CERIA: A Community Empowerment as Dementia Preventive Measure among Elderly

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ABSTRACT

Background: Dementia is predicted to double in the next 15 years and causes adverse socioeconomic effects, yet the clinical therapy for dementia has not shown satisfactory results for many years. Preventive efforts involving the active role of the elderly and supported by the development of information technology are strongly needed. Method: This is a quasi-experimental study aimed to evaluate the effectiveness of CERIA as community-based intervention and to increase the awareness of dementia. CERIA (Cerdas Hindari Demensia) was implemented for 32 elderlies in Pasar Minggu District, South Jakarta who were willing to participate. The interventions implemented were memory training, brain vitalization gymnastics, playing angklung, and storytelling to toddlers. We measured the pre-and post-intervention scores of the elderly using an assessment tool of dementia screening, then compared the results using Student T-test. We also created a dementia prevention manual book (Buku Panda) and built a smartphone app for educational purposes. Results: As many as 97% of the elderly have a good daily activity score and 90.9% have a good body balance. Assessment of pre-intervention cognitive function showed a mean value of 27 and increased to 29 after intervention. The pre-intervention emotional assessment showed a mean value of 1 and decreased in post-intervention to 0. Some of the most afflicted diseases of the elderlies were hypertension (30,3%) and diabetes mellitus (18,2%). Conclusion: This dementia prevention program has a strong potential to be implemented in wider scope. Further improvement involving parties such as the Ministry of Health is needed to replicate this effort.
Keyword: Community empowerment, Dementia, Elderly, Preventive measure.

INTRODUCTION

The global population is rapidly aging, and projections indicate a two-billion increase by 2050. This trend poses a multifaceted challenge with social, economic, and mainly health impacts, straining healthcare, welfare, and social care system. It also has significant implications for sustainable development. A scoping review has addressed efforts targeting older people under SDGs 1, 3, 10, and 11, although limited research is available on SDG-targeted efforts focused on older adults. Despite these challenges, aging presents opportunities, with older adults contributing to communities through works, volunteering, and informal care (Shevelkova, et al, 2023).

World Health Organization promoted the concept of healthy aging in 2015 as a process of developing and maintaining functional ability for well-being in older age, including happiness, satisfaction, and fulfilment, with functional ability encompassing health-related attributes supporting valued activities. WHO stated that ageing is also influenced by external factors like the built environment, societies and communities, policies, services, and systems, rather than biological process only (World Health Organization, 2015).

It is widely known and has become commonplace in society when the elderlies experience cognitive function decline. Dementia, a term for several diseases that affect memory, thinking, and the ability to perform daily tasks, are mainly affects older people but not all people will get it as they age (World Health Organization, 2023). Dementia becomes epidemic as the number of elderly increases (Sindi, et al,

2015). One of the most common causes of dementia is Alzheimer's disease (60-70% of total cases). Alzheimer's Indonesia on its page stated that every 3 seconds, 1 person in the world experiences dementia. Currently, more than 55 million people have dementia worldwide (Alzheimer's Indonesia, 2023).

In Indonesia, it is estimated that there were around 1,2 million people with dementia in 2016, which will increase to 2 million in 2030 and 4 million people in 2050 (Alzheimer's Indonesia, 2023). The estimated life expectancy of Indonesians in 2045 will increase to 77.6 years because of the decrease in mortality, and this increases the population of the elderly (Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia, 2013).

Dementia causes parental dependence and disability, and increases social, economic, and medical burden as its progression in cognitive capacity impairment can interfere with daily functioning or activities. Deterioration in cognitive capacity occurs because of the loss of the relationship between neurons or synapses and the breakdown of neurons themselves due to the formation of intracellular and intracellular neurofibril beta plaque formation (Shevelkova, et al, 2023).

Dementia is diagnosed based on careful medical history, physical examination, laboratory test, and the characteristic changes in thinking, day-to-day function and behaviour associated with each type (Alzheimer's Association, 2023). Until now, there is no cure for dementia. Some medications only help to manage dementia symptoms (World Health Organization, 2023). Therefore, early intervention and prevention of dementia should be one of the primary focuses in public health, especially in primary health care (Shevelkova, et al, 2023).

Efforts in preventing dementia should also include the development of protective factors, including (1) psychosocial factors (high levels of education and socioeconomic status, social activities, and cognitive stimulation), (2) healthy lifestyle (physical activity), (3) healthy nutrition intake, and (4) the use of medicinal drugs to treat risk factors, because if dementia has occurred, the only thing that can be done is brain reservation and cognitive reservation to prevent the progression of dementia (Shevelkova, et

al, 2023) (Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia, 2013).

