Jurnal Keterapian Fisik
Vol. 11, No. 1, May 2026
https://doi.org/10.37341/jkf.v11i1.474

Original Research

Impact of Crossword Puzzle Therapy on Cognitive Performance Among Elderly Individuals

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ABSTRACT

Background: *The elderly experience a decline in cognitive function due to degenerative processes that affect their independence and quality of life. Crossword Puzzle Therapy is one of the non-pharmacological interventions that can stimulate cognitive functions, including memory, concentration, language, and problem-solving. This study aimed to examine the effect of crossword puzzle therapy on cognitive function among older adults at community-based health service posts in Central Java, Indonesia.*

Methods: *This research utilized a pre-experimental design with a one-group pretest–posttest approach. The sample, selected through purposive sampling, consisted of 35 elderly participants who took part in six intervention sessions over a two-week period. Cognitive function was assessed using the Mini-Mental State Examination (MMSE). Data analysis involved the paired sample t-test for comparison, with the Shapiro–Wilk test applied to assess data normality.*

Results: *The findings revealed an increase in the average MMSE score from 24.74 to 26.20 following the intervention. Results of the paired sample t-test yielded a p-value of <0.001 (<0.05), indicating a statistically significant difference between pre- and post-therapy scores.*

Conclusion: *Crossword Puzzle Therapy significantly improves the cognitive function of the elderly and offers an easy, affordable, and enjoyable intervention that can be applied within the community. Crossword Puzzle Therapy can be an intervention option to prevent cognitive decline and for older adults with cognitive impairment.*

ARTICLE HISTORY
Received: August 15, 2025
Accepted: February 15, 2026

KEYWORDS
crossword puzzle therapy; cognitive function; elderly; the Mini-Mental State Examination

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Cite this as: Rachma, A. A., & Nurhidayah, N. (2026). Impact of Crossword Puzzle Therapy on Cognitive Performance Among Elderly Individuals. *Jurnal Keterapian Fisik, 11(1)*, 1-9. https://doi.org/10.37341/jkf.v11i1.474

INTRODUCTION

Aging involves gradual changes in physical, mental, and social abilities that can affect an older person's ability to live independently and their overall quality of life (Harada et al., 2021). According to Akbar et al. (2021)'s interpretation of Undang-Undang Nomor 13 Tahun 1998, an elderly individual is a person aged 60 years or older. In 2023, around 11.75% of Indonesia's population was elderly (Badan Pusat Statistik, 2023). WHO projects that this number will increase to 1.5 billion by 2050 (Badan Pusat Statistik, 2023).

One of the many decreases that older adults face is a reduction in cognitive function, which can impact behavior, activities, and social interactions (Setiawan et al., 2023). This can lead to functional impairment and a lower quality of life for older adults. Due to neural system degradation, this decrease encompasses a number of cognitive abilities, including memory, attention, language, and executive function (Harada et al., 2021; Yuliyanti et al., 2022). Cognitive decline in older adults can also increase the risk of becoming dependent in daily activities and heighten the likelihood of developing mental health disorders.

There are both pharmaceutical and non-pharmacological ways to address the deterioration of cognitive function in the aged. Pharmacological therapies include the use of drugs that have been demonstrated to reduce the course of cognitive impairment, such as galantamine, memantine, rivastigmine, and donepezil (Miculas et al., 2022). Additionally, Cholinesterase inhibitors are frequently used in the treatment of cognitive impairment, while antioxidant agents like vitamin E have been studied as additional therapies that may offer protective effects for the nervous system (Miculas et al., 2022). In addition to pharmacological therapy, non-pharmacological approaches such as cognitive training, physical activity and social stimulation have also been shown to play a significant role in maintaining and improving cognitive function in older adults.

Occupational therapy and cognitive exercises, which include activities like reading, cooking, Sudoku, and crossword puzzles, are also effective non-pharmacological interventions for preserving brain function (Komsin & Isnaini, 2020). According to Permana and Sintia (2021), a crossword puzzle is a game that improves memory, word matching, and logical thinking. Consequently, cognitive activities such as crossword puzzles have the potential to serve as effective non-pharmacological interventions in helping to maintain and improve cognitive function.

