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Balloon Breathing Exercise Games as Motor-Cognitive Coordination in Elderly with Dementia

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Abstract
The elderly represents the final stage in the human life process, characterized by various physical, cognitive, and functional limitations that arise due to the degenerative process. According to statistical data from 2022, the proportion of the elderly population increased from 7.57% in 2021 to 10.48% in 2022. One of the most prevalent conditions among the elderly is dementia, which manifests as a progressive decline in memory, cognitive abilities, and the capacity to perform daily activities. Without intervention, dementia symptoms worsen over time, necessitating targeted therapeutic approaches to prevent its progression. Engaging in recreational activities, such as playing games, has been shown to keep the mind active and foster cognitive engagement. This is particularly important for the elderly, especially those at risk of or experiencing mild dementia. The "Balloon Breathing Exercise Game" is a simple yet engaging activity that involves the use of locally crafted wooden tools, woven bowls, and plastic balls. This game aims to stimulate cognitive functions, enhance memory, and improve concentration in 11 elderly individuals. The objective of this study was to evaluate the effectiveness of the Balloon Breathing Exercise Game as a therapeutic medium for managing mild dementia in the elderly. A quasi-experimental research design was used, utilizing a one-group pretest-posttest approach to assess the effect (impact) of the intervention. Statistical analysis using a correlation test yielded a significance (sig.) value of 0.021 (<0.05), indicating a significant effect of the Balloon Breathing Exercise Game on reducing Mini-Mental State Examination (MMSE) scores in elderly individuals with mild dementia. Furthermore, a paired sample t-test yielded a sig. (2-tailed) value of 0.005 (<0.05), indicating a significant difference between pretest and posttest MMSE scores following the intervention. In conclusion, the Balloon Breathing Exercise Game is an effective therapeutic medium for managing mild dementia in elderly individuals.

Keywords: Balloon Breathing Exercise Game, dementia, elderly

INTRODUCTION

The elderly, represents the final stage in the human life process and is considered a natural part of the life cycle. According to Law No. 13 of 1998, the elderly are defined as individuals aged 60 years or older. Additionally, the World Health Organization (WHO) defines the elderly as a group undergoing the aging process, characterized by gradual physiological changes that impact their overall health and functionality. Aging involves a progressive decline in the body's ability to repair tissues and maintain normal physiological functions. This decline reduces the body's resistance to infections and its ability to recover from damage (López-Torres Hidalgo et al., 2021; Maulidina, 2016). According to data from the Central Statistics Agency (Badan Pusat Statistik or BPS), the proportion of the elderly population in Indonesia reached 11.75% in 2023, marking an increase of 1.27% from the previous year. In the province of West Nusa Tenggara (NTB), the percentage of elderly individuals in 2023 was recorded at 10.20% (Central Bureau of Statistics, 2021). With increasing age, the health conditions of the elderly deteriorate, often accompanied by a rise in functional impairments and disabilities (Merchant et al., 2021). Data indicate that mild disabilities, measured by the ability to perform daily activities, affect approximately 51% of individuals aged 55–64 years and 62% of those aged 65 years and older. One of the primary conditions contributing to increased disability among the elderly is dementia.

Dementia, or decline in cognitive function, is a serious threat to the quality of life of the elderly. This disease not only affects thinking and memory abilities, but also independence, social interactions, and overall mental health (Stefanowski et al., 2023). The main features of dementia are disturbances in short-term and long-term memory, associated with disturbances in abstract thinking, impaired judgment, other disturbances in higher-order cortical functions, or personality changes. The disorder is severe enough to significantly interfere with work or social activities or relationships with other people. Cognitive and psychosocial symptoms are progressive (Knopman et al., 2001). In advanced stages, the loss results, for example, in forgetting the names of close relatives and in dire need of assistance with activities of daily living (ADL) (Cipriani et al., 2020).

