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Multi-intervention Approach for Preventing and Management of dementia among Elderly: A Scoping Review

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Abstract: Background: Dementia is a general term for several diseases affecting memory, other cognitive abilities, and behavior. Various quantitative studies about the dementia interventions have been reported. However, most of the studies used a single intervention which did not give a comprehensive approach to the client. This review aimed to identify the types of interventions that are effective to overcome dementia problems among older adults. Methods: This review used a scoping review method. Electronic literature searching was conducted using databases: Google Scholar, Proquest, EBSCOhost, PubMed, Scopus, and DOAJ, using keywords Dementia, Elderly, and Intervention. The inclusion criteria were: peer-reviewed articles, published between 2007-2017, research design included quasi-experimental, experimental and Randomised Controlled Trial. Exclusion criteria were non-English papers, and the sample size was fewer than 30 participants. Preferred reporting items for systematic reviews and Meta-analyses were used. A total of 38,100 articles were retrieved: however, 79 met the inclusion criteria, and further 60 articles were excluded. Thus, only 19 articles were included in the analysis. Results: Five out of 19 articles used multi-interventions. The types of interventions were occupational therapy, physical activity, reminiscence program, diet, and cognitive therapy. Multi-intervention approach has shown more positive results compared to a single intervention. However, most studies did not involve family or caregiver in the interventions. Conclusions: Multi-intervention studies have more potential to produce effective outcomes for treating or preventing dementia and improve quality of life than those with one intervention. Further studies required to examine the effect of multi-intervention combined with family involvement to prevent or treat dementia among the elderly in the community.

Keywords: dementia; elderly; intervention

1. Introduction

Dementia is a general term, used to identify brain diseases that are progressive and terminal. All of these diseases have some similar features: affect mood, communication, reasoning, and memory, which significantly interferes with an individual's talent to sustain daily life activities (WHO, 2015). Dementia is caused by brain damage due to disease. The most common determinant of dementia is Alzheimer's

disease. Other considerations of dementia include vascular dementia, mixed dementia (Alzheimer's disease and vascular dementia), dementia caused by Parkinson's disease and the group that causes frontal temporal dementia (Alzheimer's Society, 2018).

In 2015, the number of people with dementia globally was estimated to be 47 million and is predicted to increase to 135 million by 2050. Every three seconds, a person in the world develops dementia. Prevalence of East Asia increased from 4.98% (2009) to 6.99% (2015) (WHO, 2015). Nearly 60% of people with dementia in the world are in poor and developing countries. In Indonesia, there is no official data regarding the number of people with dementia, but ADI (Alzheimer's Disease International) estimates 1.2 million people have dementia (ADI, 2016).

Dementia is one of the chronic diseases that cause dependence on the elderly (WHO, 2015). A person with dementia will have symptoms of cognitive impairment including daily memory, concentrate, plotting or regulating, language, visuospatial ability, and orientation (Alzheimer's Society, 2018). People with dementia also have difficulties to meet their basic needs, thereby increasing the dependency ratio. Families caring for the elderly with dementia have a difficult burden and are susceptible to psychological distress and social isolation as well as financial difficulties (Brodaty & Donkin, 2015). Dementia has a personal impact to elderly and his families, communities and the environment.

Given the many impacts of dementia, effective dementia prevention is essential. There are two ways to prevent or treat dementia with pharmacology and non-pharmacology. There is a great deal of studies spotlight on pharmacological and non-pharmacology programs to optimize cognitive function and maintain the health of the elderly brains, especially for the elderly at risk for dementia (Pieramico, Esposito, Cesinaro, Frazzini, & Sensi, 2014).

Proven pharmacological interventions can enhance and maintain cognitive functioning of Cognitive Enhancer Drug (CED) groups such as dopamine and methylphenidate (Andersen et al., 2010; Hannestad et al., 2010; Lynch & Mills, 2012). However, excessive nerve connectivity is influenced by CEDs that sometimes have the potential to cause problems. In concept, development excitatory synaptic transmission, together with shortened synaptic pruning, can lead to uncontrolled synaptic plasticity and over-activation of the nervous system, thereby increasing the below noticeable to noise ratio that may cause cognitive impairment (Belmonte & Yurgelun-Todd, 2003). Also, some pharmacological therapies could not avoid the motor and functional changes caused by disease progression in a person (Courtney, 2004).