Participation in mentally challenging activities like solving crossword puzzles has been linked to maintaining memory function and slowing down cognitive decline in older adults (Livingston et al., 2020), improve cognition, slow brain shrinkage (Devanand et al., 2022). In addition, crossword puzzles help maintain and train written language skills in individuals with amnesia and stimulate various brain areas such as the frontal, parietal, temporal, and occipital lobes, as well as the hippocampus and entorhinal (Komsin & Isnaini, 2020). As such, activities such as doing crossword puzzles can be an effective form of cognitive stimulation to help maintain brain function in older adults.

Moreover, this therapy develops general thinking patterns, reasoning, and problem-solving abilities (Permana & Sintia, 2021), helps in the identification and comprehension of learning terms through the use of skills like spelling, reasoning, logical thinking, conclusion-making, and choice evaluation (Bawazeer et al., 2022), expands vocabulary to improve speaking and writing abilities (Nainggolan et al., 2023; Pohloh & Ma'rifatulloh, 2023), and enhances information recall, retention, and student engagement in the classroom (Bawazeer et al., 2022). Thus, crossword puzzle treatment can be employed as a simple, inexpensive, and enjoyable alternative intervention for decreasing cognitive decline in the elderly (Komsin & Isnaini, 2020). Crossword puzzle therapy is a straightforward, affordable, and pleasant way to improve cognitive function, and it can be easily carried out in community-based environments.

This study differs from earlier research, which was carried out in clinical or institutional settings, by exploring the use of crossword puzzle therapy in community health posts (posyandu). It focuses on the actual tackles an important research gap by offering evidence from Indonesian older adults, a group that is not well-represented in

cognitive intervention research, especially in low- and middle-income countries. This study was conducted to determine the effect of Crossword Puzzle Therapy on the cognitive function of the elderly at community-based health service posts in Central Java, Indonesia. This research is important because it has not been widely applied at the local community level and can be the basis for developing similar cognitive stimulation programs in other posyandus.

MATERIALS AND METHOD

The study used a pre-experimental design with a one-group pretest-post test form. A single-group pretest-post test design has been commonly employed in community-based intervention studies to measure changes over time in the same participants, before and after an intervention, where randomization and control groups are neither possible nor ethical under field conditions (Chang et al., 2022). This study offers preliminary evidence on intervention impact and feasibility, especially for older adults, for whom resource and recruitment challenges preclude more rigorous designs.

The purpose of this study is to compare the elderly's cognitive function before and after the Crossword Puzzle Therapy intervention. The research was conducted at community-based health service posts in Central Java, Indonesia. These locations were carefully chosen because they are community-based elderly health centers that hold regular monthly events and consistently attract older adults. The posyandu primarily serves older adults living in the community and not in institutional care, which aligns with the study's goals of assessing cognitive intervention in a real-world community setting.

This study population comprised community-dwelling older adults aged 60 years and above who were registered at community-based health service posts in Central Java, Indonesia. The study sample amounted to 35 elderly people selected using purposive sampling technique from both posyandu with the following inclusion criteria: (1) elderly aged ≥60 years; (2) Mini-Mental State Examination (MMSE) score ≥18; (3) able to read and write; (4) do not have severe visual impairment; (5) willing to become respondents; and (6) follow 6 times the intervention. The sample size was determined by the number of eligible participants who met the criteria and were willing to complete the full intervention program. In pre-experimental one-group pretest-post test studies, a sample size of approximately 30 participants or more is considered adequate to evaluate preliminary intervention effects and feasibility in community settings.

The independent variable in this study was crossword puzzle therapy. The dependent variable was cognitive performance among older adults. The Crossword Puzzle Therapy was implemented as a structured cognitive stimulation intervention comprising six sessions over two weeks, each lasting 15-30 minutes and involving completing an age-appropriate crossword puzzle designed to stimulate memory, attention, language, and executive functions. Participants worked independently, with minimal facilitator supervision and assistance, to maintain cognitive engagement while ensuring comprehension of the tasks. Cognitive function was measured before and after the intervention using the MMSE, as a valid and reliable screening tool for cognitive performance. The MMSE evaluates orientation, memory, attention, language, and visuospatial abilities through a structured 30-item questionnaire administered via direct interview. Cognitive performance was evaluated before and after the intervention to determine changes associated with the crossword puzzle therapy.