Dementia is a degenerative disease that cannot be treated using conventional methods for physical degenerative diseases, such as surgery or direct physical interventions. This is because dementia primarily affects the nervous system (Yogi Udjajaa, Reinert Yosua Rumagita, Wikaria Gazalia, 2021). The disease progresses gradually, often beginning with mild depressive symptoms, followed by mild cognitive decline, such as forgetfulness. In Indonesia, the prevalence of dementia is rising and resembles an iceberg phenomenon, where a large portion of cases remains undiagnosed or unaddressed. Currently, more than 4.2 million Indonesians are estimated to be living with dementia. Several factors contribute to the development of dementia, including age, gender, genetic predisposition, a family history of the disease, Down syndrome, hypertension, low levels of folic acid, insufficient family support, and unhealthy lifestyle choices (Ganguli et al., 2021; Oladinrin et al., 2021).

One effective approach to preventing or reducing the risk of dementia is by stimulating the brain (Yogi Udjajaa, Reinert Yosua Rumagita, Wikaria Gazalia, 2021). According to systematic reviews by Demurtas (2020) and Ita (2022), approximately 3% of dementia cases could be prevented by increasing levels of physical activity. Enhanced physical activity slows the pathological progression of dementia (Demurtas et al., 2020). Physical activities, such as playing games, have been shown to positively affect cognitive health (Ita et al., 2022). Several games specifically target various aspects of dementia and are designed to address the cognitive and functional challenges associated with the condition (Abd-Alrazaq et al., 2023). To implement this approach, researchers have developed a game that stimulates the brain through the Balloon Breathing Exercise activity. Based on an initial survey conducted at Puskesmas Mambalan (Mambalan Community Health Center), there are 3,521 elderly individuals in the center's coverage area. While the Elderly Family Posyandu program is conducted monthly within the Puskesmas work area, no game-based activities have been implemented as part of this program. The objective of this study was to evaluate the effectiveness of the Balloon Breathing Exercise Game as a therapeutic medium for managing mild dementia in the elderly.

METHOD

This study was conducted in the Puskesmas Mambalan work area from March to November 2024. A quasi-experimental method with a one-group pretest-posttest design was used to evaluate the effectiveness of the Balloon Breathing Exercise game activity as an intervention for elderly individuals with mild dementia. This design does not include a comparison group; however, it involves an initial observation (pre-test), which allows researchers to assess changes following the intervention. The study population consisted of all elderly individuals with dementia residing in the Puskesmas Mambalan work area, managed by the Elderly Family Posyandu. Participants were selected using the Mini-Mental State Examination (MMSE) based on the following inclusion criteria: Aged 60–85 years, Cooperative, Literate (able to read and write), Not experiencing decreased consciousness, Free of significant hearing or vision impairments, and MMSE scores <23 (Monroe & Carter, 2012).

The Balloon Breathing Exercise game intervention was administered to elderly participants with mild dementia across 12 sessions, each lasting 25–30 minutes. The sample size was determined using the Lameshow formula (1990) (Mansoor & Maqbool Ahmed Khuwaja, 2020). The result of the sample size calculation was increased by 10% to account for potential dropouts, resulting in a total sample size of 11 elderly participants. The sampling technique used was consecutive sampling, with participants selected based on predefined inclusion and exclusion criteria. The research instrument utilized in this study was the Mini-Mental State Examination (MMSE). The MMSE consists of 11 question items, with researchers assigning scores for each item. The assessment typically takes 10–15 minutes to complete. The MMSE was used to identify elderly individuals with mild dementia, defined as those with a score of <23 (Monroe & Carter, 2012). The MMSE has a maximum score of 30 and is a reliable tool for detecting cognitive impairments, establishing baseline cognitive function, and monitoring cognitive

decline over time.

