International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 02, 2020
ISSN: 1475-7192

The Correlation of Cognitive Activities and Dietary Habits with theElderly's Cognitive Functions

[1]Rega Setiananda, Elida Ulfiana, EkaMishbahatul, HerdinaMariyanti

Background---*The decrease of cognitive functions is one of the most prominent forms of functional status disruption in the elderly. Earlier studies suggest that cognitive activities and coherent dietary habits can be performed to maintain the brain structure in the aging process. However, little attention has been paid to the correlation of cognitive activities and dietary habits with the cognitive functions in the elderly.*

Purpose *This study aims to analyze the correlation of cognitive activities and dietary habits with the cognitive function in the elderly.*

Method *The design employed in this study was a descriptive correlational study with a cross-sectional approach. There were 40 respondents selected through convenience sampling. The independent variables includedcognitive activities and dietary habits, while the dependent variable was the cognitive function.The data were obtained through a cognitive activity questionnaire, Semi-quantitative Food Frequency Questionaire, Mini-Mental State Examination (MMSE), and Spearman'srho statistical analysis with a significance level of $\alpha<0.05$.*

Results *The correlation test results suggested that there was a correlation of cognitive activities ($p=0.000$ and $r=0.602$) and dietary habits ($p=0.044$ and $r=0.321$) with the cognitive function in the elderly.*

Conclusion *There is a significant correlation between cognitive activities and cognitive function in the elderly, but a low correlation between dietary habits and cognitive function. Therefore, nurses and health workers should make interventions to improve cognitive activities and to regulate the proper dietary habits to maintain cognitive function in the elderly. Future research is required to assess the study further.*

Keywords---*cognitive activities, dietary habits, cognitive functions, elderly*

I. Introduction

The decrease of cognitive functions is one of the most prominent forms of functional status disruption in the elderly. The decrease of cognitive functions includes various aspects, i.e., orientation, registration, attention and calculation, memory, language, and visual construction. The decrease of cognitive function is closely related to the decrease of intellectual capacity, which affects the well-being of the elderly. Several modifiable factors, including dietary habit, cognitive activity, health, and exercise, have been studied and proven to be capable ofreducing the risk of damage to cognitive function (Andel, Hughes & Crowe, 2005).

[1]***Faculty of Nursing, UniversitasAirlangga***

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

A person's cognitive abilities will change with age due to the permanent cellular changes in the brain, resulting in neuron reductions with no regenerative power. Previousdeveloped theory expounds that functional consequences are a combination of changes related to age and risk factors towardslife quality or activities of the elderly (Miller, 2009). Negative functional consequences are the function impairment of the elderly, which cause decrease in their functions and quality of life. Age-related changes are physiological processes that increase the susceptibilityto the negative effects of risk factors. The sources of risk factors include the environment, lifestyle, support systems, psychosocial conditions, treatment and alcohol effects, lack of knowledge behavior, visual and auditory impairment, dementia, and depression. The cognitive function of the elderlywith a healthy lifestyle will be classified in the good category. The healthy lifestyle of the elderly should consider several aspects, i.e., physical activities (sports), cognitive activities, good dietary habit, no smoking rule, good sleep, and rest patterns(Wallace, 2007).

Dietary habits and cognitive activities have vital significance in the cognitive function of the elderly. Cognitive activities that can maintain the cognitive function of the elderly consist of playing chess, reading, writing, filling in the crossword puzzle, playing music, and participating in discussion groups(Verghese et al., 2003). Maintaining the brain structure in the aging process should also consider the dietary habit with a balanced nutritional intake. Basic brain function exercises can be performed by regulating eating frequency. The more frequent a person eats, the more essential functions of the brain become better. Whena person eats,several exercise processestake place in the basic functions of the brain, such as swallowing and chewing activities, taste perception, and digestive system(Nadesul, 2011). Previous studies revealed that there is an irregular frequency of elderly food consumption, which is twice a day. Meanwhile, the frequency of regular eating is three main meals and two small mealsa day(Elvia, Siregar & Siagian, 2013).

