LAMK Lahden ammattikorkeakoulu
Lahti University of Applied Sciences

MEMORY BITES AND GAMES --ENVIRONMENTAL AND MENTAL ELEMENTS AFFECT BRAIN HEALTH FOR ELDERLY

A literature review

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A Literature Review

Bachelor's Thesis in Nursing

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ABSTRACT

This bachelor's thesis is part of the Research and Development (R&D) project "Memory Bites and Games" at Lahti University of Applied Sciences. The aim of that project is to develop a new social game application which can be web-based or/and mobile based. The function of the application is helping to train and maintain brain health, to identify early signs of cognitive malfunction or impairment.

The **purpose**: This literature review is to find out what are the mental, environmental elements which have affected on the development of brain diseases and how these aspects should be taken into account in preventing them.

The **method:** Data was collected through systematic database search. The study consisted of international studies and articles were selected by peer reviewed. A qualitative literature review was used as the research method, inductive content analysis was used for data analysis.

The **findings:** From environmental perspective, there are six factors containing lifestyle, residency, social networks, games, radiation and pollution were found to affect elder adult's brain health. From mental perspective, five factors including lifestyle, social status, medical intervention, disease and art were found to dedicate to the quality of brain health of elderly people.

In **conclusion**: The literature review is involved in environmental and mental elements which effect brain health of elderly people, the follow-up study about physical and cognitive elements effecting brain health is recommended in future.

Keywords: brain health, developing of brain disease, preventing of brain disease, mental element, environmental element.

Lahden Ammattikorkeakoulu
Hoitotyön koulutusohjelma

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Muistin Puraisut ja Pelit- Ympäristötekijöiden ja psyykksiien tekijöiden vaikutus aivojen-terveyteen Kirjallisuuskatsaus

Hoitotyön opinnäytetyö, 52 sivua sisällystä
Kevät 2017

TIIVISTELMÄ

Tämä opinnäytetyö on osa tutkimus ja kehitys projektia " Muistin Puraisut ja Pelit " Lahden ammattikorkeakoulussa. Kyseisen projektin tavoitteena on kehittää uusi sosiaalinen pelisovellus joka voi olla selain ja/tai kännykkä pohjainen sovellus. Ohjelman tarkoituksena on auttaa harjoittelemaan, ylläpitämänä aivojen kuntoa ja tunnistamaan varhaisia merkkejä kognitiivisestä heikentymisestä tai vajaatoiminnasta.

Tarkoitus: Tämä kirjallisuuskatsaus selvittää mitkä ovat psyykkisiä ja ympäristöllisiä tekijöitä, jotka vaikuttavat aivosairauksien kehittymiseen ja mitenkä nämä pitäisi huomioida niiden ehkäisemiseksi.

Menetelmä: Tiedot kerättiin systemaattisesti etsimällä tietokannasta. Tutkimus sisälti kansainvälisiä tutkimuksia ja artikkeleita, jotka valittiin Melinda, Masto-finna, Academic search elite (EBSCO), Medic ja PubMed tietokannoista. Kuvaistavaa kirjallisuuskatsomusta käytettiin aineiston lähteenä ja määrällistä sisällön analyysia käytettiin analysoinnissa.

Havainnot: Ympäristöllisesti on kuusi tekijää. Elämäntapa, asuinpaikka, sosiaaliset verkostot, pelit, säteily ja saaste havaittiin vaikuttavan vanhuksen aivojen terveyteen. Psyykkisiä tekijöitä oli viisi tekijää. elämäntavat, sosiaalinen asema, lääkinnällinen apu, taudit ja taide havaittiin vaikuttavan vanhusten aivoterveyteen.

Yhteenveto: Kirjallisuuskatsauksessa liittyvät ympäristöllisiin ja psyykkisiin tekijöihin jotka vaikuttavat vanhusten aivojen terveyteen. Jatkotutkimus fyysisestä ja kognitiivistsa tekijöistä, jotka vaikuttavat aivojen terveyteen on suositeltavaa tulevaisuudessa.

Avainsanat: Aivojen terveys, aivosairauden kehittyminen, aivosairauden ehkäisy, psyykkiset tekijät, ympäristötekijät.

LIST OF ABBREVIATIONS

AD Alzheimer's Disease

CDC Centers for Disease Control and Prevention and the Alzheimer's Association

BDNF Brain-derived neurotrophic factors

DHA Omega-3 fatty acid/ docosohexaenoic acid

MADRS Montgomery and Asberg Depression Rating Scale

ACC Anterior cingulate cortices

PSTG Processing speed training game

TBI Traumatic brain injury

FTD Frontotemporal dementia

NSES Neighborhood socioeconomic status

EClipSE Epidemiological Clinicopathological Studies in Europe

EMF Electromagnetic field

SES Socioeconomic status

NCDs Noncommunicable diseases

TBI Traumatic brain injury

PTSD posttraumatic stress disorder

CONTENTS

1 INTRODUCTION

From the 20th century, the human lifespan had been doubled, this phenomenon has brought issues related to brain health to the forefront of public health policy (CDC 2007, as cited in Brain Health Fitness: Beyond retirement 2011). According to World Population Aging Estimates， the population of individuals 65 years and older is growing faster than the total population worldwide. By the year 2050, nearly one in every six persons are projected to be at least 65 years of age (World Population Aging Report 2015). Therefore, the challenge for improving brain health of elderly people are significant in the health care field.

This bachelor's thesis is part of the Research and Development (R&D) project "Memory Bites and Games" at Lahti University of Applied Sciences. The aim of that project is to develop a new web-based or/and mobile based social game application. The objective of inventing the game application is to maintain and promote brain health for elderly people, at the same time to detect early signs of cognitive malfunction or impairment, therefore, to start early medical intervention to improve prognosis.

Brain health is a major factor in ensuring the quality of life and maintaining independence of elderly people. According to the guidance of the school project, brain health may be affected by many factors, from aspects of physical related factors, environmental relevant factors, mental health factors, cognitive degenerative factors . In this thesis, the authors are trying to find out what are the precise factors which have affected the development of elderly people's brain heath. A descriptive literature review was used as methodological method to collect data, key words were chosen under tutor's recommendation. At last 228 related articles were fund from 5 databases: PubMed, Masto-Finna, Melinda, Medic and EBSCO.

Due to large amount of data, in this review, authors mainly explore the environmental and mental health related elements. Under each general wide element, more introductions and explanations are given about each

factor depending on the research review results. After demonstration of the results, the authors have a discussion according to the findings, and try to find out what prevention methods can be taken into account in preventing this elements to damage brain health and interventions to improve quality of brain health for elderly people.

2 CONCEPTS AND DEFINITIONS

2.1 Brain Health

According to American neuropsychologist Paul David Nussbaum's perspective, brain health is "The result of a dynamic process in which a person engages in behaviors and environments to shape the brain toward a healthier existence" (Nussbaum 2015). Center for Disease Control organization defined brain health as: " brain health or cognitive health, refers to skills such as remembering, learning new things, planning, concentrating, or making decisions" (CDC 2011).

Maintaining a healthy brain means reducing stress and anxiety, increasing inner balance and emotional well-being, enhancing memory or focus, increasing energy and creativity, and living a life that is socially, cognitively, spiritually, nutritionally, and intellectually integrated. As well as, keeping a healthy brain in balance can promote holistic individual's health by functioning at its near-peak potential exertion.(Nussbaum 2015.)