The MMSE instrument was used in this study as it demonstrates excellent validity and reliability. The results of the factor analysis suitability test showed a KMO value of

0.90 and a significant Bartlett's Test of Sphericity ($\chi^2 = 69.555$; $p < 0.001$), indicating that the data were suitable for factor analysis. The results of the Confirmatory Factor Analysis (CFA) indicate that the model fits very well, with CFI = 1.000, TLI = 1.000, RMSEA = 0.009, and SRMR = 0.034. Meanwhile, the reliability of the instrument based on Zumbo's alpha ranged from 0.89 to 0.98, indicating very high internal consistency. Consequently, the MMSE instrument was deemed valid and reliable for measuring cognitive function in older adults (Tan & Feng, 2022).

Data analysis included: (1) the Shapiro-Wilk test to determine the normality of data distribution, and (2) comparative analysis to determine differences in cognitive function of the elderly before and after treatment/intervention. Based on the normality test, the data is normally distributed, so the comparative analysis uses a paired sample t-test. All statistical analyses were performed using statistical software, with a significance level set at $p < 0.05$.

The researcher applied for an ethical permit to the ethics committee of the Dr. Moewardi General Hospital. This research has met ethical requirements under No. 1.748/VII/HREC/2024. This study has also adhered to the principles of research ethics. Prior to data collection, respondents were provided with an explanation of the study's objectives, procedures, benefits and potential risks, and were then asked to sign an informed consent form as a form of agreement to participate. Throughout the research process, the researcher ensured that the activities carried out did not pose any risk or harm to the respondents (non-maleficence) and were expected to contribute to enhancing knowledge regarding the health of older adults (beneficence). Furthermore, all respondents were treated fairly without discrimination based on gender, age, or social background (justice).

RESULTS

This study involved 35 older adults recruited from two community-based elderly health service centres. The participants were divided into two groups, comprising 17 and 18 respondents respectively. The characteristics of the respondents examined included age group, gender and educational attainment.

Table 1. Sociodemographic characteristics of older adults (n = 35)

Variable	Elderly Health Post 1 (n = 17)	Elderly Health Post 2 (n = 18)
Age, n (%)		
60–74 years	17 (100.0)	17 (94.4)
75–90 years	0 (0.0)	1 (5.6)
Gender, n (%)		
Female	17 (100.0)	18 (100.0)
Male	0 (0.0)	0 (0.0)
Education level, n (%)		
Elementary school	6 (35.3)	9 (50.0)
Middle school	3 (17.6)	2 (11.1)
High school	4 (23.5)	7 (38.9)
Diploma	2 (11.8)	0 (0.0)

Variable	Elderly Health Post 1 (n = 17)	Elderly Health Post 2 (n = 18)
Bachelor	2 (11.8)	0 (0.0)

Based on age categories, most respondents fell within the elderly range (60–74 years), with 17 individuals (48.55%) in each Elderly Health Post. In terms of gender, all respondents in both locations were female, with 17 people (48.57%) from Elderly Health Post 1 and 18 people (51.43%) from Elderly Health Post 1. Regarding educational attainment, six respondents (17.1%) at Elderly Health Post 1 completed elementary school. Similar findings were made at Elderly Health Post 2, where nine individuals (25.7%) had only completed elementary school.

The normality of the data was assessed using the Shapiro–Wilk test. The results showed p-values of 0.126 for the pre-test and 0.204 for the post-test, both greater than 0.05, indicating that the data were normally distributed. Therefore, the statistical analysis was performed using a paired sample t-test as a parametric method to compare the pre-test and post-test scores.