The increasing number of the elderly population in the world causes the increasing number of the elderlyto experience cognitive decline as well. The prevalence of impaired cognitive functions, including dementia, increases with age(World Health Organization, 2016). The incidence of cognitive decline in the elderly is estimated at 121 million people, with a composition of 5.8% of men and 9.5% of women. An increasing number of the elderly also occurred in community unit 8 (hereafter RW 8), Mojo sub-district, Surabaya, Indonesia, with the highest elderly population amounted to 200 people according to preliminary data obtained from the Mojo Health Center in Surabaya, Indonesia (2016). RW 8, Mojo sub-district held routine elderly activities weekly. The number of the elderly who attended the routine elderly activities was only about 50% of the number of elderly people in RW 8, Mojo sub-district, Surabaya, Indonesia. The preliminary study was conducted at Posyandu Bugar(integrated health services post) for the elderly at RW 8, Mojo sub-district with interview technique on April 23rd, 2016. The preliminary study involved 16 elderly people with the Mini-Mental State Examination (MMSE) format. The results indicated that nineelderly (56.25%) had poor cognitive functions, and sevenelderly (43.75%) had good cognitive function. The elderly with poor cognitive functions stated that they frequently forgot and paid less attention to dietary habits,as well asrarely did activities held by RW 8, Mojo sub-district, Surabaya, Indonesia.

Previous studies have associated the significance of dietary habits (Smith & Blumenthal 2016; Yin et al., 2018), physical activities (Laurin et al., 2001) and cognitive activities (Andel, Hughes & Crowe 2005; Ghisletta, Bickel & Lövdén, 2006) on cognitive functions in the elderly population. However, several studies did not indicateany significant correlation to cognitive function in the elderly population (Aartsen et al., 2002; Mackinnon et

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

al., 2003; Salthouse, Berish & Miles, 2002). That circumstance can occur due to the differences in the method employed. Nevertheless, little attention has been paid to the study conducted in developing countries, especially Indonesia, since developing countries are the fastest aging population countries compared to developed countries(UN DESA, 2002-2004).

This study aims to determine the correlation of dietary habits and cognitive activities with the cognitivefunction in the elderly.

II. Method

Study and Samples

This study was conducted in 2016. The study employed a descriptive correlational design with a cross-sectional approach. The sampling technique in this study was convenience sampling with the following criteria:

1) the elderly with permanent residents in RW 8, Mojo, Surabaya, Indonesia;
2) the elderly with a minimum education level of elementary school graduates or equivalent;
3) literate;
4) the elderly with no food restrictions due to illness, culture or religion; and
5) the elderly who were willing to take part in the research. The accessible population isa population that fulfills the research criteria and is usually approachable by researchers from the group. The accessible population in this study was the elderly people aged 60-80 years old who attended the integrated health services post.

Measure

Observation instrument: The instrument in this study was the primary data taken from three questionnaires, as follows:

1. Instrument 1 was the statement regarding respondent demographic data consisting of age, sex, and the latest education.
2. Instrument 2 was in the form of a cognitive activity questionnaire(Verghese et al. 2003).The activities inquired were playing chess, reading books or newspapers, writing, filling in a crossword puzzle, playing music, and participating in discussion groups. Every day: score 7, Every week: score 4 Every month: score 0. The range of scores was 0-42, then grouped into two categories, i.e., exercise training with a low score was lesser than 12, and a good score was higher than 12.
3. Instrument 3 was a Semi-quantitative Food Frequency Questionnaire.Food Frequency Questionnaire (FFQ) was usually utilized to assess the frequency of eating certain foods over a specified period. In FFQ, food portions could be added to assess energy and other nutrients, so this method became FFQ Semi-Quantitative (Gibson, 2005). The list of food and beverage names was arranged based on food groups, and then the frequency for the list of food names was grouped in the response category. To collect the food names that would be included in the list, several approaches were performed, such as looking at the list of food ingredients and identifying what foods or ingredients with nutrients according to the research needs. Another approach was by listing all food names that may contain essential nutrients then systematically reducing the

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

list of food names. The next approach was by employing open data (Willett, 2012). The scoringcategories or the scores used to assess the frequency are grouped as follows

- "never" with the score of0, if <1/week, the score was 1;
- if <3/week, the score was 2;
- if 3x/week, the score was 3;
- if 1x/day, the score was 4; and
- if >1x/day, the score was 5. After all types of foods and drinks were given the scores, the scores were grouped into a score ≥median=frequent and a score <median=infrequent.
- The median cut off point was selected because of its abnormal distribution.