Some systematic reviews examined the benefits of non-pharmacology therapy in dementia, the intervention being grouped into two approaches: physical activity and cognitive therapy (Ballard, Khan, Clack, & Corbett, 2011; Potter, Ellard, Rees, & Thorogood, 2011). According to Potter et al. (2011) program of physical activity can improve the quality of life, motor, and cognitive function, and reduce the symptoms of depression in patients with Alzheimer's disease. Longitudinal research is needed to find out how long do the positive effects of non-pharmacological interventions (Pieramico, Esposito, Cesinaro, Frazzini, & Sensi, 2014). However, this is denied by Kelly et al. (2014) who stated that long-term cohort studies and short-term clinical trials of exercise and physical activity could improve cognitive function in the elderly.

Although, there is no definition of an optimal intervention program, integrating various physical and cognitive activities may be more effective than a single intervention of physical activity or only cognitive intervention alone. Therefore, the scoping review needs to be conducted to identify the most appropriate and effective non-pharmacological multi-intervention elderly with dementia.

1.1 Research Questions

What are effective non-pharmacological interventions for the prevention and management of dementia in the elderly?

2.1 Purpose

Scoping review aims to quickly map out the important approach underlying the research area and as the primary basis and to view existing evidence from a study. Also, to find gaps from previous studies to be filled in subsequent research (Pham et al., 2014).

2. Methods

The literature study is done by analyzing a published (resume) of research articles related to the research question. The search method used several electronic databases: Google Scholar, Proquest, EBSCOhost, PubMed, Scopus, and DOAJ. Articles obtained from keywords: dementia, elderly, intervention. A total of 38,100 papers retrieved. The inclusion criteria in this literature study are research articles that have peer review, full text, and written in English, have title and content relevant to the research question, publication year from 2007 to 2017 and have a minimal research design quasi-experiment. Exclusion criteria include articles that do not have the structure of a good paper (consisting of Abstract, Introduction, Methods, Results, Discussions, Implications, and References), review articles and articles' content that cannot answer research questions.

Table 1. The result of Searching Literature

Databases	Number of articles according to keywords	Number of articles obtained	Number of articles match the inclusion criteria
Google Scholar	27,600	7	3
Proquest	411	4	0
Ebscohost	109	5	0
PubMed	7,966	11	2
Scopus	818	27	8
DOAJ	1,196	25	7
Total	38,100	79	19

After sorting the title, papers that met inclusion criteria from Google Scholar were seven articles, Proquest four articles, EBSCOhost five articles, PubMed 11 articles, Scopus 27 articles, and DOAJ 25 articles, with a total of 79 articles. Then, the next stage was sorting the content of the article, from 79 articles obtained 53 articles that have the structure of a good paper (consisting of Abstract, Introduction, Methods, Results, Discussions, Implications, and References). After that, the articles were skimmed and scanned to get an idea of the contents of the article, 34 articles were excluded because the articles used research design other than RCT or quasi-experiments, samples less than 30 participants, and clinical research. Finally, 19 articles were included in the analysis which consists of 18 quantitative articles, and one mixed-method (quantitative and qualitative) article. The detailed literature searching flowchart is presented in Figure 1.

3. Results

The articles that met the inclusion criteria were read and then summarized. Research on intervention for elderly with dementia has been done in various countries across the continent of America, Asia, and Europe. The articles in this review were from America, Japan, Argentina, Brazil, Hong Kong, Netherlands, Israel, Turkey, England, and Finland (Table 2). The research design consisted of quantitative and mixed-methods with the quasi-experiment method, RCT and semi-structured interview (Table 3).