The implementation of this study began with visits to the Elderly Family Posyandu within the Puskesmas Mambalan work area to discuss and determine the most suitable time to conduct the activities. Once the schedule was finalized, the researchers gathered the elderly participants and established a mutual agreement regarding the timing and commitment required for participation. Then, a pre-test assessment using the Mini-Mental State Examination (MMSE) was conducted. Additionally, researchers collected general demographic data on the elderly participants. Following this, the intervention involving the Balloon Breathing Exercise game activity was carried out. The intervention lasted for six weeks, with a frequency of two sessions per week, each lasting 25–30 minutes. During the intervention, the researchers acted as a facilitator, supported by additional facilitators to ensure the smooth running of the sessions. Upon completion of the intervention, the MMSE was administered again as a post-test. Data processing included general demographic data and the results of the pre-test and post-test assessments. Descriptive statistical methods were used, including frequency distribution, mean, median, and standard deviation. To analyze the effect of the Balloon Breathing Exercise game activity on mild dementia in the elderly, a paired t-test was conducted. A significance level of $p < 0.05$ was set, where the null hypothesis (H_0) would be rejected. Statistical analysis was performed using SPSS version 26.6 for Windows.

RESULTS & DISCUSSION

Results

Table 1. Respondent Characteristics in the Elderly (n=11)

Characteristics	Categories	f	%
Gender	Man	2	18.1
	Woman	9	81.8
Ages	Pre elderly	1	9.1
	Elderly	9	81.8
	Elderly Late age	1	9.1

Table 1 shows the distribution of characteristics that the majority of respondents are female with a total of 9 people (81.8%). Meanwhile, seen from the age category, the majority of respondents are in the elderly category with a total of 9 people (81.8%).

Table 2. The Effect of Balloon Breathing Exercise Game Activity as a Medium for Mild Dementia Therapy in the Elderly

The Effect of Balloon Breathing Exercise Game Activity as a Medium for Mild Dementia Therapy in the Elderly	Groups	p Value
	Intervention (n=11)	
Pretest Mean	21.00	
Postest Mean	21.90	
Comparison Pretest vs postest*	p = 0.021	
% turun (mean)		0,005

Based on the data in Table 1, the correlation test yielded a significance (sig.) value of 0.021, which is less than 0.05. This indicates a significant effect of the Balloon Breathing Exercise game activity on reducing MMSE scores in elderly individuals with mild dementia. Furthermore, the paired t-test yielded a sig. (2-tailed) value of 0.005, also less than 0.05. This indicates a statistically significant difference between the pre-test and post-test MMSE scores of elderly participants who underwent the Balloon Breathing Exercise game activity intervention.

Discussion

According to Health Direct, a Mini-Mental State Examination (MMSE) score below 20 may

indicate cognitive impairment (Lu et al., 2018). In In this study, participants were elderly individuals aged 60–75 years. At this stage of life, the elderly typically experience a decline in health, including memory deterioration. This aligns with a study conducted by Wijaya and Simon, which suggests that elderly individuals in nursing homes with mild dementia represent a small proportion of cases. Furthermore, the study emphasizes that advancing age does not necessarily mean a worsening of dementia symptoms. Maintaining a healthy lifestyle and continuously exercising cognitive functions can help ensure that dementia remains mild, even in individuals over 80 years old (Eryani et al., 2022). According to Pramitasari & Widya, there needs to be an effort to improve the quality of life for the elderly by adopting a healthy lifestyle, such as increasing physical activity (Pramitasari & Cahyati, 2022).

A literature review by McCallum & Boletsis (2013) highlights that games designed for the elderly can help combat dementia. These games serve various purposes, including prevention, rehabilitation, and education, which are tailored to meet the specific needs of elderly individuals. Moreover, a study conducted by Craig et al., (2023) showed significant improvements in dementia-related knowledge after playing such games. Increases in pre-test to post-test scores were observed across seven categories of dementia knowledge: life impact, risk factors, symptoms, treatment, assessment, caregiving, and disease trajectories. The largest improvements were noted in understanding dementia trajectories and risk factors, with all comparisons showing statistical significance at $p < 0.001$ Mild dementia in the elderly is characterized by early cognitive impairment, affecting memory, attention, and executive function, but often with preserved daily functioning. Early, non-pharmacological interventions are widely recommended to slow cognitive decline and enhance quality of life. Among these, game-based activities especially those that are accessible, familiar, and enjoyable are gaining empirical support as effective therapeutic tools (Ganguli et al., 2021; Ita et al., 2022). In addition, the Balloon Breathing Exercise Game engages multiple cognitive domains simultaneously. Players must focus on the task, remember the rules, and adjust their actions based on feedback, which exercises working memory, attention, and problem-solving skills. In addition, these activities require the role of health workers according to Atmadji & Widya, that there is a significant relationship between the number and type of health workers at the health center and the achievement of the performance indicators of the Minimum Service Standards for Health Services (Chae et al., 2025; Liu, 2023).