However, brain health can be disturbed by so many factors, for example, traumatic brain injury, psychological or psychiatric malfunction, aging, environmental disturbances, hereditary and neurological diseases, cognitive degeneration, drug abuse, alcoholism, malnutrition and so on. For older adults, cognitive degenerating diseases like Dementia including Alzheimer's disease become the chef culprit disturbing brain balance. As research showing, only in United States, in 2010, there were 4.7 million individuals aged 65 years or older with AD dementia (95% confidence

interval). The total number of people with AD dementia in 2050 is projected to be 13.8 million, with 7.0 million aged 85 years or older.(Hebert 2013.)

2.2 Environmental element

The environment is a broad term that can be described particularly in various domains. It is said the environment is about people's surroundings and the circumstance concerning their surroundings, involving physical, biological, social and cultural conditions which influence people's lives and the growth of plants and animals (Landon 2006, 3). In public health area, environment can be described into physical, social and built aspects, which can be superimposed on each other in some parts (Russell 2011, 4).

From the perspective of Russell, physical environment is concerned all the characteristics belonging to environment (e.g., forests, prairies, watershed, plants and animals) and the factors relating to environmental health, such as, air and water pollutants, radiation hazards and so on (Russell 2011, 5). It also can be comprehended that physical environment contains air, water, land, plants and animals, buildings and other infrastructure, and total natural resources which can afford essential requires and opportunities for people to develop society and economy (Ministry of social development 2003).

By virtue of social aspect, environment can be described into diverse part. It involves the direct physical surroundings, social relationships and cultural contexts, which can be changed dynamically and undergo synchronously in households, kin networks, neighborhoods, towns, cities and regions (Barnett & Casper 2001, 465). On other words, social environment contains a specific area which is intangible but real exiting and relevant to human and human behaviors. It impacts on healthy and healthy behaviors through forming the social standards, supplying resources and opportunities of healthy behaviors, and defending passive health outcomes. For instance, social status and social support can be relevant with health behavior directly.(Mama et al. 2016.)

Built environment can be described as a result created by human. Some researches considered that built environment is composed of all buildings, spaces and products which have been constructed and altered by human in their activities (Clarke et al. 2008). It can affect health directly by polluted air and water, barely ventilated and heated building, the hazards of road traffic, and indirectly through social and behavior effects, for instance, accessing housing and employment opportunities, health services and other facilities.(Bird 2012.) Additionally, built environment stimulates human health in three predominant fields via facilitating physical activity, connecting and enhancing communities, affording healthy food equitably (Kent & Thompson 2012).

2.3 Mental element

Mental health is described by World Health Organization (WHO) as the foundation health status welfare of the individual to realize his or her own ability, be able to deal with normal life pressure, it can work valuable outcome and can contribute to his or her community. Mental health is composed of multiple interactions of social, psychological factors, such as the general health and disease.(WHO 2001a.)

Mental health is influenced by personal factors, social interactions, social structure and cultural values. By daily life experience, it is affected by the family, school, community and the workplace. On the one hand, physiological factors concern unhealthy lifestyle, heart disease, depression and anxiety; social factors involve unemployment, low income, education, stressful working environment, discrimination, violence and so on. (Lehtinen, Riikonen & Lahtinen 1997.) Both mental and physical health can exist alone, however, the psychological, physiological and social functions are mutually beneficial and interacted as well (Sartorius 1990).

3. PURPOSE, AIM AND RESEARCH QUESTIONS

The purpose of this thesis is to find out what are those factors affecting brain health from environmental and mental perspectives. At the base of that, we

gave further discussion about all the found environmental and mental elements impacting on the brain health of elderly respectively. The authors are trying to explore and display more concise and precise answers for the readers to understand deeper about how these environmental and mental factors affecting elderly people' s brain health, and how to implement prevention and interventions.

The brain is the core organ responsible for the cognitive response and recovery process. In this thesis, authors pay attention to mental and environmental-related embedded factors in the process of the connection between the mental and environment relations in the brain. The neurological changes can affect mood expression, regulation pattern, the stress response, recovery, and responses, or even to speed up the aging body.

The aim of this Memory Bites and Games Project is to develop a new social game application which can be web-based or/and mobile based. The function of the application is helping to train and maintain brain health, at the same time to identify early signs of cognitive malfunction or impairment, for example, postponing degeneration of memory functions. This article is to demonstrate what are the precise factors from environmental and mental perspectives affecting the quality of brain health for elderly people.

The research questions are:

1) what are the environmental factors affecting brain health of elderly people?

2) what are the mental factors affecting brain health of elderly people?

4. RESEARCH CONTENT AND METHODS

4.1 Literature review as a research method

The authors used a systematic literature review to approach the environmental and mental elements related to brain health, and to provide

relevant research findings as the fundamental knowledge base for the research and development project of “Memory Bites and Games”.

Literature review is a research approach through surveying current academic information and research-related information on a particular topic. The target is to provide a holistic and strict statement of knowledge and research-based theory to the topic.(Paula 2010, 5.)

A systematic literature review adopts exact and strict systems, such as, quantitative and/or qualitative methods, to combine original research findings to contribute responsible results to particular topics (Thomas & Harden, 2008; Helen 2010, 68). The key progress of literature review involves identifying the research question, collecting data by using inclusion and exclusion criteria, implementing research strategy, electronic searching, recording searching strategy, framing description and stating results via adding confirming relevant articles (Helen 2010, 68).

4.2 Data search, collection and thesis process

Due to the broad and extensive character of the brain health topic, the primary research questions of the literature review cover all the aspects of factors which effecting brain health. The sections were categorized into physical, environmental, cognitive and mental elements. According to the guidance of the “Memory Bites and Games” project tutor and thesis tutor, the environmental and mental elements were chosen to be demonstrated into this essay.

A comprehensive data screening was explored for research questions. The data was collected from five databases: Lahti academic library (Masto-finna), Medic, academic search elite (EBSCO), US national library of medicine national institutes (PubMed) and union catalogue of Finnish libraries (Melinda).

The elementary screening was done by keywords: brain health, developing of brain disease, preventing of brain disease, mental element, and environmental element. In first step selected by key words(Table 1), around 10,000 articles were found. An article review by the title of article as the second step was implemented, around 600 articles were selected. The third selection was carried out by reviewing abstract part of these articles thoroughly, 217 articles were found as potentially existing suspected findings. At last, by reviewing the whole articles and scrutinizing the result/finding part of these articles, 48 articles were used for providing evidences for answering the research questions and marked by star* at the beginning of each reference in the reference list.

Table 1. Databases, and number of selected articles at different stages of research collecting process.

Databases	Key Words	Article title	Abstract	Findings
PubMed /NCBI	1310	111	46	9
Masto-Finna	4118	110	73	25
EBSCO	3280	258	53	11
MELINDA	158	59	14	1
Medic	1329	116	31	2
Totals	10,195	654	217	48

The articles are selected by certain inclusion and exclusion criteria(Table 2), during the selecting process, we included all the articles those are published above 2000 year, the core topic are related with mental health of elderly people instead of children and adolescents. From the consideration of

ethics, we only selected the full text and peer reviewed articles. The language are only limited in English, as well as, the research thesis which are in the rodent testing stages are excluded.

Table 2. Inclusion and exclusion criteria when selecting articles.

Inclusion:	Exclusion:
➢ Articles published between the years 2000--2016 ➢ Articles with related findings about mental health for the elderly. ➢ Articles available as free full text and peer reviewed.	➢ Articles published before the years 2000 ➢ Articles concerning the mental health but aiming at children or adolescents ➢ Studies that focused on research based on rodent testing stages. ➢ Articles were written in any other language rather than English

Table 3. A summary of data collection and thesis progress.