Table 2. Distribution of Research Sites

Place of study	Number of articles
United State of America	3
Argentina	1
Netherlands	1
Brazil	1
Europe (Germany, Netherlands, Ireland)	1
Finland	1
Hong Kong	1
United Kingdom	2
Israel	1
Japan	6
Turkey	1
Total	19

Figure 1. Literature Searching Flowchart

Table 3. Research Design

Research design	Number of articles
Randomized control trial (RCT)	16
Quasi-experimental	2
Mixed Method (RCT dan Qualitative)	1
Total	19

Five of the 19 articles used multi-interventions, namely occupational therapy, physical activity, a memento program, diet, and cognitive therapy. Multi-intervention approaches have shown more positive results than single interventions. However, most studies do not involve family or caregivers in the intervention.

4. Discussion

This scoping review analyzed 19 articles discussing the intervention for the elderly with dementia. Each article has different interventions and methods to prevent and treat the elderly with dementia. There were studies that use only one intervention but also multi-intervention studies. The findings of this review can be grouped into single interventions, multi-intervention, the advantages and constrain of multi-intervention for elderly with dementia.

4.1. Single Intervention for Aged with Dementia

The results of the scoping review found that there were four types of intervention tested in research in various countries, namely occupational therapy, physical activity, memory therapy and cognitive therapy. Of the four interventions, physical activity and cognitive therapy were the most frequently tested interventions and had shown positive results to prevent and treat dementia in the elderly. This is evidenced from research conducted by Arcoverde et al. (2013) on treadmill exercises in older adults with Alzheimer's disease. The inclusion criteria are elderly with mild dementia. The results of this study concluded that walking on a treadmill can be recommended as an augmentation treatment in Alzheimer's disease patients. A similar study was conducted by Makaziko et al. (2013) in Japan that examined the effect of walking for 6 minutes on memory and brain volume of the elderly who experienced mild cognitive impairment. The results of the study 6MWD (6 minutes walking distance) gave a positive impact on the visual memory of the elderly.

In America, Walsh et al. (2015) conducted research on the effect of Tai Chi on elderly cognitive function. This six-month study, comparing the cognitive function of the elderly with the elderly group of Tai Chi experts. Conclusions from this study, the Tai Chi group showed an increase in the value of cognitive function measurement compared with the usual elderly or not tai chi group. While in Europe, Devenney et al. (2017) are examining the effects of extensive training programs on the elderly with mild cognitive impairment in three countries: Germany, Netherlands, and Ireland.

Cognitive therapy also becomes the choice of intervention to deal with dementia in the elderly. According to Kwok et al. (2013), a cognitive exercise program can activate the brain to improve cognitive function and quality of life of the elderly. Cognitive therapy consists of a variety of types of one-digit digit span test (DST) or otherwise known as a number range test is a direct memory test in which the patient is required to repeat a series of numbers spoken by the examiner. This intervention has been tested by Lavner and Rabinowitz (2015) in 65 older adults with mild dementia. In the intervention group, there was an increase in their digit range performance compared to the control group.

Table 4. Article's Summary

Authors (publication year)	Research sites	Target		Duration		Methods (Therapy)				Severity of Dementia		
		Individual	Family/Caregiver	≤12 weeks	>12 weeks	Occupational	Physical Activity	Reminiscence	Cognitive	Normal	Mild	Medium/Severe
Clark et al. (2012)	America	✓			✓	✓				✓		
Sugano et al. (2012)	Japan	✓		✓			✓		✓		✓	
Yamagami et al. (2012)	Japan	✓		✓		✓			✓		✓	
Jorge et al. (2012)	Argentina	✓		✓				✓				✓
Arcoverde et al. (2013)	Brazil	✓			✓		✓				✓	
Kwok et al. (2013)	Hongkong	✓		✓					✓		✓	
Makaziko et al. (2013)	Japan	✓			✓		✓				✓	
Nakamae et al. (2014)	Japan	✓			✓	✓		✓				✓
Ven et al. (2014)	Netherlands		✓		✓						✓	✓
Nakatsuka et al. (2015)	Japan	✓		✓			✓	✓	✓		✓	
Lavner & Rabino (2015)	Israel	✓		✓					✓		✓	
Walsh et al. (2015)	America	✓			✓		✓			✓	✓	
Duru et al. (2016)	Turkey	✓		✓				✓			✓	✓
Watermeyer et al. (2016)	UK		✓		✓				✓		✓	✓
Sakamoto et al. (2017)	Japan	✓		✓		✓						✓
Williamson et al. (2017)	America	✓			✓		✓			✓	✓	
Rosenberg et al. (2017)	Finland	✓			✓	✓	✓		✓	✓		
Orrell et al. (2017)	UK		✓		✓				✓		✓	
Devenney et al. (2017)	Europe	✓			✓		✓				✓	
TOTAL		16	3	8	11	5	8	4	8	3	14	6