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Table 2. Analysis of the Mini-Mental State Examination (MMSE) before and after the intervention (n = 35)

Variable	Min	Max	Mean ± SD	Mean Difference	p-value*	Interpretation
Pre-test Cognitive Function	18	29	24.74 ± 2.501	1.46	<0.001	Significant
Post-test Cognitive Function	20	30	26.20 ± 2.374			

Note: SD = Standard Deviation; * a paired sample t-test

The analysis's findings indicate that elderly people who receive crossword puzzle therapy have higher cognitive function scores. An increase in cognitive function in the elderly was indicated by the average MMSE score, which increased from 24.74 to 26.20. The test results show a p-value of <0.001 ($p < 0.05$), indicating a statistically significant difference between pre-test and post-test scores. Thus, the intervention provided is proven to improve the cognitive function of respondents. The analysis produced a p-value of 0.001 ($p < 0.05$).

DISCUSSION

The study revealed that crossword puzzle therapy significantly improves cognitive function in the elderly. This finding is consistent with studies conducted by Komsin and Isnaini (2020), who found that Crossword Puzzle Therapy had a significant effect on the cognitive function of the elderly at PPSLU Sudagaran Banyumas. Similarly, Devanand et al. (2022) reported that computer-based crossword puzzle training effectively enhances cognitive performance in individuals with mild cognitive impairment and contributes to reducing brain atrophy.

The activity of filling in crossword puzzles trains various cognitive aspects, including memory, concentration, language skills, and problem-solving, thus stimulating the brain to stay active. Berry (2021) said that doing hard mental activities like crosswords, sudoku, and other puzzles is linked to a lower chance of getting dementia

and might help slow down thinking problems in older people. Aniek et al. (2025) noted that a cognitive game, a modified version of the Snakes and Ladders board game adapted for Indonesian players, helps improve cognitive skills. Komsin and Isnaini (2020) explained that this cognitive exercise stimulates the brain by encouraging the retrieval, processing, and interpretation of absorbed questions or information, as well as retaining the acquired messages or knowledge. Consistent stimulation helps maintain and enhance the brain's remaining cognitive functions. According to Sigalingging et al. (2020), such continuous stimulation can activate brain nerve cells even in old age, strengthening the connections between neurons and preventing severe cognitive decline.

Furthermore, the improvement in cognitive function observed in this study can also be explained by the concepts of cognitive reserve and neuroplasticity. Cognitive reserve refers to the brain's ability to adapt and compensate for changes caused by the ageing process or neurological damage by utilising alternative neural networks. Regular engagement in mentally stimulating activities, such as doing crossword puzzles, can strengthen these neural networks and enhance the brain's flexibility in processing information. Cognitive stimulation can also encourage the formation of new synaptic connections and maintain existing neural pathways, thereby helping to preserve cognitive performance in older adults. Therefore, structured cognitive activities not only provide short-term mental stimulation but also have the potential to enhance the brain's resilience against age-related cognitive decline (Huang et al., 2022).

From a neurobiological perspective, cognitive exercises such as crossword puzzles are believed to enhance cognitive function through the role of neurotransmitters, particularly acetylcholine, in the central nervous system (Komsin & Isnaini, 2020). According to Huang et al. (2022), acetylcholine is essential for memory formation as it regulates neuronal transmission. Stimulation of the association cortex, medial temporal lobe, and hippocampus plays a key role in sustaining memory (Zhao et al., 2024). Reduced levels of acetylcholine can impair both the creation of new memories and the retrieval of existing ones, making cognitive activities important for maintaining brain stimulation (Huang et al., 2022). Furthermore, Ananth et al. (2023) found that Acetylcholine is important for thinking, like paying attention, learning new things, and remembering. It works through special nerve networks in the basal forebrain that connect to the brain's outer layer, helping the brain process information more effectively.

The results of this study suggest that using crossword puzzles as a form of therapy can be a practical, cost-effective way to stimulate cognitive function in older adults in community healthcare settings. The noticeable could be included in standard health initiatives for older adults, especially within primary healthcare and posyandu services. For healthcare professionals such as occupational therapists and community health workers, crossword puzzle therapy offers a useful method for maintaining cognitive health and encouraging social interaction among elderly individuals. Incorporating structured mental exercises into standard community health programs can help develop approaches to slow the loss of mental abilities and support older people in staying capable and independent in their daily activities.

However, this study has several limitations that need to be considered. First, all participants were elderly women, so the results of the study cannot be generalized to the male elderly population, given the absence of male elderly participation in posyandu activities. Second, this study has not observed other factors that could potentially affect cognitive function, such as disease history, occupation, and living conditions (living alone or with family). Third, limited facilities in the form of a lack of availability of chairs and

tables during the intervention may affect the comfort of respondents when working on crossword puzzles.

