informed consent. We asked questions about whether older adults with MCI have cognitive problems and emotional changes, how to influence emotions, and what training is used to help older adults with MCI, and technology. We also asked about the effects of the positive emotions on the older adults.

Table 5: Expert Demographic.

Expert ID	Area of expertise
Expert 1 [HP1]	Treatment for the older adults
Expert 2 [HP2]	Health psychology (older adults)
Expert 3 [HP3]	Health psychology (MCI and dementia)

The results reveal four aspects or themes that can be used to identify cognitive problems in older adults with MCI and how positive emotions affect older people with MCI. Table 6 shows an expert analysis.

Table 6: Analysis from expert.

Theme	Feedback
a. Emotions are related to cognitive and how positive emotions can appear	Emotional connections can arise from family interactions, spiritual input, life events and social environment
b. The influence of emotion on older	Positive and negative emotions can arise from

adults	desire or self-awareness and are influenced by the mind
c. Daily social activities for positive emotions	Fun activities that help cognitive and emotional
d. Food contributes to positive emotions	Foods can contribute to emotions

Emotions are associated with cognitive abilities in older adults. Positive and negative emotions affect the social environment. Past life events and historical events play an integral role in their lives today.

"Emotions are very closely related to cognition. It's important to know that life events are the main contributor to emotions. Past life events are very important because they influence current thinking. For example, losing a job or losing a loved one creates negative emotions in life." [HP1].

Both experts [HP2, HP1] agreed that emotions are associated with cognitive performance in older adults. Positive or negative emotions can result from the ability to control consciousness and emotions through social influences. Older adult emotions can be built by focusing on positive things such as religion, family, and hobbies. Delicious food also contributes to emotions.

"Cognition and emotions are very related and affect daily activities. For example, losing something or losing a loved one will bring emotions. How to get positive emotions through social interaction, gathering with family, and spiritual/religion is a major question." [HP2]

"How can positive emotions manifest themselves in social situations? When around people with positive emotions, older people often react positively to religious and social activities and family gatherings. Positive emotions have a positive effect not only on yourself but also on others. It's true that older adults are more affected by emotions as they are older. One way to deal with the emotions of older people is to focus on positive things such as religion, family, and hobbies. Food also contributes to positive emotions. Having access to your favorite food makes eating fun and happy." [HP2].

These findings state that positive and negative emotions affect the social environment, and past

life events or historical events play an essential role in emotions.

According to HP3, the emotional and cognitive aspects are related. Emotions affect perception. The process of aging can affect the cognitive abilities of older people. Positive emotions can occur because memories such as remembering old things and old music can affect the feelings of older adults. Findings from expert interviews are supportive, stating that old music and old things can affect the positive emotions of older adults. HP3 also said that reminiscence therapy is good for older people suffering from MCI. We provide cognitive training by remembering the past as part of memory therapy. Reminiscence can help positive emotions. Examples of reminiscences combined with gaming technology to help older adults with MCI are limited [33].

Reminiscence therapy is suitable for the emotions of the elderly suffering from MCI. We provide cognitive training by remembering old events as part of memory therapy. Memory therapy is of considerable benefit to older adults with MCI. They may appear familiar at first but are most likely to develop dementia within the next five years. Older people with MCI need to exercise their brains to improve cognition.

HP3 agrees that technology will be better if older people receive brain training and that innovations in health care are quite mature. A study by [39] also suggests that technology can help older people with MCI problems.

"Emotions and cognition are related because MCI is a memory problem, involving issues such as the loss of something or forgetting something that affects the emotions. People with MCI also sometimes remember faces, but not names; they don't remember the corresponding emotions. Emotions also play an important role in everyday activities. Positive emotions and negative emotions can arise because of their own thoughts. Older people are more emotional, and they are easily affected, such as when they prefer to listen to old music. There is a reminiscence method in emotion theory. This therapy is used to search past memories with images and music. Food also contributes to the emotions of the elderly. Foods they like can make them happy and evoke positive emotions." [HP3].

Through our analysis, we found that older people in nursing homes perform six types of activities that can influence positive emotions: spiritual, communication, games, music, gardening, and spending time with family/friends. Some

testimonies from interviews with experts are as follows.

"Several activities which is good for older adults. Games are interesting activities because people from different cultures can participate. Games can reduce stress, increase creativity, and exercise cognitive abilities." [HP3].