In addition to DST, individual cognitive stimulation therapy (iCST) also included a type of cognitive therapy. In a study conducted by Orrell et al. (2017) concluded that there was no evidence that iCST had any effect on the cognitive and quality of life of the elderly with dementia. Individual cognitive stimulation therapy contributed in improving the quality of caregiver relationships and the quality of life of caregivers. The effectiveness of cognitive therapy in the elderly with dementia was also studied by Watermeyer et al. (2016) with 29 participants through semi-structured interview method.

Conclusions about the purpose of cognitive therapy and the difficulties experienced by the elderly with dementia in everyday life were discussed.

In addition to the above two therapies, there was another type of therapy which was memory therapy. Reminiscence therapy was used as an intervention for the elderly with dementia, but at the implementation, the stage was often combined with other interventions. Memory therapy with a life story approach was proven to improve the quality of life and interpersonal relationships in groups in older adults who have Alzheimer's disease (Jorge & Serrani, 2012). Memory therapy is also supported by research conducted by Duru & Kapucu (2016) in Turkey that concluded memory therapy could improve cognitive function and reduce symptoms of depression in older adults with Alzheimer's.

From the description above, it can be known various types of intervention given to the elderly with dementia have the benefits and effects vary with the goal of achieving healthy, productive and independent elderly. Several researchers from various advanced countries with high life expectancy continue to seek the most appropriate and effective interventions for the elderly with dementia. Thus, emerged various studies by applying multi-intervention in the hope to obtain maximum and comprehensive results.

4.2. Multi-intervention for Elderly with Dementia

4.2.1. Intervention Method

Based on the five multidomain articles reviewed, interventions for the elderly with the most tested dementia were cognitive therapy, studied singly or compared with other interventions. In Japan, Sugano et al. (2012) examined the effectiveness of cognitive therapy and physical activity (aerobic exercise), this study was conducted by comparing cognitive groups and aerobic groups with criteria for measuring cognitive function, physical function and interpersonal relationships. In contrast to previous studies, cognitive therapy was compared with two types of simultaneous intervention, physical therapy and memory therapy (Nakatsuka et al., 2015).

Still associated with cognitive therapy, research conducted by Yakamae et al. (2012), tested the effectiveness of BAR (Brain-Activating Rehabilitation) on the elderly living in the orphanage. BAR is a combination of cognitive and therapeutic therapy. BAR activities can be physical activities, games, crafts, cooking, singing and reality orientation. Research on the application of FINGER (Finnish Geriatric Intervention Study to Prevent Impairment and Disability), cognitive therapy is one of four focus interventions consisting of nutrition, exercise, cognitive therapy, and management of vascular risk factors (Rosenberg et al., 2017).

The study by combining two interventions simultaneously to apply to one group was performed by Nakamae et al. (2014) by examining the effect of memory therapy and a physical activity called PAROT (Productive Activities with Reminiscence in Occupational Therapy). This study aimed to reduce the symptoms of depression and improve the ability of elderly to work with dementia, with the result of decreasing depressive symptoms score in the intervention group but no improvement in patient memory improvement.

Although cognitive therapy is widely tested, it is only by comparing it with other therapies such as physical activity, memory therapy, or occupational therapy (Nakamae, Yotsumoto, & Tatsumi, 2014; Nakatsuka et al., 2015; Rosenberg et al., 2017; Sugano et al., 2012). Research related to the application of cognitive therapy as well as with other therapies in the same group of samples has not been found.