Preparation
✧ The thesis project was enrolled, topic was approved, research questions were confirmed.
✧ Thesis plan was drafted, research questions were settled. Key words were formed. First article selection process started by keywords: brain health, developing of brain disease, preventing of brain disease, mental element, environmental element.
✧ First and second article selection process were finished, 654 related articles were found by screening title of article.

Organizing

- ✧ Re-screening the selected articles by abstract section, 217 articles were selected.
- ✧ Articles were grouped into four categories: mental, physical, environmental and cognitive elements.
- ✧ Evidences finding process was started. Evidences were found and listed into four categories same as above.
- ✧ Submit results to thesis tutor and project tutor as instructed, only mental and environmental sections need to be demonstrated in this thesis and 48 articles had been used.
- ✧ Mental and environment findings lists were made and acquired into broader higher order categories .

Thesis Reporting

- ✧ Reliability and validity of data were scrutinized, analyzed and interpreted.
- ✧ During the process of drafting the thesis, results were re-checked constantly. Evidences of findings were supplemented and completed by collecting data using subcategory keywords.
- ✧ Thesis draft process was completed and submitted to thesis tutor. Feedback was given and thesis was adjusted.
- ✧ Final thesis was approved and report was given.

4.3 Data analysis

In this thesis the authors had used content analysis method with themes for the data analysis in an inductive way. Content analysis has been use in communication, journalism, sociology and other disciplines for more than 60 years. Nowadays, its application has reached into law and health care field universally (Kimberly A. Neuendorf 2017).

Qualitative content analysis is one of the data analysis methods currently available for analyzing data and interpreting its meaning. As a research method, it represents a systematic and objective means of describing and quantifying phenomenon.(Schreier 2012.)

Inductive content analysis is used in those cases where there are no enough former studies dealing with the phenomenon or when it is fragmented (Elo & Kynga 2007). Inductive data analysis approach moves from the specific points to the wider whole, so that particular instances are analyzed and then grouped into a broader categories or general statement (Chinn & Kramer 1999, as cited in Elo & Kynga 2007). This characteristic is explained in this paper comprehensively.

In this thesis the target unit of analysis was confirmed: the factors affecting brain health for elderly people. Then valuable data was collected and coded by an open coding methods. The authors numbered the articles those had been selected by abstract section, for example, Physical-P1-P143, Environment-E1-E19, Cognitive C1-C29 and Mental-M1-M38. During selecting article process, all the articles were marked by the first letter or word of databases, such as, E for EBSCO, M for Medic, Masto for Masto-finna, Mel for Melinda Pub for PubMed. After the marking process by abbreviation and coloring, we organized all the found evidences from original articles into four lists by first, second, third and fourth categories(Figure 1). This marking and listing process helped the authors to count and analyze data afterward tremendously.

Findings Which Affect Brain Health				
Initial term	First subclass	Second subclass	Third subclass	Fourth subclass
Exercise and BDNF have been associated with reducing depression and promoting cognitive enhancement. It is possible that exercise can influence the epigenome to reduce depression and enhance cognitive abilities.	exercise can reduce depression and promote cognitive enhancement	Exercise& Diet	Lifestyle	P37 Physical
These results suggest that relative youth and increased financial resources are the primary factors related to better TBI.	individuals with TBI who are younger and have more income are more likely to have better mental health.	Financial	Social status	M5 Mental
It was reported that EMF(electromagnetic field) exposure was associated with neurological diseases by increasing the level of amyloid beta, a risk factor, in the brain.	EMF exposure was associated with neurological diseases.	Electromagnetic field	Electronic device	E10.Environmental
Results of the Seattle Longitudinal study found that those who retired from cognitively complex jobs suffered a greater decline in cognitive function following retirement than those with less complex occupations.	People who retire from cognitively complex jobs suffer a greater decline in cognitive function.	Retirement	Social status	C2, Cognitive

Figure 1. A sample of research record to illustrate the marking process.

The next step of grouping was followed: all the selected articles were grouped into higher categories, mental, environmental, physical and cognitive elements. When the target elements were fixed during organizing process, the attributing evidences for affecting environmental and mental element were combined into subcategories, genetic categories and main categories(Figure 2). The process of analyzing all the data was done in a step-by-step sequence.

Findings/results of Environmental Elements which Affect Brain Health				
Initial term	Induction	Sub-category	Category	Main category
It is now clear that voluntary exercise can increase levels of brain-derived neurotrophic factors(BDNF) and other growth factors, stimulate neurogenesis, increase resistance to brain insult and improve learning and mental performance.	Sports can increase the brain BDNF and other growth factors, stimulate neurogenesis.	exercise	lifestyle	Environmental elements
Lipids have a complex relationship with AD. However, high levels of cholesterol in middle age has been linked to higher risk for AD in later life. Further complicating the picture is the finding that high cholesterol late in life is actually linked to a reduction in AD risk, suggesting that AD is likely linked to a rapid loss of cholesterol with age .	Cholesterol value is related with the risk for AD in later life;	cholesterol		
Recent research indicates that the effects of exercise on the brain can be enhanced by concurrent consumption of natural products such as omega fatty acids or plant polyphenols. The potential synergy between diet and exercise could involve common cellular pathways important for neurogenesis, cell survival, synaptic plasticity and vascular function. Optimal maintenance of brain health might depend on exercise and intake of natural products	Effects of exercise on the brain, the optimal brain's health may depend on exercise and intake of natural products	exercise & diet		

The overall evidence supports the idea that diet and exercise can influence synaptic plasticity, neuronal signaling, and cognitive function by acting on critical mediators of energy metabolism. This information has functional consequences to use the power of diet to boost the positive effects of exercise.	Diet and exercise can influence synaptic plasticity, neuronal signaling and cognitive function	diet and exercise	Lifestyle	Envionmental elements
New evidence shows that dietary supplementation of DHA and curcumin has important actions on the mechanisms that maintain membrane physiology and neuronal signaling.	DHA and curcumin maintain membrane physiology and neuronal signaling	diet and curcumin		
In terms of the benefit of nutraceuticals is it clear that some naturally occurring molecules can be advantageous to both the young and aged brain, and that they have actions that ultimately can be directed to aid either in the improvement of cognition or in the management of debilitating neurodegenerative and neuropsychiatric conditions.	Nutraceuticals are beneficial of brain growth.	nutrition		

Figure 2 . A sample of the whole analyzing process: lifestyle section is illustrated.

5. RESEARCH FINDINGS

In summary, we found out from environmental perspective, subcategories: lifestyle, residency, social network, game, radiation and pollution are affecting the quality of brain health of elderly(Figure 3), from mental perspective, subcategories: lifestyle, social status, medical intervention, disease and art are contributing to brain health of older adults(Figure 4).

5.1 Environmental elements affect brain health

According to the general definition of environmental elements above, environmental elements consist of physical, social and build environments. The factors those belong into these three sections were listed as sub-categories. The authors categorized all the sub-categories into genetic categories showed below, aiming to demonstrated elaborately how lifestyle, residency, social networks, games, radiation, and pollution affected brain health of elderly people on the base of findings.

Findings/results of Environmental Elements which Affect Brain Health		
Subcategories	Categories	Main categories
Exercise	lifestyle	Environmental elements
Diet		
Domicile	Residency	
Relocation		
Location		
Social support	Social network	
Communication		
Relationship		
Social ties		
Neighborhood integration		
Video game	Game	
Exercise game-"find the pair"		
Brain game-"GO game"		
Cognitive training game		
EMF(electromagnetic field) exposure	Radiation	
Electronic products- mobile phone		
Air pollution	Pollution	
Pollutants-chemical		
Stimulation of light & sound		

Figure 3. Summarized the findings from environmental section.