CERIA (Cerdas Hindari Dementia), is a community development program that helped the elderly being physically active and taking part in activities and social activities that stimulate the brain and maintain daily function. The interventions are community-based activities which are hoped to maintain their quality of life and promote well-being. Our program aimed to evaluate the effectiveness of CERIA as community-based intervention, increase awareness of dementia and perform some activities involving brain stimulation. The primary focus is to do screening of cognitive function for pre- and post-intervention in the elderly in Kebagusan District, Pasar Minggu, and do early intervention in primary until tertiary preventive measures.

METHODS
Design & Participants

This is a quasi-experimental study conducted in Kebagusan District, Pasar Minggu, South Jakarta from May – October 2017. We included the reachable population of 32 elderlies aged 50 years old or older who all live in the neighborhood, willing to participate by signing an inform consent form, and are physically active. Exclusion criteria are bedridden elderly and unstable medical conditions. Samples were taken by consecutive method.

We conducted weekly meetings with the participants and gave different interventions each week. Assessment for dementia was done using the same tool at the baseline (on the first week before any intervention was given) and on the last week (after all the interventions had been given). Based on the results of the initial assessment, we excluded those with impaired ADL from having these interventions and referred them to the neurologist to be further examined.

Participants in each weekly session were not steadily maintained; one individual may come in 2 sessions and not in the others, another came in all sessions; it is subject to the participants' convenience. In the end, there were 33 elderly who were exposed to at least one intervention and did both pre- and post-intervention tests, all of which were included in the analysis.

Tools

We used ABCDE screening tools for dementia to assess the conditions of the subjects pre-and post-intervention. ABCDE stands for A) Activity daily living, measured using Katz Index; B) Balance test, done using Romberg's test; C) Cognitive, done using Mini Mental State Examination (MMSE) questionnaire; D) Disability and Disease, recording of comorbidities occurred in the subject; and E) Emotion, measured using Geriatric Depression Scale (GDS) (Mayza, 2016) (Forbes, et al, 2013). ABCDE method introduced by Ministry of Health is a comprehensive examination including both physical and mental aspects (Sulistyaningsih, et al, 2021).

Activity Daily Living (ADL). The Katz Index for ADL was developed by Katz et al. in the 1960s. It measures six self-care tasks with dichotomous ratings (dependent as 0/independent as 1) as listed: bathing, dressing, toileting, transferring to and from a chair, maintaining continence, and feeding. The measurement result of six points indicates independence while less than two points is considered major functional impairment (Katz, et al, 1970) (Wallace, et al, n.d).

Balance. Romberg's test was a standardized tool used widely in clinical settings to assess a patient's ability to maintain body balance. Participants were told to stand erect, and the balance was observed. The participant is then told to close his eyes and be observed for one minute. This test is said to be positive if the subject is not able to maintain balance while observed, as implied by abnormal movements such as swaying or toppling over or even signs that the participant will fall. This tool was chosen for its simplicity to be done in many situations (Katz, et al, 1970) (Wiratman, 2017).

Cognitive. MMSE was also a widely used tool in neurological clinics. It consists of 11 instructions each assessing different cognitive domains such as orientation, registration, attention and calculation, memory recall, or language.[9,14]

Disability and Disease. Known history of life-long diseases such as diabetes Mellitus, hypertension, and dyslipidemia were recorded as they would impact the well-being as well as become risk factors for dementia (Piolatto, et al, 2022).

Emotion. We used Geriatric Depression Scale (GDS) as our preferred method of assessing emotion. GDS consists of 15 yes-no questions, each question has a 0 or 1 score depending on the question. A score of 10 or more is indicative of depression, while 5-9 means the subject is at a higher risk of developing depression (Sulistyaningsih, et al, 2021).

Interventions

Memory Training. We did memory recall training as part of our intervention to maintain cognitive function. We did the training by playing a 5 to 10-minute short film and asked participants about some key events, characters, or plots during the film.

Brain Vitalization Gymnastics. This is the gymnastics that stimulate the brain through some physical movements.

Playing angklung. Angklung is a traditional musical instrument originating from the Sundanese tribe of West Java, Indonesia. Angklung is very easy to play and was widely taught all around Indonesia, usually to elementary school students. This instrument was unique as it had to be played in a group, for one instrument being played by one person only represents one *melody*. Thus, playing *angklung* improves the cognitive function of the brain, as it demands concentration, trains auditory stimulation, and needs coordination between auditory stimuli and hand movement, while also inducing interpersonal social abilities among its players.

Storytelling to toddlers. The act of storytelling itself has various advantages for the elderly. It restricts cognitive function degradation.

Additional Instruments

In addition to the programs, we created supplementary instruments as a means of sustainability and ease of replicability of our program in the future. *Buku Panda (Panduan Pencegahan Demensia)* is a book that contains general information about dementia and written information about our program. It is provided as a manual book for the elderly group to run our program independently. All screening assessment tools as well as descriptions and materials for our interventions were given in the book.