CONCLUSION

Therapy using Balloon Breathing Exercise game activity is an effective medium for treating mild dementia in the elderly.

REFERENCES

Abd-Alrazaq, A., Abuelezz, I., AlSaad, R., Al-Jafar, E., Ahmed, A., Aziz, S., Nashwan, A., & Sheikh, J. (2023). Serious Games for Learning among Older Adults with Cognitive Impairment: Systematic Review and Meta-analysis. *Journal of Medical Internet Research*, *25*. https://doi.org/10.2196/43607

Badan Pusat Statistik. (2021). *Statistik Penduduk Lanjut Usia 2021*. https://www.bps.go.id/id/publication/2021/12/21/c3fd9f27372f6ddcf7462006/statistik-penduduk-lanjut-usia-2021.html

Chae, H. J., Kim, C. H., & Lee, S. H. (2025). Development of an Evidence-Based Cognitive Training Application for Elderly Individuals with Cognitive Dysfunction. *Healthcare (Switzerland)*, *13*(3), 1–16. https://doi.org/10.3390/healthcare13030215

Cipriani, G., Danti, S., Picchi, L., Nuti, A., & Di Fiorino, M. (2020). Daily Functioning and Dementia. *Dementia e Neuropsychologia*, *14*(2), 93–102. https://doi.org/10.1590/1980-57642020dn14-020001

Craig, S., Stark, P., Wilson, C. B., Carter, G., Clarke, S., & Mitchell, G. (2023). Evaluation of a dementia awareness game for undergraduate nursing students in Northern Ireland: a Pre-/Post-Test study. *BMC Nursing*, *22*(1), 1–8. https://doi.org/10.1186/s12912-023-01345-2

Demurtas, J., Schoene, D., Torbahn, G., Marengoni, A., Grande, G., Zou, L., Petrovic, M., Maggi, S., Cesari, M., Lamb, S., Soysal, P., Kemmler, W., Sieber, C., Mueller, C., Shenkin, S. D., Schwingshackl, L., Smith, L., & Veronese, N. (2020). Physical Activity and Exercise in Mild Cognitive Impairment and Dementia: An Umbrella Review of Intervention and Observational Studies. *Journal of the American Medical Directors Association*, *21*(10), 1415-1422.e6.