5.1.1 Lifestyle

It has become a common sense that lifestyle of individuals has a strong influence on the health of the body and mind. Lifestyle is a way of living, it can reflect the individual's values, health status, world view, life perspective and attitude. According to the findings, exercise and diet are factors contributing to the brain health of older adults.

According to the findings, approve that exercise can improve depressive symptoms and cognitive functions in older adults. Voluntary exercise rather than forced exercise can increase levels of brain growth factors, such as brain-derived neurotrophic factors (BDNF), which acts at the interface of

metabolism and plasticity, stimulate neurogenesis, increase resistance to brain insult and improve learning and mental performance. Exercise also plays a significant role of mobilizing gene expression profiles that would be predicted to benefit brain plasticity processes.

Diets rich in saturated fatty acids and alcohol, and deficient in antioxidants and vitamins appear to promote the onset of AD disease. In another hand, diets rich in unsaturated fatty acids, vitamins, antioxidants, and wine likely suppress its onset. Evidence suggests that diets rich in polyphenols and some spices suppress the onset of AD by scavenging free radicals and preventing oxidative damage. Metal ions are known to catalyze the production of free radicals and induce mental retardation or dementia.

Lipids have a complex relationship with AD. Result shows high levels of cholesterol in middle age has been linked to higher risk for AD in later life. Further complicating the picture is the finding that high cholesterol in late life is actually linked to a reduction in AD risk, it is referring that AD is likely linked to a rapid loss of cholesterol with age.

Nutraceuticals have potential benefits on promoting brain health as well. Nutraceuticals are food, or part of a food, and will give health benefits in addition to nutrition to provide better health and/or minimize pathological effects. Molecules contained therein provide medicinal value, and bridge the gap between food and prescribed medicine. Nutraceuticals provide more than nutritional value, and the synergistic actions of certain ingredients subtly influence key cellular signaling that favors improved neuronal function. Nutritious food containing molecules with medicinal value can alleviate disruptive side effects caused by medicines by correcting deranged cellular signaling, and thus nutraceuticals provide the added value of helping to repair cellular damage, thereby improving brain health.

New evidence shows that dietary supplementation of omega-3 fatty acid (DHA) and curcumin has important actions on the mechanisms that

maintain membrane physiology and neuronal signaling. Select dietary factors such as curcumin may have the capacity to restore energy management after brain trauma, and to contribute to the effects of exercise.

The DHA provides building material to the brain, which is fundamental for supporting intercellular signaling events. In addition to this, omega-3 fatty acids positively influence molecular systems that serve synaptic function. Conversely, diets rich in saturated fats and sugar, or high in calories are considered deleterious for neural function, as they act to elevate levels of oxidative stress and to reduce synaptic plasticity and cognitive functions.

Interestingly, exercise has been shown to interact with both dietary interventions, boosting the positive effects of DHA and attenuating the unhealthy effects of the high fat diet. Therapies based on DHA, curcumin, and exercise can benefit the brain, and have long-term consequences on molecular systems responsible for maintaining synaptic function, underlying higher order operations such as learning and memory, and emotions.

The overall evidence supports the idea that diet and exercise can influence synaptic plasticity, neuronal signaling, and cognitive function by acting on critical mediators of energy metabolism. The effects of lifestyle mainly from dietary supplementation and exercise can benefit the inherent capacity of the brain, therefore promote the quality of brain health.

5.1.2 Residency

Residency where elder people domicile in is a specific place where elderly conduct daily activities mainly. It affords an area for elderly to eat, sleep, relax and so on, especially, to protect them from harm of environmental changing and invading of human and animals. A small number of research findings illustrated the residency of elder people can affect their brain health.

One of the findings proved residency could impact on the symptoms and emotional expression of elder adults in dementia. The evidence demonstrated the patient's domicile could influence the neuropsychiatric symptoms, containing dementia duration and emotional burden of frontotemporal dementia (FTD) patients. Another finding displays relocating residency can vary the brain activities. The research revealed that relocation to senior housing was an important stressor for female elderly via changing flattened diurnal salivary cortisol rhythms and an indicator of allostatic load.

The location of residency also relates to brain health. A finding proved the rural older adults were higher depressive symptoms than elderly who were living in urban area, less education, lower pension benefits, less household assets and infrastructure of neighborhood.

5.1.3 Social network

Social network is an interactional social structure in which people can tie to others, such as, family, friends and colleagues, plays an important role in people's life. As the findings displaying, social network also impacts on brain health of elder person.

Evidences prove social network can generate a positive effect to brain. Depending the findings, social network support played a remarkable role in depressive symptoms and cognitive impairment for elderly from three dimensions containing extent of contact with others, satisfaction with contacts and availability of help if sick or disabled. Besides, the communication relationship from family and friends were important to TBI individuals and rehabilitation.

Some parts of findings reveal that active social ties benefit to brain functions. As the research displaying, regular social ties benefited to cognitive improvement, and active social relationships protected the cognitive function. Similarly, a frequency of social contacts was relevant to a lower

risk of dementia in older adults, but the proximity of social contacts was concerned about a higher risk of dementia in elderly with high indicts of occupation-based motivational processes. Additionally, neighborhood integration and connectivity affected cognitive capability and reduction independently and variously in elderly with and without AD.

5.1.4 Games

Games are designed by human aiming to relax and play in entertainment via papers, phone, computers and so on. And it is acceptable in diverse population for its advantage. In this research, some findings prove games contribute to brain health for elderly.

The evidence reveals games can affect brain by stimulation and stressing. According to the findings, as a 6-month follow up research, a GO game positively could affect the mean score of MADRS, and improved the Serum Protein Levels of BDNF and symptoms of patients with AD. And exercise games training affected prefrontal cortex activity and /or function of elderly brain compared with conventional balance training, and also improved gait speed, cadence and stride length during dual-task walking.

Depending on the findings, playing games benefit to brain functions for elder people. As evidence of findings displaying, brain training game (such as, Brain Age) furthered the executive functions and processing speed for elderly in short term training (4 weeks), and also improved emotional states as well in a PSTG. And the “Find the pairs” game played an important role in detecting the early signs of cognitive decline. Likewise, Short-term step pad training of video game at home related to falling risk of physical and cognitive parameters in high functioning elderly.

Similarly, game as cognitive training can affect the brain construction of elder adults. Finding revealed cognitive training impacted on cortical thinning and network variations of elderly brain for changing the training-driven plasticity. And robot-assisted cognitive training was available

to alleviate cortical thinning in the ACC which played an significant role on attention's allocation, initiation and persistence of goal-directed activities.

5.1.5 Radiation

Kinds of electromagnetic wave are full of human living space, for instance, radio, television, mobile phone, wireless remote control, navigation, high pressure distribution line into the air and ground radiation of electromagnetic energy. Electronic products with electromagnetic interference achieving a certain strength can harm to people. As research disclosing, EMF(electromagnetic field) exposure as a risk factor in the brain was associated with neurological diseases such as AD. It can increase the level of amyloid beta and enhance oxidative stress.

Even though in the outside world without electric field, part of the human body function of normal chemical reaction also produce very weak electric current, for example, sending nerve signals in the form of electrical pulses, most of the biochemical reactions including digestion and brain activity accompanied by a charged particle configuration. Low frequency electric field can influence the human body, like other substances composed of charged particles. When the electric conductive material, will influence the surface charge distribution. Electric field will make the current from the body to the earth. Low frequency magnetic field can induce current human body cycle. The strength of the current depends on the strength of the external magnetic field, if the current is large enough, can produce the human body to stimulate nerve and muscle, or affect other physiological processes. Similarly, heating is the physiological functions of radio frequency electromagnetic fields. In the microwave, used to heat food. People often come into contact with the strength of the radio frequency electromagnetic field intensity is obviously much lower than produce heat effect.