4.2.2. Targets

Based on Sugano et al. (2012) there were two aspects of approaches to prevent dementia, firstly elective prevention that targeted elderly at risk and the second is common prevention which targeted elderly without dementia. In line with research conducted by Nakatsuka et al. (2015) and Rosenberg et al. (2017) mentioned that the samples of the research were elderly residing in the community. But some other articles research on the elderly living in nursing homes (Nakamae, Yotsumoto, & Tatsumi, 2014; Yamagami, Takayama, Maki, & Yamaguchi, 2012).

The results of the literature review found that there was no research involving caregivers or families as a support system to achieve the success of the elderly when undergoing an intervention. Target research focuses only on the elderly as an individual or object of study without involving the

family or the next of kin (Nakamae et al., 2014; Nakatsuka et al., 2015; Rosenberg et al., 2017; Sugano et al., 2012; Yamagami et al., 2012).

Although it does not involve families but researchers need help from others in conducting research interventions, such as occupational officers (Nakamae et al., 2014; Nakatsuka et al., 2015; Yamagami et al., 2012), sports instructor (Sugano et al., 2012), and doctors, nurses, and nutritionists (Rosenberg et al., 2017). In addition to being supported by experts in the fields, research on the elderly also need to involve family members who play the "informal" caregiver of the elderly. In Asian countries including Indonesia, the eastern culture is still strong and families hold responsibilities for taking care of the elderly. This culture can be utilized to get better intervention results.

4.2.3. Duration

Duration of RCT research with a multi-intervention method to obtain significant results were ≤ 12 weeks (Nakatsuka et al., 2015; Sugano et al., 2012; Yamagami et al., 2012). Research conducted by Nakatsuka et al. (2015) consisted of 12 sessions with a frequency of 1 time per week each session with a duration of 60 minutes per session. In line with previous research Yamagami et al. (2012), research time also for 12 weeks, two times per week with 1-hour duration per session. While research conducted by Sugano et al. (2012) performed a shorter period of study which was eight weeks of intervention, once a week with an hour duration.

In some multi-intervention studies, it also took a long research period of up to 2 years (Nakamae et al., 2014; Rosenberg et al., 2017). This long period was due to the complexity of the intervention and the state of the research sample. A research conducted by Rosenberg et al. (2017) aimed to examine the influence the application of FINGER towards sociodemographic factors, socioeconomic status, basic cognitive, or cardiovascular factors. Another study by Nakamae et al. (2014) included the mild to severe dementia as study samples.

From the description above, it can be concluded that the duration of multi-intervention research should not take a long time to see the results. It can be done within a minimum of 12 weeks to get a significant result. However, there are things to consider such as the number of sessions and the duration of each session. Based on the article obtained the ideal duration of each session is 60 minutes.

4.2.4. Severity

Elderly without dementia were also need to receive treatment in order to prevent dementia which is supported by research conducted by Rosenberg et al. (2017) in Finland. The participants in this study were 1260 elderly (60-77 years old) with inclusion criteria MMSE score of at least 20. It means that prevention of dementia could be conducted for healthy elderly. Apart from healthy elderly, people with severe dementia could also receive treatment, but this required trained personnel to intervene and took a long period of research (Nakamae et al., 2014).

Most articles limit sample severity, i.e. mild dementia (Nakatsuka et al., 2015; Sugano et al., 2012; Yamagami et al., 2012). This limitation is due to various considerations such as the risks posed by the intervention and the possibility of recovering.

4.3. *Advantages of Multi-Intervention Approach*

Multi-intervention is the provision of interventions to the elderly by combining two or more single interventions that have been shown to have a positive impact or to compare one intervention with another to obtain the most effective intervention. Some of the advantages of multi-intervention applications include:

4.3.1. Maximum Results

The comprehensive implementation of multi-domain of the elderly lifestyle (nutrition, exercise, cognitive exercise, and management of vascular risk factors) and the involvement of experts in the implementation and evaluation phases provide significant and accurate changes in the intervention group (Rosenberg et al., 2017).