"For older adults who have experienced MCI, the best activity is games. Games can sharpen your brain and make you happy." [HP2].

"Technology offers many benefits to older people when they are alone, both as entertainment and as an inner pleasure." [HP 1]

"I agree about using technology to help older people." [HP3]

"There is one therapy that can help older people with MCI called reminiscence or nostalgia, in which people remember old photos, things, and nostalgic music." [HP3].

5. PROPOSED EMOTION-BASED GAMES FRAMEWORK

Figure 3 shows the positive emotions and application development framework of older adults with MCI. The results of our study show the activities that contribute to the positive emotions of older people with MCI, such as listening to old songs, spiritual/religious activities, outdoor gardening, family/friend relationships, and playing digital games. An activity is an activity that is physically or mentally (not physically) performed. Daily activities are activities carried out by the elderly. Activity theory is now widely used in the study of human activity, especially in the field of movement [1]. This theory relates to a framework that can explain human activity based on new concepts and models of human activity. This theory is also related to intervention methods that can present and support collaborative and innovative activities for practitioners. Therefore, activity theory aims to stimulate and support learning activities to find something new (utility) [8].

The study found that the daily activities of older people promote positive emotions: spirituality, socializing, games, music, gardening, and family encounters. These are activities preferred by older people with MCI from our study. The psychological feature mentioned in the study [41] is the effect of emotional and cognitive changes seen in enjoying daily life so that older people can make better changes in their daily lives.

In Figure 3, after finding out about some activities of the elderly in nursing homes, we investigated with an older adult psychologist who stated that certain treatments, namely, reminiscence therapy, could help the elderly. Reminiscence is used for cognitive and emotional therapy in older adults with MCI [26]. Activities such as playing games are activities that older adults also enjoy. Nursing homes play several traditional games, such as chess and the traditional Malay game Congkak. Games are a good activity for training older people because they facilitate focus and prevent loneliness. We also find that older people are interested in technology.

Figure 3 suggests a conceptual framework for the development of applications for brain training exercises in the form of digital games suitable for older adults with MCI.

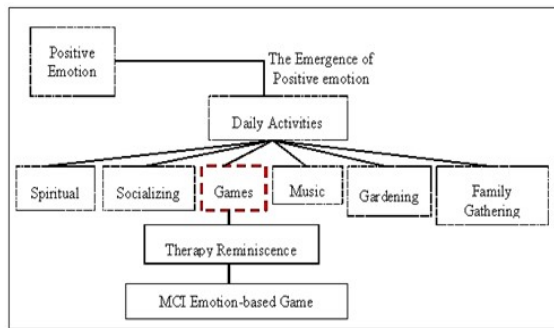


Figure 3: Proposed Emotion Game Framework for MCI Older Adults

These activities are developed using a reminiscence approach that incorporates game platform technology. The development of dementia can be prevented by implementing and practicing technical interventions aimed at supporting MCI. Technology-based interventions such as digital games can be chosen as a strategy for cognitive and emotional support.

The problem of dementia is increasing, but the number of older people using technology for MCI training remains small [36]. Gaming technology is a training medium that is expected to help the elderly. Game-based technical interventions are an effective training tool, and a brain training site was developed to create awareness of dementia and its risk factors among subjects in the intervention group.

Game studies for older adults also tend to focus on cognitive training. Specialized gaming technology to address risk-mitigation approaches to MCI, especially for the growing population of older adults with MCI in Asia, is lacking. Therefore, technological games innovation for older MCI

adults is proposed to support efforts to reduce the risk of dementia.

6. CONCLUSION

The main finding in this study is the exploration of activities that contribute to positive emotions in older adults with MCI. We found that older adults play games during their leisure time in addition to partaking in social activities. Games technology that implements a reminiscence therapy approach has potential for future implementation.

Our research justifies that the existence of problems in the older adults in cognitive and emotional has a negative effect on them. Older adults could improve cognitively and emotionally. Our achievements in this investigation are in the exploration of technological innovation with a reminiscence therapy approach to assist MCI older adults included in game technology. We believe that ICT innovation can help MCI older adults in brain training activities, thereby improving the cognition and positive emotions of the older adults.

In future work, we will develop a digital game with the reminiscence concept that provides brain training activities in module development and incorporate some design principles for older adults with MCI.

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