Using a mobile phone to call phone emits radio waves. These radio waves can be from the nearest base station receive, once the base station receives the radio waves of mobile phones, will send them to the

communication and exchange based on the current call type will call another base station or a fixed telephone network, thus calls. When using mobile phones, mobile phone will launch base station transmitting radio waves, and any kind of radio waves more or less absorbed by human body, so as to change the body's tissues, may affect the health of human body, called mobile phone radiation.

Cell phone radiation change human genes, although the report also prove that mobile phone radiation can damage DNA, part of the experiment shows that radiation can lead to genetic changes and cause a high risk of malignant brain tumor. Mobile phone may release toxic mercury gas, damage the brain and cause AD, Parkinson's disease, multiple sclerosis, fertility, premature aging and memory loss, scientists and so on.

Effective preventive measures for radiation involve trying to use the phone by the antenna, use the mobile phone hands-free headset to answer the phone and to reduce the use of mobile phones as short as possible. Additionally, launch time under the condition of microwave radiation intensity to reduce microwave radiation exposure every day.

5.1.6 Pollution

Along with the development of the modern industrial society, more and more severe air pollution, long exposure time or acute exposure to certain air pollutants can damage the central nervous system directly. Pollutants induce harmful factors, through the peripheral circulation in the brain, leading to the brain's nerve inflammation, neurotoxicity, oxidative stress, resulting in neurodegenerative diseases.

Findings suggest that exposure to air pollution has the potential to impact neurodegenerative disease pathways. The mechanism is that pollutants can induce changes in neurodegenerative disease proteins like α-synuclein, Aβ42, those have been proposed as potential indicators of preclinical

neurodegenerative diseases, such as PD, AD, and frontotemporal dementia.

One of the main air pollutants of ozone is a kind of reactive oxygen species and the strong oxidant, in the lungs can interact with protein, lipid, protein and lipid oxidation, and produce some toxic ingredients, through the circulation of blood to the brain, eventually lead to oxidative stress in the brain. The oxidative stress induced by acute or chronic ozone exposure, lead to brain lipid peroxidation, dopaminergic neurons in the substantia nigra death, neurons damage on the morphology, eventually lead to movement disorders, and memory impairment. Peripheral system to produce various cytokines or harmful substances through the circulatory system into the brain leads to systemic inflammation of neurodegeneration associated with various neurodegenerative diseases.

The brain is dominant consciousness, thinking, emotional, motor and accepting all kinds of sense organs, its physiological function is implemented by biological activity. Brain voltage is an important performance of electrical activity in nerve cells in the brain. Electroencephalogram can detect when there is no specific external stimuli or light, sound, electricity, and the contact pressure potential changes caused by different brain stimulation, best reflect the characteristics of the electrical activity of the brain. Alzheimer's disease is a serious threat to human health disease, the disease attacks is one of the main causes of strong light stimulation. All of a sudden, bright and dazzling wavelength are likely to cause seizures, patients with brain nerve function disorder, the brain rapid changes in voltage fluctuation significantly.

However, it’s not all the so-called pollutants are harmful for human’s brain, for example, one research about stimulation of light and sound proves that the positive effects were found through the association of brain stimulation by light and sound with therapies that combat depression and anxiety states. The investigation showed brain stimulation technique could induce

favorable mental states to enlarge treatments of several disorders that affected humans in a safe and noninvasive way.

5.2 Mental elements affect brain health

Majority of mental elements are involved in personal, psychological and social factors. All the factors are interrelated and collaborative with each other. It's commonly accepted fact that their synergistic effect to brain health are general and accessible easily from different channels. In this paper, authors are going to implore deeper about precise factors and their mechanism of influencing brain health. According to the results, the subordinate categories of lifestyle, social status, medical intervention, disease and art are founded factors which affect brain health from mental health perspective.

Findings/results of Mental Elements which Affect Brain Health		
Subcategories	Categories	Main categories
Exercise	lifestyle	Mental elements
Diet intervention		
Sleeping quality		
Education	Social status	
Financial resource		
Marital status		
Check-up & health screening	Medical intervention	
Placebo response		
Flavonoid compounds		
Depression	Disease	
Alzheimer's disease		
Music	Art	
Dance		
Art programs		

Figure 4 . Summarized the findings from mental section.

5.2.1 Lifestyle

From mental health point of view, the lifestyle also plays a significant role of orientating and determine the elders' brain health level. Exercise, sleeping quality, and food intervention are the determining factors affecting the quality of brain health of older people.

Exercise could improve physical function and mental health of brain cancer survivors. The positive psychological outcomes were found in the subject participants, showed clinically meaningful improvements in depression and total distress after the implementation of exercise therapy.

Regular aerobic exercise could maintain brain health. It could help to reduce stress by keeping in check the level of cortisol, a hormone shown to shrink the brain and damage the cells in the hippocampus an anatomic area in brain affecting memory. Other forms of activity to reduce stress included tai chi, yoga, meditation, and so forth.

Result showed sleeping also can promote mental health. Getting adequate sleep nightly for elderly people is also crucial, because sleep deprivation increases brain cortisol levels and lowers growth hormone that plays a role in repair/healing. As well as keep a regular routine for stabilizing endogenous circle is imperative for older adults.

Research also proved the significant role of short nap and exercise on the sleep quality and mental health of elderly people. The study proved short nap less than one hour during the daytime and exercise with moderate intensity in the evening could reduce the wake time after sleep onset and increased sleep efficiency, sleep quality was improved significantly.

Research results demonstrated that naps of less than 30 min could prevent nighttime insomnia and reduce the risk of developing dementia to less than one fifth among elderly, however naps longer than 1 hour would have negative effect and associated with a twofold increase the risk of dementia because the person goes into deep sleep, that produce sleep inertia (the

bad mood and disorientation that a person feels upon waking), also naps close to bedtime is not recommended. The frequency of nodding in the evening significantly decreased and the quality of nocturnal sleep was improved. Present results demonstrated that the proper awakening maintenance during evening was effective in improving sleep quality as well. Therefore, mental health also improved with improving sleep quality.

Much work is yet to be performed in determining the role of the gut microbiota in brain function and behavior in human populations. It has become evident that the physiological influence of the gut microbiota extends beyond the periphery to the central nervous system (CNS). Current data derived from preclinical studies indicate that the gut microbiota can influence CNS function. It has played a crucial role in the bidirectional gut-brain axis that integrates the gut and central nervous system activities.

Furthermore, the potential for microbiota-targeted functional food interventions is evident. As new findings emerge in this rapidly developing field, it is envisaged that a greater understanding of microbe-brain interactions will herald a new era of psychotropic therapies to promote normal brain function and mental health.

In comprehensive perspective, research study showed that a mentally stimulating lifestyle might enhance brain reserve and thereby protect against the development of cognitive impairment. In line with brain reserve theory, results refer that a mentally stimulating lifestyle compresses the cognitive morbidity of late-life dementia by delaying its onset and by its association with more rapid decline after dementia onset.

The present results suggest that a mentally stimulating and growth-oriented lifestyle is an important part of maintaining brain health in old age. Current research suggests that the activities should be complex and challenging, and because they need to be sustained over a period of time, these endeavors should be engaging and enjoyable. As well as, taking steps to

keep mentally sharp for as long as possible should start in the 40s and 50s, or even earlier.