The category or score used to assess the amount of food consumed followed the "2014 Balanced Nutrition Guidelines" (Kementerian Kesehatan, 2014).

Accordingly, if the amount of staple food consumed by older men was ≥500 grams, the score was 2, if <500 grams, the score was 1. Meanwhile, if elderly women consumed ≥350 grams of staple food, the score was 2.If the consumption was >350 grams,the score was 1. The consumption portions of animal proteins, plant proteins, vegetables, fruits, and low-fat milk among elderly men and women were equal with the information as follows:

a. If a person consumed animal protein more than 150 grams, the score would be 2, and if the consumption were lesser than150 grams, the score would be 1.
b. If a person consumedplant protein more than 150 grams, the score would be 2, if the consumption were lesser than 150, then the score would be 1.
c. If a person consumed animal protein more than 400 grams, the score would be 2, and if the consumption were lesser than150 grams, the score would be 1.
d. If a person consumed animal protein more than 150 grams, the score would be 2, and if the consumption were lesser than150 grams, the score would be 1.
e. If a person consumed low-fat milk more than 150 cc, then the score would be 2.If the consumption were lesser than 150 cc, then the score would be 1. Next, the scores were added and groupedinto "good" if the scores were ≥12, and "poor" if the scores were<12.

The assessment was classified into three categories:

1. Good dietary habit: high frequency and proper food portions
2. Slightly poor dietary habit: high frequency and improper food portion
3. Poor dietary habit: low frequency and improper food portion

4. The 3rdInstrument was the MMSE questionnaire.

MMSE was grouped into seven categories: Place orientation (country, province, city, building, and floor), time orientation (year, day, month, day, and date), registration (repeating 3 words quickly), attention and calculation

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

(sequentially subtracting number 100by 5, or spelling the word WAHYU backwards), memory (recalling 3 words that have been repeated before), language (naming 2 objects, repeating sentences, reading aloud and understanding a sentence, writing sentences, and following the 3-step instructions), and visual construction, such as copying image (Potter & Perry, 2005).

The total score was 30, then the score was calculated and classified into three categories, as follows:

a. 24-30: good cognitive function

b. 17-23: average cognitive function

c. 0-16: poor cognitive function

In this study, the independent variables includedthe cognitive activities and dietary habits of the elderly, whereasthe dependent variable was the cognitive function of the elderly.

Ethical Clearance

This study has obtained the ethical clearance issued by the Health Research Ethics Commission of the Faculty of Nursing, UniversitasAirlangga, Surabaya, Indonesia No.166-KEPK.

Statistical Analysis

The data collected through the cognitive activity questionnaire, Semi-quantitative FFQ, and MMSE were analyzed using the Spearman's rho statistical test by using the level of significance $p<0.05$.

III. Results

The demography characteristics of the respondents

In this section, the demographic characteristics of the respondents were presented, including gender, age, and formal education background.

Table 1: The distribution of the respondents based on sex, age, andformal education background

Respondent Characteristics	F	(%)
Sex		
Male	6	15
Female	34	85
Total	**40**	**100**
Age		
60-74 years old	32	80
74-90 years old	8	20

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

Total	**40**	**100**
Formal Education Background		
Elementary school graduates or equivalent	14	35
Junior high school graduates or equivalent	8	20
Senior high school graduates or equivalent	12	30
College or university graduates	6	15
Total	**40**	**100**

Table 1 revealed that the majority of the respondents were female, amounting to 34 (85%). The age data suggestedthat the majority of respondents were 60-74 years old,reaching 32 respondents (80%), and the formal education data denoted that most respondents graduated from elementary school or equivalent, amounting to 13 respondents (32.5%).