https://doi.org/10.1016/j.jamda.2020.08.031
Eryani, I. G. A. P., Jayantari, M. W., & Wijaya, I. K. M. (2022). Sensitivity Analysis in Parameter Calibration of the WEAP Model for Integrated Water Resources Management in Unda Watershed. *Civil Engineering and Architecture*, *10*(2), 455–469. https://doi.org/10.13189/cea.2022.100206
Ganguli, M., Hughes, T. F., Jia, Y., Lingler, J., Jacobsen, E., & Chang, C. C. H. (2021). Aging and Functional Health Literacy: A Population-based Study. *American Journal of Geriatric Psychiatry*, *29*(9), 972–981. https://doi.org/10.1016/j.jagp.2020.12.007
Ita, D., Gauthier, E., & Bih, L. (2022). NA systematic review and meta-analysis of randomized controlled trials on the effect of serious games on people with dementiao Title. *Ageing Research Reviews*, *Volume 82*. https://doi.org/https://doi.org/10.1016/j.arr.2022.101740
Knopman, D. S., DeKosky, S. T., Cummings, J. L., Chui, H., Corey–Bloom, J., Relkin, N., Small, G. W., Miller, B., & Stevens, J. C. (2001). Practice parameter: Diagnosis of dementia (an evidence-based review). *Neurology*, *56*(9), 1143–1153. https://doi.org/10.1212/wnl.56.9.1143
Liu, N. Y. C. (2023). Using Games as an Effective Intervention for Supporting Families Living with Dementia. *EAI Endorsed Transactions on Pervasive Health and Technology*, *9*(1), 1–28. https://doi.org/10.4108/eetpht.9.3365
López-Torres Hidalgo, J., Sotos, J. R., Salmerón, L. A., Gras, C. B., Rosa, M. C., Escobar Rabadán, F., Vizcaíno, C. E., Belenguer, J. L. E., Martín, J. F., López, V. F., García, A. L., López, J. L. T., López, J. L. T., Verdejo, M. Á. L., Yeste, A. L., Callejo, M. Á. L., Lozano, M. J. M., Núñez, J. M., Rodríguez, K. N., … Lapeira, J. M. T. (2021). Effectiveness of physical exercise in older adults with mild to moderate depression. *Annals of Family Medicine*, *19*(4), 302–309. https://doi.org/10.1370/afm.2670
Lu, W., Pikhart, H., & Sacker, A. (2018). Domains and Measurements of Healthy Aging in Epidemiological Studies: A Review. *Gerontologist*, *59*(4), E294–E310. https://doi.org/10.1093/GERONT/GNY029
Mansoor, K., & Maqbool Ahmed Khuwaja, H. (2020). The Effectiveness of a Chronic Disease Self-Management Program for Elderly People: a Systematic Review. *Elderly Health Journal*, *6*(1), 51–63. https://doi.org/10.18502/ehj.v6i1.3416
Maulidina, H. (2016). *Peraturan Menteri Kesehatan Republik Indonesia* (Patent No. 25). http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No._25_ttg_Rencana_Aksi_Nasional_Kesehatan_Lanjut_Usia_Tahun_2016-2019_.pdf
McCallum, S., & Boletsis, C. (2013). Dementia games: A literature review of dementia-related serious games. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *8101 LNCS*, 15–27. https://doi.org/10.1007/978-3-642-40790-1_2
Merchant, R. A., Chan, Y. H., Hui, R. J. Y., Tsoi, C. T., Kwek, S. C., Tan, W. M., Lim, J. Y., Sandrasageran, S., Wong, B. L. L., Chen, M. Z., Ng, S. E., & Morley, J. E. (2021). Motoric cognitive risk syndrome, physio-cognitive decline syndrome, cognitive frailty and reversibility with dual-task exercise. In *Experimental gerontology* (Vol. 150, p. 111362). https://doi.org/10.1016/j.exger.2021.111362
Monroe, T., & Carter, M. (2012). Using the Folstein Mini Mental State Exam (MMSE) to explore methodological issues in cognitive aging research. *European Journal of Ageing*, *9*(3), 265–274. https://doi.org/10.1007/s10433-012-0234-8
Oladinrin, O., Gomis, K., Jayantha, W. M., Obi, L., & Rana, M. Q. (2021). Scientometric Analysis of Global Scientific Literature on Aging in Place. In *International journal of environmental research and public health* (Vol. 18, Issue 23). https://doi.org/10.3390/ijerph182312468
Pramitasari, A., & Cahyati, W. H. (2022). Kejadian Hipertensi pada Lansia di Wilayah Kerja Puskesmas Banyudono 1 Kabupaten Boyolali. *HIGEIA (Journal of Public Health Research and Development)*, *6*(4), 204–215. https://doi.org/10.15294/higeia.v6i4.57037
Stefanowski, B., Kucharski, M., Szeliga, A., Snopek, M., Kostrzak, A., Smolarczyk, R., Maciejewska-Jeske, M., Duszewska, A., Niwczyk, O., Drozd, S., Englert-Golon, M., Smolarczyk, K., & Meczekalski, B. (2023). Cognitive decline and dementia in women after menopause: Prevention strategies. *Maturitas*, *168*(April 2022), 53–61. https://doi.org/10.1016/j.maturitas.2022.10.012
Yogi Udjajaa, Reinert Yosua Rumagita , Wikaria Gazalia, J. D. (2021). Healthy Elder: Brain Stimulation Game for the Elderly to Reduce the Risk of Dementia. *Procedia Computer Science*, *178*, 95–102. https://www.sciencedirect.com/science/article/pii/S1877050920324546