5.2.2 Social status

Social status is a position in the society depending on individual experience, like marriage, education, finance and so on. It's a significant part relating to people's health. As our findings, social status is relevant to mental health concerning the factors of financial resource, education and marital status.

As the results, education is linked to the risk of dementia independently. Research exposed that more education experience positively declined dementia risk at old age via varying the connection between pathology burden and cognitive reduction.

Financial resource displays a specific role in brain health for elder adults depending on the findings. A research proved more accumulation of SES (socioeconomic status) displayed a benefit in cognitive function for elderly. As another findings demonstrating, neighborhood socioeconomic status (NSES) of women were significantly relevant to her cognitive function's level, living in a neighborhood who was in a upper NSES linked to higher cognitive function.

As some findings displaying, marital status also impacts on health of elder adults by brain. Evidence revealed single older person had higher odds of cognitive impairment (increasing 2.5 times) compared to being married, especially for single men (6.2 times) and window men (about 5 times) compared to married men. Similarly, a study of association between marital status and risk of dementia demonstrated that each non-married subcategory had obvious higher risk dementia than the married group by Cox regression analysis.

5.2.3 Medical intervention

Medical intervention refers to a certain treatment methods or substances utilized to improve the brain health in older adults. According to the findings, check-up for certain disease, placebo response and flavonoid compounds can promote elder people’s brain health from prevention perspective.

Researchers advocated the screening for depression in older adults are crucial because of its prevalence and risk for increased mortality. Research results proved that the screening for late-life depression have better response rates than usual care, it can decrease the depression morbidity by early intervention. Therefore, the check-up for elderly people are beneficial.

Flavonoids could prevent the onset of Alzheimer's disease and progress, and promote the cognitive ability. Regular consumption of flavonoids had been associated with a reduced risk of neurodegenerative diseases. In addition to their antioxidant properties, these polyphenolic compounded exhibit neuroprotective properties by their interaction with cellular signaling pathways followed by transcription and translation that mediate cell function under both normal and pathologic conditions. This mechanism explained their therapeutic potential to prevent the onset and progression of Alzheimer's disease and to promote cognitive performance.

Research proved the close relations between placebo response associated with mental and physiological process. It referred to the placebo effect in the placebo analgesia effect and brain function imaging showed that the activation link, and increase the function of the correlation between the anterior cingulate, island of prefrontal cortex and the nucleus accumbens, amygdala, the brain stem. There is indeed a "placebo response" that engages common brain mechanisms in different domains, and how profoundly placebo can affect our mental and physical health still need further exploration. Recent studies in humans have demonstrated that placebo treatments induce active psychobiological changes in several domains, including pain, Parkinsons disease, and depression.

5.2.4 Disease

Diseases are the common and well-known culprit of reducing brain health . For elderly, the characteristic of co-existing multiple chronic diseases and long term recovering period are prominent. According to our findings, disease like brain tumor effect brain health significantly. One study shows patients with primary brain tumors are not only disturbing brain functions, it also cause depression, anxiety and obsessive-compulsive symptoms. The quality of life worsened tremendously. The complications after operation also effect their mental health as well..

Depression is most common disease effecting brain health of elderly people. Researches showed the prognosis period of mild depression patients with cancer is very long. The general symptoms of depression include loss of interests, loss of energy, reduce the diagnosis of sexual desire and concentration, anorexia, weight loss, sleep disturbances, the change of motion of the spirit, fatigue, etc. A lot of evidence prove that depression affects not only the disease of the nervous system, but also in the gray matter atrophy due to reduce the quantity/size of the brain neurons and glia. It affects neurogenesis, namely new neurons/mature functions, seems to remain in the adult brain for the whole life. There are three parts of the brain seems to play a role in major depressive disorder: the hippocampus, the amygdala and the prefrontal cortex.

Alzheimer's disease as a disease conceals the progress of the development of nervous system degenerative disease. Unquestionably, it’s influencing mental health tremendously. The pathological mechanism is the impaired neuron function, the irreversible neuron shrinking or loss, the anatomical changes like decrease of brain volume and weight and changes of gray matters and so on. The symptoms embodied in the decline of the cognitive function, behavior and daily activities. Alzheimer's disease is caused by all kinds of primary or secondary brain diseases, such as stroke, traumatic brain injury.

5.2.5 Art

Art has been well-known as keys of better brain health by variable artistic expressions, for example, music, writing, painting, architecture, design and so on. Art improve brain health by the mechanism of sense-of-control mechanism, enhance social engagement and strengthen brain plasticity. Scientist shows positive feelings associated with a sense of control as triggering a response in the brain that sends a signal to the immune system to produce more beneficial immune system cells. Arts can create something new and beautiful works, therefore, continuously positive feelings are produced. As well as, arts provide some of the best opportunities to experience a new sense of control or mastery and offer an enormous sense of satisfaction and empowerment. Many forms of art provide significant opportunity for social engagement, including chorales., poetry groups., bands, groups engage in painting, writing, drama, and dance and so on. Brain plasticity means, when die brain is challenged through our activities and surroundings, it is altered through the formation of new synapses, more synapses means better communication among brain cells and increased opportunities for new ideas connecting. Conclusively, every form of art provides optimal utilization of the benefits of simultaneous brain involvement, optimally integrating left- and right-brain capacities.

According to our findings, it shows music-based interventions are widely accepted as beneficial for the mental state of people with dementia. The effects of music can reduce the behavioral and psychological symptoms. Music can help increase confidence and alertness, improve behavioral and psychological symptoms and cognitive abilities. Music can also decrease aggressive behaviors as well as anxiety and agitation of elderly patients with Alzheimer’s. Preferred music listening has a positive impact by reducing the anxiety level in older adults with dementia, also have study reports that music listening can impact on the sleep quality of older people.

The use of music as a means of mood regulation has been proved to be an important factor for elder’s mental health. Adequate mood regulation may play an important role in mitigating or preventing mental illness. However,

the means of mood regulation are related to individual's gender. According to findings, male with higher anxiety and/or neuroticism is more likely to use discharge, using sad or aggressive music to express a negative mood.

Brain responses to music vary with individual differences of depression, anxiety and neuroticism levels, it is possible that music acts more as a risk factor or a protective factor in mental illness. For example, certain music listening patterns, such as listening to sad or aggressive music without the outcome of mood repair, might have more negative neural outcomes for such depressed, anxious or neurotic individuals than healthy individuals. Furthermore, the listening to a certain quality or genre of music probably does not, in itself, cause one to become anxious or possibly also depressed; listening regularly to that same music in the context of a discharge regulation strategy, for individuals who are more neurotic, might very well increase one's risk of experiencing mood or anxiety disorders. The same music used by the same individual for solace or diversion may cause a different outcome in terms of mental illness risk than would be seen for discharge.

This pilot study done in community settings found that a dance movement group therapy can improve participants' well-being emotionally, socially and cognitively. Music, dance and movement facilitate a non-verbal dialogue through those people with dementia and those around them, most of them found verbal communication becomes more difficult.

A project results indicate that community based art programs can have powerful positive intervention effects in health promotion and disease prevention. It indicates the positive impact on maintaining elder people's independence and on reducing their dependency. Thus, these community-based cultural programs for older adults appear to be reducing risk factors that contribute to the need for long-term care. In the project, the art group showed improvement in morale, oppositely, the control group showed morale declined. The art group also showed less loneliness than the control group.