The cognitive activities, cognitive functions, and dietary habits in the elderly

Table 2:The cognitive activities, cognitive functions, and dietary habits in the elderly

Cognitive activities		
Category	**f**	**%**
Good	20	50
Poor	20	50
Total	40	100
Cognitive functions		
Category	**f**	**%**
Good	11	27.5
Average	22	55
Poor	7	7.5
Total	40	100
Dietary habits		
Category	**f**	**%**
Good	13	32.5
Slightly Poor	7	17.5
Poor	20	50
Total	40	100

Table 2 indicated that the elderly's cognitive activities were equal between the elderly with good cognitive activities, amounted to 20 people (50%), and the elderly with poor cognitive activities, amounted to 20 people (50%). Table 2 also indicated that some of the elderly had poor dietary habitcategory,amounted to 20 people (50%). Most of the elderly had an average cognitive function, amounted to 22 people (55%).

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

The dietary habits in the elderly

The dietary habits studied were related to the frequency and the portion of foodconsumption in the elderly.

Table 3:The consumption frequency and the number of ingredient consumption servings for the elderly

Ingredient	Frequent		Infrequent		Total	Good		Poor		Total
	f	%	f	%		f	%	f	%	
Staple food	14	35	26	65	40	13	32.5	27	67.5	40
Animal protein	11	27.5	29	72.5	40	11	27.5	29	72.5	40
Plant protein	28	70	12	30	40	26	65	14	35	40
Vegetables	12	30	28	70	40	12	30	28	70	40
Fruits	12	30	28	70	40	11	27.5	29	72.5	40
Low fat milk	26	65	14	35	40	27	67.5	15	32.5	40

Table 3 indicates the frequency and number of food consumption servings in the elderly wherea lot of the elderly,amounting to 28 people (70%), frequently consumed vegetable protein, and the elderly of the similar proportion (29 people or 72.5%) did not frequently consume animal protein. In addition, 27 elderly people (67.5%) were grouped into good category in terms of low-fat milk consumption, and 29 elderly people (72.5%) were classified into poor category in terms of animal protein and fruits consumption.

The correlation of cognitive activities and dietary habits with the cognitive functions in the elderly

Table 4: The cross-tabulation of cognitive activities with the cognitive functions in the elderly

Cognitive activities	**Cognitive Functions**						
	Good		**Average**		**Poor**		**Total**
	f	%	F	%	F	%	
Good	10	25	10	25	0	0	20 (50%)
Poor	1	2.5	12	30	7	17.5	20 (50%)
The Spearman'srho test r=0.602 p=0.000							
Dietary habits	**Cognitive Functions**						
	Good		**Average**		**Poor**		**Total**
	f	%	f	%	F	%	
Good	7	17.5	5	12.5	1	2.5	13 (13.5%)
Slightly Poor	1	2.5	4	10	2	5	7 (17.5%)
Poor	3	7.5	10	32.5	5	10	20 (50%)
The Spearman'srho test r=0.321 p=0.044							

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

The cross-tabulation in table 4 suggested that the elderly with good cognitive activities reached 20 people (50%), respectively,10 people had good cognitive functions (25%), and the other tenpeople (25%) had average cognitive functions. Meanwhile, the elderly with poor cognitive activities reached 20 people (50%), and most of the respondents, amounted to 12 people (30%), had average cognitive functions. The statistical test results signified that H1 was accepted, as proven from the value of $p=0.000$, with a significance level of $p<0.05$. Hence, there was a correlation between cognitive activities and cognitive functions in the elderly. The correlation coefficient value obtained was 0.602, indicating that cognitive activities had a strong positive correlation with the cognitive function in the elderly. It implied that if cognitive activities were proper, cognitive function would also improve.