CONCLUSION

Crossword puzzle therapy was shown to enhance cognitive function in older adults living in the community, as evidenced by higher MMSE scores after six therapy sessions. This straightforward, inexpensive, and non-medication-based approach can be incorporated into regular community health initiatives for older adults to improve cognitive function and help slow the loss of mental abilities. In practice, crossword puzzle therapy can be easily integrated into the work of healthcare professionals, such as occupational therapists and community health workers, as part of standard community-based programs for elderly health. This approach helps support cognitive well-being and may help slow the progression of the cognitive decline.

ACKNOWLEDGEMENTS

The authors would like to thank those who have provided support during the research process, including: (1) The supervisors and examiners provided direction, input, and evaluation, which were very helpful in improving this manuscript; (2) Cadres and managers of Posyandu Sehat Sekeco and Posyandu Ngudi Langgeng, Gagaksipat, Ngemplak, Boyolali, who gave permission and support during the field research; (3) All elderly participants who are willing to take the time and follow the intervention until this research can be completed properly; and (4) Colleagues and family, for their prayers, motivation, and moral support throughout the research process.

DECLARATION OF USE OF AI IN SCIENTIFIC WRITING

AI tools were used solely for grammar and language editing. The authors take full responsibility for the content and integrity of the manuscript.

CONFLICT OF INTERESTS

The author declares that there is no conflict of interest in this research.

REFERENCES

Akbar, F., Darmiati, D., Arfan, F., & Putri, A. A. Z. (2021). Pelatihan dan pendampingan kader posyandu lansia di Kecamatan Wonomulyo. *Journal Abdidas*, *2*(2), 392–397. https://doi.org/10.31004/abdidas.v2i2.282

Ananth, M.R., Rajebhosale, P., Kim, R., Talmage, D.A., & Role, L.W. (2023). Basal forebrain cholinergic signalling: Development, connectivity and roles in cognition. *Nature Reviews Neuroscience,* 24, 233–251. https://doi.org/10.1038/s41583-023-00677-x

Badan Pusat Statistik. (2023). *Statistik penduduk lanjut usia 2023* (Direktorat Statistik Kesejahteraan Rakyat (ed.)). https://doi.org/ISSN 2086-1036

Bawazeer, G., Sales, I., Albogami, H., Aldemerdash, A., Mahmoud, M., Aljohani, M. A., & Alhammad, A. (2022). Crossword puzzle as a learning tool to enhance learning about anticoagulant therapeutics. *BMC Medical Education*, *22*(1), 1–12. https://doi.org/10.1186/s12909-022-03348-0

Berry, E. (2021). *Do brain-training apps, games, and puzzles enhance brain health?* University of New South Wales Medicine & Health. Retrieved 03 March 2026 from https://www.unsw.edu.au/newsroom/news/2021/09/do-brain-training-apps--games-and-puzzles-enhance-brain-health-?

Chang, S.J., Lee, Ke., Yang, E., Ryu, H. (2022). Evaluating a theory-based intervention for improving eHealth literacy in older adults: A single group, pretest–posttest design. *BMC Geriatrics,* 22, 918. https://doi.org/10.1186/s12877-022-03545-y

Devanand, D. P., Goldberg, T. E., Qian, M., Rushia, S. N., Sneed, J. R., Andrews, H. F., Nino, I., Phillips, J., Pence, S. T., Linares, A. R., Hellegers, C. A., Michael, A. M., Kerner, N. A., Petrella, J. R., & Doraiswamy, P. M. (2022). Computerized games versus crosswords training in mild cognitive impairment. *NEJM Evidence*, *1*(12), 1–12. https://doi.org/10.1056/evidoa2200121

Harada, C. N., Love, M. C. N., & Triebel, K. L. (2021). *Normal cognitive aging.* C*linics in Geriatric Medicine*, 37(3), 397–410**.** https://doi.org/10.1016/j.cger.2021.03.002