Mobile Application. We developed an Android application to be used by healthcare workers to assist them while

doing this program. The application contains all our screening/assessment tools as well as brief information about dementia and the CERIA intervention. Using this application, all assessment scores are readily stored on our cloud-based server and may be quickly analyzed. We hope this will ease future analysis and replication efforts of this program. This application may be found in the Google Play Store under the name CERIA.

RESULTS AND DISCUSSION

This intervention was conducted on 32 elderly people in Kebagusan District, Pasar Minggu, South Jakarta with a mean age of 61.9 years. The female elderly have greater frequency compared with male, that is women equal to 71.8% and males equal to 28.2%. Preliminary screening is performed before interventions that include daily activities, balance, cognitive function tests, depressive symptoms checkups, and comorbid disease.

Table 1. Baseline characteristics of subjects (n=32).

Variable	Frequency n(%)
Number of subjects based on age	
40-49	2 (6,25)
50-59	9 (28,125)
60-69	16 (50)
70-79	5 (15,625)
Sex	
Men	9 (28,125)
Women	23 (71,875)
Comorbid diseases	
Hypertension	9 (28,12)
Diabetes Melitus	6 (18,75)
Others	4 (12,5)
No disease	13 (40,62)

As many as 2 people (6.25%) experience impairment of daily activities. Examination of balance by using the Romberg test sharpened showed impairment in 2 elderly people (6.25%). On examination of cognitive function using MMSE, the average pre-intervention score in the elderly was 27.

Table 2. Screening results.

Variable	Frequency n (%)
Activity daily living	
Normal	30 (93,75%)
Impaired	2 (6,25%)
Balance	
Normal	30 (93,75%)
Impaired	2 (6,25%)
Cognitive function by MMSE	(Mean of MMSE)
Pre-Intervention	27
Post-Intervention	29
Depressive symptoms	(Mean of GDS)
Pre-Intervention	1
Post-Intervention	0

The examination of depressive symptoms using the Geriatric Depression Scale on pre-intervention showed a mean of 1 that classified into the normal category. A comorbid disease that is most suffered by the elderly is hypertension with an amount of 9 people (28.12%).

The results obtained were augmenting cognitive function improvement from the mean increase of MMSE score from 27 to 29. There were significant differences in MMSE scores before (M = 27 SD = 3,53009) and after intervention (M = 29, SD = 2,94004); p = 0.004, hypothesis test using Student T-test.

Examination of depressive symptoms also decreased from a mean of 1 to 0 after intervention. There were significant differences in the GDS Score before (M = 1, SD = 1.20439) and after intervention (M = 0, SD = 0.84190); p = 0.096, hypothesis test using Student T-test.

Preliminary screening was carried out using ABCDE tools. Almost all subjects who were screened in pre-intervention demonstrated good physical activity scores. The Romberg test was performed on all subjects in the pre-intervention stage as a screening test. Both ADL Katz Index Score and Romberg test were not carried out in the post-intervention since we did not attempt on improving motoric skills and balance of the body in the elderly.

In MMSE screening, there was a mean increase of 2 points. Many factors can contribute to the improvement of MMSE score, such as diet, social interaction, and physical activity. Activities that require cognitive skill and mental stimulation have been shown to protect against the progression of brain aging. Few studies investigated that decreases in mental engagement or cognitive stimulation during life are associated with dementia risk (World Health Organization, 2023). The elderly population in Kebagusan District were

experiencing retirement, which is a risk factor for dementia.

Exercise programs have a significant impact in improving the ability to perform activities daily living and cognition in elderly people. The evidence shows that exercise affects structural and functional changes in neurons. The increase of production of brain-derived synaptic proteins (BDNF) has induced exercise-related neurogenesis and neuron modelling. Meta-analyses written by Kuiper et al. (2016) confirmed that multiple aspects of social relationships are associated with cognitive decline. The modulation function of social circumstances involves the significant influence of social networks, encompassing both direct and indirect interactions among individuals through which information, attitudes, and norms are exchanged (Piolatto, et al, 2022).

From the GDS, the average score decreased from 1 point to 0 point. This shows a positive result as a high GDS indicates the presence of depressive symptoms in the elderly. Higher score on the GDS is mainly obtained in the elderly who were illiterate, who had one or no children, who were bedridden, who were without visits from relatives, and who had no activities outside (Jung, et al, 2017) (Patra, et al, 2017). Our results are in line with a systematic review by Mammen et al. (2013) which included 30 follow-up studies. They concluded that baseline physical activity is inversely related to depressive symptoms. The relationship between depression and future daily activity dependence is also found; lack of motivation and initiation is mainly found in people with depression, and this leads to restriction of daily physical activity. This explains that depression is strongly linked to lack of social interaction, physical activity, motivation, and initiation. In addition, a robust level of social involvement and expansive social connections have been linked to improved glucose regulation in adults without diabetes, as well as enhanced self-management of diabetes, leading to a decreased risk of dementia. This suggests a potential connection between social relationships and cognitive abilities (Marseglia, et al, 2019).