The cross-tabulation also indicated that the elderly with good dietary habits reached 13 people (13.5%), most of them, which reached 7 people, (17.5%) had good cognitive functions. Furthermore, the elderly with slightly poor dietary habits reached 7 people (17.5%),and most of them, amounted to 4 people (10%), had average cognitive functions. Meanwhile, the elderly with poor dietary habits reached 20 people (50%), who most of them, amounted to 10 people (32.5%), had average cognitive functions. The statistical test results signified that H1 was accepted, as proven from the value of $p=0.044$, with a significance level of $p<0.05$. Accordingly, there was a correlation between dietary habits and cognitive function in the elderly. The correlation coefficient value obtained was 0.321, indicating that dietary habits had an insignificant positive correlation with the cognitive function in the elderly. In a nutshell, if the dietary habits were proper, the cognitive function would also improve.

IV. Discussion

The study suggested that there was a significant correlation between cognitive activities and cognitive function in the elderly. The elderly with good cognitive activities had good cognitive function. Age-related changes affect cognitive, and it cannot be changed.Instead, the effects of the changes can be minimized to achieve health (Miller, 2009). Age-related changes are physiological processes that increase vulnerability to the negative effects of risk factors. Sources of risk factors include the environment, lifestyle, support systems, psychosocial condition, treatment and alcohol effects, lack of knowledge behavior, visual and auditory impairment, dementia, and depression. The cognitive functions of elderly people with a healthy lifestyle were classified in the good category. The healthy lifestyle of the elderly should consider several things, i.e., physical activities (sports), cognitive activities, good dietary habits, no smoking rule, good sleep, and rest patterns (Wallace, 2007).As people get old, there will be a more decline in the function and quality of life in the elderly (Miller, 2009). The deterioration prevention in the function and quality of life in the elderly can be undertaken by reducing risk factors, one of which is to maintain healthy lifestyles. One of the healthy lifestyles that can reduce functional decline risk factors is by performing good cognitive activities.

Cognitive activitiescorrelate with the thinking habit of the elderly. Most elderly people with good cognitive activities perform reading and writing activities every day, interspersed by participating in group activities every week. Cognitive activitiesare the activities to help the elderly keep their minds sharp while being aware of reducing the risk of age-related dementia (Hurley, 2013).Cognitiveactivities can improve brain compensation from pathology by increasing brain reserve, so that it can protect or slow the clinical onset of cognitive impairment and dementia(Costa et al., 2007). Cognitiveactivitiesare considered to maintain a cognitive reserve. The concept of

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

cognitive reserve refers to the ability to tolerate degenerative changes in brain tissue to prevent clinical symptoms (Fratiglioni & Wang, 2007). In the group of good cognitive activities, most of the respondents were senior high school graduates or equivalent. The elderly in that group said that they were accustomed to doing brain-sharpening activities such as reading, writing, and participating group discussion regularly. Meanwhile, the elderly with poor cognitive activities mostly were elementary school graduates or equivalent. Education influenced the cognitive function of the elderly (Dore et al., 2007)

The effort to inhibit the decline in cognitive function is to exercise the brain function with cognitive activities (Nadesul, 2011). The accumulation of the daily additional cognitive activities in a week would inhibit the onset of decreased memory for 0.18 years (Hall et al., 2009). Previous studies analyzing data on 1,076 respondents also concluded that the participation level in cognitive activities affects the rate of decline in cognitive function (Wilson et al., 2012). Cognitive activities would be categorized as good if the elderly performed at least two routine cognitive activities every day and were interspersed with one routine cognitive activityevery week. The elderlywith theright level of participation in cognitive activities decelerated the occurrence of cognitive dysfunction. On the contrary, if the participation of cognitive activities was classified at the poor level, the occurrence of cognitive function disorders would accelerate.