6 DISCUSSION

According to Neurologist Nussbaum, to keep a healthy brain in balance can promote holistic individual's health by functioning at its near-peak potential exertion (Nussbaum 2015). Therefore, it's important to find out what disturb the balance of brain health for health care professionals. This thesis is displaying what are those factors influencing brain health of elder adults from mental and environmental perspectives.

According to the findings, lifestyle is playing an important role in keeping elder's brain health. Lifestyle related factors belong to both mental and environmental sections, individual's behavior are affected by a complex variety of environmental, personal and psycho-social factors (Soundy, Faulkner & Taylor 2007). And simple adjustments to diet, exercise, social and cognitive stimulation can reduce age-related cognitive decline and improve memory and thinking (Ganzer & Zauderer 2011).

Dietary intake is an essential component of body's health. Depending on the research of Mychasiuk et al, dietary intake could vary the behavioral recovery of mild traumatic brain injury (mTBI) and the telomere length (TL) of brain as well as epigenetic expressions (Mychasiuk et al 2015). For the changes of aging, the nutrient needs are altered for elderly. The dietary guidelines for older adults highlighted appropriate fluid, convenient and readily available foods, and physical activities (Tufts Now 2011, as cited in Bernstein & Munoz 2012). Hence, it should be considered to supplement selected diet contained richly in DHA, curcumin, unsaturated fatty acids, vitamins, antioxidants as well as nutraceuticals while caring for certain clients to senior adults in advisable eating patterns.

Regular physical activities are recommended for older adults aiming promoting brain health. Depending on the WHO, physical activities for older adults at age of 65 years and above contained leisure time physical activity, transportation like walking and cycling, household chars, play, games and

so on. Aiming to further cardiorespiratory and muscular fitness, bone and functional health, shorten the risk of NCDs, depression and cognitive decline, older adults should do moderate-intensity physical activities at least 150 minutes or vigorous-intensity aerobic physical activities at least 75 minutes or an equivalent combined activities per week, and muscle-strengthening activities concerning major muscle groups per week if their abilities and conditions allow.(WHO 2011.) Therefore, positive and competent activities are crucial for older adults, and voluntary exercise should be always encouraged to participate.

Healthy sleeping pattern is beneficial to brain health. According to WHO, sleep deprivation could affect cognitive impairment including deteriorating performance, attention and motivation; diminishing mental concentration and intellectual capacity; as well as raising the risk of working and driving accidents (WHO 2004). Likewise, as the research of Macera et al demonstrating, sleep problems could remarkably mediate the development of PTSD or depression (or both) by the impact of a positive TBI screening (Sobel $P < 0.01$)(Macera et al 2013). Additionally, aging could result in the changes of sleep architecture (increasing N1 and N2 sleep, decreasing N3 and REM sleep), sleep quality (such as, hardness of sleep initiation, bed earlier and wakening earlier) and circadian rhythms (Edwards et al 2010). Consequently, keeping a healthy sleeping habits is very important and daytime naps should be recommended for senior adults.

According to the results, residency also can affect elderly brain health. Generally, residency is essential part of human's life. However, residency requirement is specific for elderly cohorts. As the research of Yen et al, the components of built environment involving aesthetics, land use and connectivity could affect the mobility decisions of older adults positively through the mechanism of perceptional safety, concerning walking for transport and /or leisure and general physical activity (Yen et al 2014). For dementia elderly, green and natural environment, provision with visuals, social integration, outdoor space and local communal connection were

recommended to housing alternative (Lee et al 2012).Thus, comfortable and convenient dwelling place should be opted for elderly adults, considering housing architecture, aesthetics, natural space and so on, aiming to afford safe and secure environment to participate physical activities and social interaction which are relevant to brain health.

As the findings revealing, social interactions impact on the elderly brain health. Social interactions involved social contact, social activities, social integration, social participation, social support and so on, which possibly affect healthy aging (McKee & Schüz 2015). Coping resources (such as social support and self-efficacy) and active coping patterns (like concrete planning) were beneficial to successful aging (Tovel & Carmel 2013). As the 4-year follow-up research demonstrating, supportive social network and daily contacts were advantageous to cognitive function and risk for dementia in elderly women (Crooks et al 2008). Additionally, cognitive and physical activities could decline the risk of pursuant all-cause dementia and AD (Heser et al 2014). Therefore, older adults should be encouraged to join in any activities which can promote their social connections, and keep in a good touch with their families and friends as well as neighbors.

Depending on the results, social status as another dimension of social aspect affects elderly brain health. It can be explained into objective social status (OSS) involving income, education, occupation and so on, and subjective social status (SSS) correlating to individual's perception lying on social hierarchy (Pieriz, et al 2016). As the study of over 13,000 samples at age 50 years and over demonstrating, median years of education and median household income at community-level as well as years of education at individual level were significantly relevant to overall cognitive score in both urban and rural areas (Wu et al 2016). Another research revealing, the current economic satisfaction was relevant to later life satisfaction which was associated with successful aging (Hsu 2010). Widow, divorced, separated or never married status could shorten the Leukocyte telomere length which could increase antioxidative capacity of fibroblasts in vitro and

relate to vascular dementia (Zglinicki et al 2000; Mainous et al 2011). Thus, enhancing the individual's SSS and OSS can promote healthy aging, thereby benefit to brain health of older adults.

From mental related factors, art intervention is significant for promoting brain health of elderly people. As the broad researches displaying, involving the areas of vision, audition, somato-sensation, movement and cinema, the phenomena of art was correlated to brain capabilities, containing perception, behavior, emotions and brain-related diseases (Segev et al 2014). Art therapy can be used to tap the body's relaxation response. Art activities can help to bridge the implicit and explicit memories of a stressful event, may help elderly to think and feel concurrently.(Malchiodi 2003,16-22.) For elderly adults, art therapy could regulate the psychological resources of individuals in life-resilience and reflexiveness (Glozman & Naumova 2014). Therefore, art activities like music listening, dancing, painting, drama, poetry and so on, are especially advisable for elder's adults, the reason and relative education about art activities need to be explained elaborately.

On of the results exposing, playing games can impact on the brain health of elderly adults. On one hand, gaming can influence cognitive functions of brain positively. Such as, playing video games regularly could decline activation of brain regions linked to attention (BAvelier & Davidson 2013), game-based cognitive training could affect the elderly brain in cognitive control including fluid intelligence and response inhibition (Karbach 2014). On the other hand, gaming can improve the social interaction for older adults. Ekman et al manifested games could correlate actively with social interaction via physiological linkage and social presence in a shared gaming context (Ekman et al 2012) Additionally, gaming can improve elderly activities. As the research of Hakim et al, the Nintendo Wii Fit game could improve balance capability and decline the risk of fall in individuals with peripheral neuropathy (Hakim et el 2015). Therefore, games like Brain Age, Crossword and cognitive training can be recommended to elderly adults to

improve their cognitive and mental status, and group plays are recommended as well.

As the findings, chronic and degenerative diseases affect the brain health of elder adults. The progress of diseases relating to organ failure, heart disease, systemic inflammatory, infection, hematological disease and so on, concerned to the brain-immune interaction which was related to keep health (Denes & Miyan 2014). However, the functions of classical immune of elder adults were manifested decline for aging (Vallejo 2011). Besides, as the report of WHO, disease patterns of elder adults would be altered globally over the next 10-15 years, as increasing burden of chronic noncommunicable disease containing heart disease, cancer and diabetes as well as dementia which would be referred to 150 million population in 2050 (WHO 2011). Hence, enhancing immunity of elder adults, early screening and positive treatment of diseases as well as recoverable training are very important for elderly. Dilworth-Anderson et al underlined the barriers of social justice in minority elderly adults with Alzheimer's concerning Alzheimer's disease screening, diagnosis and treatment (Dilworth-Anderson, Pierre & Hilliard 2012). Thus, social justice should be promoted expansively in elderly population aiming to afford equal opportunities of medical service.