CONCLUSION

This program has the potential as a preventive measure for dementia that can be implemented in a wider scope. Several long-term efforts have been created, such as the PANDA book as a guideline for dementia prevention in the community and the CERIA application as a comprehensive dementia screening tool. From the results, it can be concluded that interaction with other people in daily life and physical activity on a regular basis play important roles in improving and maintaining cognitive function in the elderly and prevent the development of dementia.

REFERENCES

Alzheimer's Indonesia. Statistik tentang Demensia.Alzheimer Indonesia 2019. Accessed on 15 Dec 2023. Available from: https://alzi.or.id/statistik-tentang-demensia/

Alzheimer's Association. What is Dementia? Alzheimer's Association 2023. Accessed on 15 Dec 2023. Available from: https://www.alz.org/alzheimers-dementia/what-is-dementia

Anindhita T, Wiratman W (ed.). Buku ajar neurologi. 1st ed. Jakarta: Departemen Neurologi Fakultas Kedokteran Universitas Indonesia; 2017.

Forbes D, Thiessen E, Blake C, Forbes S, Forbes S. Exercise programs for people with dementia. Cochrane Database Syst Rev. 2013;12:1-2.

Jung S, Lee S, Lee S, Bae S, Imaoka M, Harada K, et al. Relationship between physical activity levels and depressive symptoms in community-dwelling older Japanese adults. Geriatr Gerontol Int 2017;1-7. Available from: http://doi.wiley.com/10.1111/ggi13195

Katz S, Downs TD, Cash HR, Grotz RC. Progress in development of the Index of ADL. The Gerontologist. 1970 Mar;10:20–30.

Mammen G, Faulkner G. Physical activity and the prevention of depression: a systematic review of prospective studies. Am J Prev Med. 2013 Nov;45(5):649-57.

Marseglia A, Wang H-X, Rizzuto D, Fratiglioni L, Xu W. Participating in mental, social, and physical leisure activities and having a rich social network reduce the incidence of diabetes-related dementia in a cohort of Swedish older adults. Diabetes Care. 2019; 42(2):232–9.

Mayza A. Elderly Brain Detection melalui penilaian gangguan dengan faktor risiko (ABCDE). [unpublished lecture notes].

Jakarta: Neurobehavior division, Department of Neurology Faculty of Medicine Universitas Indonesia-Ciptomangunkusumo National General Hospital; 2016.

Patra P, Alikari V, Fradelos EC, Sachlas A, Kourakos M, Rojas Gil AP, et al. Assessment of Depression in Elderly. Is Perceived Social Support Related? A Nursing Home Study: Depression and Social Support in Elderly. Adv Exp Med Biol. 2017;987:139-150.

Piolatto, M., Bianchi, F., Rota, M. *et al*. The effect of social relationships on cognitive decline in older adults: an updated systematic review and meta-analysis of longitudinal cohort studies. *BMC Public Health* 2022, 278;22.

Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia. Gambaran Kesehatan Lanjut Usia di Indonesia. Buletin Jendela Data dan Informasi Kesehatan, 2013.

Shevelkova V, Mattocks C, Lafortune L. Efforts to address the Sustainable Development Goals in older populations: a scoping review. BMC Public Health. 2023 Mar;23(1):456.

Sindi S, Mangialasche F, Kivipelto M. Advances in the prevention of Alzheimer's disease. *F1000 Prime Rep.* 2015;7(50):1-12.

Sulistyaningsih N, Claramita M, Pramantara I. Geriatric assessment in elderly people by using ABCDE (Ability Balance Cognitive Disease Emotion) Method at Posyandu for Elderly People. Rev Prim Care Prac and Educ. 2021;4(3):68-73.

Wallace M, Shelkey M. Katz index of independence in activities of daily living. In: *try this:* Best Practices in Nursing Care to Older Adults, The Hartford Institute for Geriatric Nursing, New York University, College of Nursing. Available from: www.hartfordign.org.

World Health Organisation. World report on ageing and health. World Health Organisation 2015. Luxemburg: WHO Library Cataloguing-in-Publication Data. Accessed on 15 Dec 2023. Available from: https://apps.who.int/iris/bitstream/handle/10665/186463/9789240694811_eng.pdf;jsessionid=C8663

World Health Organisation. Dementia. World Health Organisation 2023. Accessed on 15 Dec 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/dementia