On the other hand, the study results suggested that there was an insignificant positive correlation between dietary habits and cognitive function in the elderly, which predominantly influenced by economic factors. The elderly with good dietary habits mostly had good cognitive functions, but there were still fiverespondents with anaverage cognitive function, and onerespondent had poor cognitive functions. The elderly with poor cognitive functionswere elementary school graduates or equivalent. The daily activities includedlooking after their grandchildren at home and going out of the house when attending a routine examination in integrated health services post for the elderly. The elderly with poor dietary habits amounted to 20 people (50%), most of them had average cognitive function, amounted to tenpeople, and fivepeople had poor cognitive function. Pertaining to the frequency of ingredient consumption, most of the elderly consumed the ingredients less than three times a day. Therefore, the portion of the food consumed was lesser than the recommended requirements. The interview results from several elderly people with poor dietary habits stated that they only received allowances from their children, which were insufficient to buy foods containing animal and fruit protein daily. Economic status greatly influenced the type and quality of food to be consumed by individuals. The selection and purchase of food will be easy if the income or financial availability is sufficient(Atkins et al., 2015). Nutrition is considerablyessential for the elderly population (Ahmed & Haboubi, 2010). Therefore, the sufficiency of psychosocial and economic factors has a significant role in fulfilling nutrition as a means to create healthy dietary habits for the elderly (Host et al. 2016).

The results suggested that proper dietary habits, interspersed with physical activities or good cognitive activities,could improve cognitive functions. There were three respondents with good cognitive functions who had good dietary habits. The elderly with good cognitive functions consisted of twopeople with good cognitive activities and one person who regularly performed elderly gymnastics. That matter is supported by previous research conducted by Milfa (2014), which proposed that physical activities can maintain critical processes to inhibit hypertrophy in brain tissue, which can cause neuronal degeneration affecting the cognitiveability. The elderly with good dietary habits arethosewith frequent consumption of particular food ingredients with the appropriate amount of

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

servings.Healthy food consumption is medicine to stimulate cognitive functions(McCann & Ames, 2005). Dietary habits influenced the life quality of the elderly. If dietary habits applied was appropriate, brain cells would improve its function, so that the memory of the elderly was maintained and difficult to be attacked by various diseases.

The other findings suggested that the respondents' demographics, i.e., age, education level, and gender, affected the cognitive functions in the elderly. Most of the elderly respondents had average cognitive functions, but they could not complete the visual construction section questionnaire. The ability to process visually and auditorially decreased in the elderly as a result of aging. Approximately, 14% of the elderly aged 70-75 years and 32% of elderly people aged over 85 years experience impaired vision, despite wearing glasses (Surprenant & Neath, 2006). Cognitive functions in the future will be tremendously determined by the factors of characteristics, health status, and dietary habits (Ham, 2007). Most elderly respondents with good cognitive functions had cognitive activities and good dietary habits. The maintenance of brain structure can be performed through exercises involving sublime functions and basic brain functions, for instance, to consume food. Consuming food involves the process of swallowing, chewing, taste perception, and digestion process (Nadesul, 2011). Furthermore, most of the elderly with poor cognitive functions were elementary school graduates or equivalent. The interview results identified that the elderly who were elementary school graduates or equivalent had littlecuriosity, sothey rarely performed the activities to sharpen their brain. The differences of cognitive performance in the elderly can be influencedby various factors, such as age, genetics, gender, education, disease history, nutritional factors, and activities (Christensen et al., 1999). The female elderly have more cognitive impairment due to the endogenous sex hormone levels in cognitive functions change (Rizhsky, 2013). The low levels of estradiol in the body have been linked to thedecrease of general cognitive functions and verbal memory(Myers, 2008).

The elderly with good activities and dietary habits would have good cognitive function. However, if there were still elderly people who had average or poor cognitive functions even though their activities and dietary habits were good, it might be caused by other influencing factors, such as age, sex, and education.

In addition, this study also had limitations, in which the researchers employed conveniencesampling so that the generalization ability was meager. Besides, the obtained Semi-Quantitave FFQ was not suitable for the research related to cognitive functions in the elderly.

V. Conclusion

Based on the study results, it can be concluded that there is a significant correlation between cognitive activities and cognitive functions in the elderly. However, the correlation between dietary habits and cognitive functions in the elderly is insignificant. Despite the fact that these findings will require confirmation in further studies, the findings can represent an essential insight regarding the correlation between dietary habits and cognitive activities in the elderly population. It also forms a significant additional study following priorstudies about how cognitive activities and dietary habits affect cognitive functions in the elderly. Subsequently, it is necessary to take account of the dietary habits and to improve the supervision by related parties for the elderly. Further research is expected to discuss the interventions required to improvecognitive activities and maintain healthy dietary habits in the elderly.