Medical intervention is an important approach to affect brain health of older adults. It concerns early medical screening, medical treatment and recoverable training, etc. Medical screening as a positive action can track asymptomatic diseases therefore promoting early diagnosis of disease. Brain diseases like cerebral tumors in the central nervous (CNS) could be detected in the neuropsychology laboratory but were unusual in general clinical practice (Franzen et al 2010, 2). Hence, medical screening benefits to expose early symptoms of diseases in brain. Additionally, medical treatment can impact on the development and outcomes of brain diseases directly. As research of Wang et al demonstrating, pathology and restoring neuronal function of brain relating to learning and memory of AD were

declined after chronic monomeric treatment (Wang et al 2012). Likewise, recoverable training shows beneficial influence for brain health. Such as, biofeedback training could improve the runtime and the functional quality of movements of individuals after cerebrovascular accidents for increasing the effectiveness of neuronal function (Calomeni et al 2013). Therefore, positive medical intervention should be recommended for elder adults aiming to boost brain health. The early detection and medical intervention of common diseases like AD and cardiovascular disorders can prevent the malignant progressing and improve the quality of treatments.

Pollution is a negative factor affecting brain health. It may relate to air, water， food pollution and so on. Air pollutants were divided into indoor air pollutants (containing tobacco smoke, emissions from cooking stoves, mold, plasticizers, flame retardants and pesticides) and outdoor air pollutants concerning tailpipe and brake emissions from mobile sources, residential fuel combustion, power plants, etc. The components of air pollution like ozone, particulate matter (PM), diesel nanoparticles, endotoxins affected the CNS of brain from the potential mechanisms.(Brockmeyer & D'Angiulli 2016.) Likewise, drinking water pollution like chronic Copper exposure could alter the levels of AP-1 DNA binging of CNS (Lung et al 2015). Benzo[a]pyrene exposure came from contaminated food, water, polluted air inhaling, and so on, could initiate the inflammatory cascade in the CNS due to bystander neuronal dying (Dutta et al 2010). Additionally, diverse frequencies of noise pollution could alter the brain activities of human measured by electroencephalogram (EEG) showing complexity changes (Allahverdy & Jafari 2016). Thus, for promoting brain health, elder adults' life and activities should be in without airy and noise polluted areas， meanwhile the components of drinking and eating should be healthy.

Radiation also impacts on the elderly brain health. Radioactive pollution may come from electromagnetic radiation, radioactive materials, ionizing radiation and so on. Previous reports manifest the linkage between radiation and brain. For example, chronic exposure of microwave radiations

at 2.45 GHz could harm the brain cells via accelerating DNA double-stand breaks and varying the activities of antioxidants enzymes (GPx, SOD and CAT) and histone kinase (Kesari et al 2010). Ionizing radiation exposure upgraded uniformly the risk of the brain/CNS tumors, such as, meningioma, glioma (Braganza et al 2012). The radon concentrations of Long-term exposure in residency related to the risk of primary brain tumors(Bräuner, et al 2013). Therefore, health education is very important for elder adults, such as, avoiding radioactive exposure, reducing the use of electronic devices, wearing mask when staying in air polluted area, annual checkup, etc.

Conclusively, as health care professionals, the findings are quite significant and helpful. When nurses, doctors, physiotherapist, nutritionist provide health care for elderly adults, the valuable information mentioned above can be used as database to promote health care quality.

6.1 Ethical considerations

Ethical fundamentals are taken into considerations as an important part in this thesis. As the principle of ethical using in nursing research, it standardizes research behavior to avoid harm and restrict risk of harm for research participants (Doody & Noonan 2016). It urges authors to eliminate falsifying or fabricating from the original data which are adopted in relevant researches and also help to guarantee this research to be true and reliable.

In this thesis, the authors collected information from previous researches in scholastic database (such as, Melinda, EBSCO, Masto-Finna, PubMed/NCBI and Medic) which can provide answers to the research questions. For preventing vulnerability, the authors used the limit criteria following the aim of research in each database via selecting the key words, language, year of publication and peer reviewed or scholarly as well as full text in availability. And the findings and results of researches are displayed without misconducts after understanding and summarizing.

For avoiding plagiarism, all the quotes from other databases are adhered the thesis guideline of Lahti University of Applied sciences (LAMK) as well as the advice of superisor in LAMK. Additionally, the reference are also cited as the standard format of LAMK reference after cross-checking as well.

6.2 Reliability and Validity

Reliability and validity were displayed strictly in this researching progress by three international students of LAMK. The reliability represents a specific test, procedure or tool will yield a result similarly in diverse circumstances in a hypothesis without nothing changes. Validity refers to how the measuring purport to the desiring measure.(Roberts et al 2006.)

In this literature review, searching keywords were confirmed strictly after negotiating with supervisor as well as researching methodology depending on the topic aiming to guarantee the findings can answer the research questions. Keywords were selected actually after some attempting searching in databases targeting the most concerned information.

The data of relevant researches were selected restrictively in publication time at the period during the past 10 years to searching time of this thesis. The data choose by three authors after adequate analysis were previous studies which were related to this topic questions.

Additionally, the presenting of findings are coherent to the topic as well. Similarly data are opted for supporting the one point. And no new topics are discussed in the thesis.

7 CONCLUSION AND RECOMMENDATION

In alignment with the aim of the study, the authors of this paper are trying to find out what are the environmental and mental elements affects brain health of elderly adults. In order to achieve this goal, a comprehensive data research was done and all the found literature were scrutinized and

analyzed systematically. Results shows environmental elements consist of lifestyle like diet, exercise; regionally differences of residences; social networks like communication; brain training games like Brain Age; radiation from electronic devices and pollution like air, chemical pollution. Mental elements include lifestyle like diet, exercise and sleep pattern; social status like education background; medical intervention like regular checkups; disease like depression and Alzheimer' disease and art like music are the founded factors contributing to the quality of brain health for elder adults.

The results are quite satisfactory to the authors' expectations. At the primary stage, authors cannot predict the subcategories, the prediction of results are considerably obscure and blurry. However, after a lengthy and elaborate database research process, the findings are emerging from underground slowly. During the organizing and reorganizing process of the findings, some evidences are supplemented into original findings in order to make each effecting factors more firm and evidence-based. At the last stage of editing of this thesis, all the found articles are analyzed and results are demonstrated concisely and precisely.

The authors take utmost assertion to cover all the possible articles which can find the evidences. However, since the huge volume of data existing around the world, authors can only use the keywords and inclusion and exclusion criteria to limit the information from the 5 databases. Furthermore, the access limitation to several articles from certain databases like Helsinki university database, and the difficulty of acquiring the valuable paper version book from the libraries of other region limited the findings of the thesis as well. Even though certain limitations of the results exist, it does not effect the core finds of this paper. According to the authors' prediction, the subcategories of the factors are comprehensive and reliable, the evidences for supporting the factors which effect brain health are dimensional and abundant, however, it still have large space to be explored deeper and profoundly.

The original goal of this paper is to find out all the four elements of environmental, mental, physical and cognitive elements affecting brain health of elderly people. However, due to the large workload, only the environmental and mental elements were explored and demonstrated in this paper. The other two dimensions of physical and cognitive elements have not been demonstrated even though the primary data search had been done. Therefore, a follow-up study in response to this literature review are recommended in the future.

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