Multi-Intervention application not only provides benefits to one particular aspect but also several aspects at once such as cognitive function, daily activities, depression, performance, and quality of life

of the elderly (Nakamae et al., 2014; Nakatsuka et al., 2015; Yamagami et al., 2012). If the objectives of the study were to compare interventions, we could obtain information on the most effective and influential interventions of the elderly. Based on research conducted by Nakatsuka et al. (2014) divided the sample into three groups namely CI, PA, and GRA. The conclusions of this study were the increase in cognitive function score occurring in CI and PA groups, while the GRA group did not show significant results.

Compared to testing only one intervention, the multi-intervention application is believed to provide maximum results when applied to the elderly with dementia because it could activated the cognitive and physical functions of the elderly simultaneously.

4.3.2. Effective and Efficient

The study was conducted on the same sample (intervention group) at one time (Nakamae et al., 2014; Yamagami et al., 2012). This makes multi-intervention research efficient because researchers do not need to conduct two different studies to test two different interventions. Regarding the length of research, multi-intervention articles have relatively shorter research times less than 12 weeks (Nakatsuka et al., 2015; Sugano et al., 2012; Yamagami et al., 2012). It is effective because by conducting multi-intervention the researcher can get more complex results and can be viewed from various aspects. Also, the results obtained due to the maximum use of multi-intervention as described previously.

4.3.3. Preventive and Curative Efforts

Multi-intervention applications can be used to prevent the occurrence of dementia in the elderly as found by Sugano et al. (2012) who examined the effectiveness of cognitive therapy and physical activity (aerobic exercise) in healthy elderly and those who experienced mild cognitive impairment. In line with this study, Rosenberg et al. (2017) also examined the factors that affect the application of FINGER. FINGER is an intervention program for older adults in Finland to prevent decline and disability including dementia.

Not only is effective in preventive efforts, but multi-intervention is also useful for curative efforts. In line with research conducted by Nakamae et al. (2014) showed that there was a significant increase in the manufacture of *onigiri* and *ohagi*. Several multi-intervention studies selected samples with mild dementia criteria, arguing that for each session of the intervention required physical and cognitive abilities in the elderly (Nakatsuka et al., 2015; Yamagami et al., 2012).

4.4. Constraints on Multi-Intervention Approach

Multi-intervention applications require professionals such as occupational therapists, while in Indonesia it is still rarely encountered in elderly terminations. If not accompanied by a therapist, the researcher should take training on various types of effective interventions for the elderly such as cognitive therapy, physical activity, memory therapy, and occupational therapy. In addition, bias may occur due to errors in the selection of research instruments so that the results obtained are not accurate. In developed countries elderly often live alone or alone with a partner so that the intervention provided focus on the elderly only. Unlike the conditions in Indonesia that still has a strong eastern culture, the elderly usually live with their children. Thus, the multi-intervention implementation of the elderly in Asian countries including Indonesia should also involve families to achieve effective and sustainable results.

5. Conclusions

Dementia is a general term, used to identify brain diseases that are progressive and terminal. All of these diseases have some similar features: affect mood, communication, reasoning, and memory, which significantly interfere with a person's ability to sustain daily life activities (WHO, 2015). Based on this scoping review, the application of intervention in various countries such as America, Japan, Netherlands, England, Finland, Turkey, and Israel, proved to benefit the elderly with dementia. The application of intervention in the research is in the form of one intervention or multi-intervention use.

The single intervention was in the form of occupational therapy, memory therapy, physical activity, and memory therapy. From 19 articles, there are five articles that implement multi-intervention, the advantages of multi-intervention use include maximum results, effective and efficient, and including preventive efforts to curative. Obstacles to do research with the application of multi-intervention in Indonesia including the number of therapists are still limited and the influence of family participation in participating multi-intervention training programs to the elderly. Nevertheless, researchers can attend training on interventions for the elderly with dementia and can empower community cadres to assist in the process of implementing interventions.

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