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

References

[1] Aartsen, M.J., Smits, C.H.M., Van Tilburg, T., Knipscheer, K.C.P.M. & Deeg, D.J.H. 2002, 'Activity in older adults: cause or consequence of cognitive functioning? A longitudinal study on everyday activities and cognitive performance in older adults', *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, vol. 57, no. 2, pp. P153–62.

[2] Affairs, U.N.D. of E. and S. 2002, *Population Division (2002) Population Ageing 1950–2050.*, New York: UN DESA.

[3] Affairs, U.N.D. of E. and S. 2004, *Population Division (2004) World Population Prospects: The 2004 Revision, Volume III: Analytical Report*, New York: UN DESA.

[4] Ahmed, T. & Haboubi, N. 2010, 'Assessment and management of nutrition in older people and its importance to health', *Clinical interventions in aging*, vol. 5, p. 207.

[5] Andel, R., Hughes, T.F. & Crowe, M. 2005, 'Strategies to reduce the risk of cognitive decline and dementia', *Aging Health*, vol. 1, no. 1, pp. 107–16.

[6] Atkins, J.L., Ramsay, S.E., Whincup, P.H., Morris, R.W., Lennon, L.T. & Wannamethee, S.G. 2015, 'Diet quality in older age: the influence of childhood and adult socio-economic circumstances', *British Journal of Nutrition*, vol. 113, no. 9, pp. 1441–52.

[7] Christensen, H., Mackinnon, A.J., Korten, A.E., Jorm, A.F., Henderson, A.S., Jacomb, P. & Rodgers, B. 1999, 'An analysis of diversity in the cognitive performance of elderly community dwellers: individual differences in change scores as a function of age.', *Psychology and aging*, vol. 14, no. 3, p. 365.

[8] Costa, D.A., Cracchiolo, J.R., Bachstetter, A.D., Hughes, T.F., Bales, K.R., Paul, S.M., Mervis, R.F., Arendash, G.W. & Potter, H. 2007, 'Enrichment improves cognition in AD mice by amyloid-related and unrelated mechanisms', *Neurobiology of aging*, vol. 28, no. 6, pp. 831–44.

[9] Dore, G.A., Elias, M.F., Robbins, M.A., Elias, P.K. & Brennan, S.L. 2007, 'Cognitive performance and age: norms from the Maine-Syracuse Study', *Experimental aging research*, vol. 33, no. 3, pp. 205–71.

[10] Elvia, N., Siregar, M.A. & Siagian, A. 2013, 'Gambaran Pola Konsumsi Pangan dan Pola Penyakit pada Usia Lanjut di Wilayah Kerja Puskesmas Tapaktuan Kecamatan Tapaktuan Kabupaten Aceh Selatan Tahun 2012', *Gizi, Kesehatan Reproduksi dan Epidemiologi*, vol. 2, no. 2.

[11] Fratiglioni, L. & Wang, H.-X. 2007, 'Brain reserve hypothesis in dementia', *Journal of Alzheimer's disease*, vol. 12, no. 1, pp. 11–22.

[12] Ghisletta, P., Bickel, J.-F. & Lövdén, M. 2006, 'Does activity engagement protect against cognitive decline in old age? Methodological and analytical considerations', *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, vol. 61, no. 5, pp. P253–61.

[13] Gibson, R.S. 2005, *Principles of nutritional assessment*, Oxford university press, USA.

[14] Hall, C.B., Lipton, R.B., Sliwinski, M., Katz, M.J., Derby, C.A. & Verghese, J. 2009, 'Cognitive activities delay onset of memory decline in persons who develop dementia', *Neurology*, vol. 73, no. 5, pp. 356–61.

[15] Ham, R.J. 2007, *Primary care geriatrics: A case-based approach*, Elsevier Health Sciences.

[16] Host, A., McMahon, A.-T., Walton, K. & Charlton, K. 2016, 'Factors influencing food choice for independently living older people—a systematic literature review', *Journal of nutrition in gerontology and geriatrics*, vol. 35, no. 2, pp. 67–94.