Huang, Q., Liao, C., Ge, F., Ao, J., & Liu, T. (2022). Acetylcholine bidirectionally regulates learning and memory. *Journal of Neurorestoratology, 10*(2), 100002. https://doi.org/10.1016/j.jnrt.2022.100002

Komsin, N. K., & Isnaini, N. (2020). The Effect Of Crossword Puzzle Therapy (CPT) On the cognitive function of elderly in Sudagaran Old Age Home (PPSLU), Banyumas. *Jurnal Ilmiah Kesehatan Keperawatan*, *16*(1), 77. https://doi.org/10.26753/jikk.v16i1.380

Livingston, G., Huntley, J., Sommerlad, A., et al. (2020). *Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. The Lancet*, 396(10248), 413–446. https://doi.org/10.1016/S0140-6736(20)30367-6

Miculas, D. C., Negru, P. A., Bungau, S. G., Behl, T., Hassan, S. S. ul, & Tit, D. M. (2022). Pharmacotherapy evolution in Alzheimer's disease: Current framework and relevant directions. *Cells*, *12*(1), 131. https://doi.org/10.3390/cells12010131

Nainggolan, C. J., Purba, C. N., & Munthe, M. V. R. (2023). The effect of crossword puzzle game on students' vocabulary mastery at grade eight of SMP Gkps 3 Pematang Siantar. *Jurnal Ilmu Pendidikan dan Sosial*, *2*(4), 502–512. https://doi.org/10.58540/jipsi.v2i4.465

Permana, S., & Sintia, N. I. (2021). Penerapan metode pembelajaran crossword puzzle (teka-teki silang) untuk meningkatkan hasil belajar siswa pada mata pelajaran IPS kelas VIII di SMP Baiturrosyad Lembur Awi Pacet. *RESOURCE: Research of Social Education*, *1*(1), 18–27. https://ejournal.unibba.ac.id/index.php/resource/article/view/632

Pohloh, A., & Ma'rifatulloh, S. (2023). The use of crossword puzzle to improve vocabulary mastery (An Experimental Study At Ban Chokok School Thailand). *IRecall Journal: An Indonesian Journal for Language Learning and Teaching*, *1*(1), 1–14. https://journal.irecall.id/index.php/IrecallJournal

Puspitosari, A., Nurhidayah, N., Jiwantoro, A.Y., & Kurniawan, D.P.G. (2025). Impact of interventions with modified snake ladder games on cognitive abilities and reducing cognitive decline in aging. *Jurnal Keterapian Fisik*, 9(2), 101-109. https://doi.org/10.37341/jkf.v9i2.455

Setiawan, Ikhtiyarotul Fikriyah, N., & Purnama, D. (2023). Description of cognitive function in the elderly with puzzle therapy intervention: Case study. *Genius Journal*, *4*(1), 250–256. https://doi.org/10.56359/gj.v4i1.246

Sigalingging, G., Sitopu, S. D., & Sihaloho, L. (2020). Karakteristik lanjut usia yang mengalami gangguan memori. *Jurnal Darma Agung Husada*, 7 (1). https://jurnal.darmaagung.ac.id/index.php/darmaagunghusada/article/view/445/423

Tan, T. K., & Feng, Q. (2022). Validity and reliability of Mini-Mental State Examination in older adults in China: Inline Mini-Mental State Examination with cognitive functions. *International Journal of Population Studies*, 8(1), 1–16. https://doi.org/10.18063/ijps.v8i1.1285

Yuliyanti, T., Kustanti, K., & Wahyuni, W. (2022). Upaya pencegahan demensia dengan pelatihan terapi otak dan pemeriksaan kesehatan dasar pada lanjut usia di Wilayah Kelurahan Bulakrejo Kabupaten Sukoharjo. *GEMASSIKA: Jurnal Pengabdian Kepada Masyarakat*, *6*(2), 141–153. https://doi.org/10.30787/gemassika.v6i2.692

Zhao, S., Sang, F., Liu, C., Zhou, C., Wang, X., & Chen, Y. (2024). Age-related enhancement of the association between episodic memory and gray matter volume in medial temporal and frontal lobes. *Behavioral and Brain Functions,* 20**,** 10. https://doi.org/10.1186/s12993-024-00237-y