[17] Hurley, T. 2013, *Cognitive Activities for The Elderly.*, viewed <http://seniors.lovetoknow.com/Cognitive_Activities_for_the_Elderly.>.

[18] Kementerian Kesehatan, R.I. 2014, 'Pedoman gizi seimbang', *Jakarta: Kemenkes RI*.

[19] Laurin, D., Verreault, R., Lindsay, J., MacPherson, K. & Rockwood, K. 2001, 'PPT - of Cognitive Impairment and Dementia in Elderly Persons', *Archives of Nurology*, vol. 58, pp. 498–504.

[20] Mackinnon, A., Christensen, H., Hofer, S.M., Korten, A.E. & Jorm, A.F. 2003, 'Use it and still lose it? The association between activity and cognitive performance established using latent growth techniques in a community sample', *Aging, Neuropsychology, and Cognition*, vol. 10, no. 3, pp. 215–29.

[21] McCann, J.C. & Ames, B.N. 2005, 'Is docosahexaenoic acid, an n− 3 long-chain polyunsaturated fatty acid, required for development of normal brain function? An overview of evidence from cognitive and behavioral tests in humans and animals–', *The American journal of clinical nutrition*, vol. 82, no. 2, pp. 281–95.

[22] Miller, C.A. 2009, *Nursing for wellness in older adults*, Lippincott Williams & Wilkins.

[23] Myers, J.S. 2008, 'Factors associated with changing cognitive function in older adults: Implications for nursing rehabilitation', *Rehabilitation Nursing*, vol. 33, no. 3, pp. 117–23.

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020

[24] Nadesul, H. 2011, *Loving the Brain, Maintaining Fitness, Preventing Disease, Choosing Food*, Jakarta: Kompas, Indonesia.
[25] Organization, W.H. 2016, 'Proposed working definition of an older person in Africa for the MDS Project', *Retrieved June*, vol. 1.
[26] Potter, P.A. & Perry, A.G. 2005, 'Buku ajar fundamental keperawatan: konsep, proses, dan praktik', *Jakarta: Egc*, vol. 1.
[27] Salthouse, T.A., Berish, D.E. & Miles, J.D. 2002, 'The role of cognitive stimulation on the relations between age and cognitive functioning.', *Psychology and aging*, vol. 17, no. 4, p. 548.
[28] Smith, P.J. & Blumenthal, J.A. 2016, 'Dietary factors and cognitive decline', *The journal of prevention of Alzheimer's disease*, vol. 3, no. 1, p. 53.
[29] Surprenant, A.M. & Neath, I. 2006, 'Cognitive aging', *Gerontology: perspectives and*, no. 3rd, pp. 89–109.
[30] Verghese, J., Lipton, R.B., Katz, M.J., Hall, C.B., Derby, C.A., Kuslansky, G., Ambrose, A.F., Sliwinski, M. & Buschke, H. 2003, 'Leisure activities and the risk of dementia in the elderly', *New England Journal of Medicine*, vol. 348, no. 25, pp. 2508–16.
[31] Wallace, M. 2007, *Essentials of gerontological nursing*, Springer Publishing Company.
[32] Willett, W. 2012, *Nutritional epidemiology*, vol. 40, Oxford university press.
[33] Wilson, R.S., Segawa, E., Boyle, P.A. & Bennett, D.A. 2012, 'Influence of late-life cognitive activity on cognitive health', *Neurology*, vol. 78, no. 15, pp. 1123–9.
[34] Yin, Z., Chen, J., Zhang, J., Ren, Z., Dong, K., Kraus, V.B., Wang, Z., Zhang, M., Zhai, Y., Song, P., Zhao, Y., Pang, S., Mi, S. & Zhao, W. 2018, 'Dietary patterns associated with cognitive function among the older people in underdeveloped regions: Finding from the NCDFaC study', *Nutrients*, vol. 10, no. 4.

DOI: 10.37200/IJPR/V24I2/PR200715
Received: 03 Jan 2020 | Revised: 15 Jan 2020 | Accepted: 28 Jan 2020