



**THE EFFECT OF MEMORY TRAINING ON COGNITIVE FUNCTION: A SYSTEMATIC REVIEW**

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**ABSTRACT**

Memory is related to the processes that allow us to record, store and then retrieve experiences and information. Memory as an information processor is analogized by psychologists and neurologists as a computer. The recording process, called encoding, is the process of obtaining information conveyed to the system by translating it into neural code which is processed in the brain. The goal of the research titled is to systematically evaluate and synthesize existing studies to determine the impact of memory training interventions on various aspects of cognitive function. This includes assessing how memory training may enhance skills such as attention, processing speed, working memory, and overall cognitive performance. By identifying patterns, strengths, and limitations in the current literature, the study aims to provide insights into the effectiveness of memory training programs and guide future research and practical applications in cognitive enhancement. Method: Articles used in systematic reviews are typically sourced from various academic databases such as PubMed, PsycINFO, Scopus, and Google Scholar. These include studies published in peer-reviewed journals. The keywords used for searching may include phrases like "memory training," "cognitive function," "cognitive enhancement," "working memory," and other related terms. This combination of keywords helps filter relevant articles. For instance, in this review, there might be 150 articles identified through the initial search. After a selection process based on inclusion and exclusion criteria, approximately 30 articles are chosen for further analysis. The articles included in the systematic review are examined systematically, following the PRISMA 2020 guidelines: Study Identification, Study Selection, Data Extraction, Analysis and Synthesis. Analyzing the results from the selected studies and compiling conclusions based on the available evidence. Results: The findings from these five literature studies cumulatively imply that activities involving the Al-Quran, such as listening, reading, or memorizing, have a positive impact on various aspects of physical and mental health, cognitive function, and brain responses. The implications of these results may stimulate further research in the field of cognitive interventions, as well as provide a more in-depth look at the role of memorization in the development of cognitive abilities at critical developmental stages. Conclusion: From the five studies reviewed, it can be concluded that memory training interventions, especially in the context of memorizing the Qur'an, contribute positively to the improvement of cognitive function in various age groups, including children, adolescents, adults, and the elderly. The implications of these findings give impetus to further research in the field of cognitive intervention, focusing on memorization strategies, as well as providing deeper insight into the role of memorization in the development of cognitive abilities at critical stages of life.

Keywords: Al-Qur'an; cognitive; effect; memory

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**INTRODUCTION**

Memory refers to the processes that allow us to record, store, and later retrieve experiences and information. Memories add richness and context to our lives, but more fundamentally, they enable us to learn from experience and thereby adapt to environmental changes. From an evolutionary perspective, without the ability to remember, we would not be able to survive as a species. Acim, S. A. (2022). According to Passer and Smith (2006, 233) memory is related to the processes that allow us to record, store and then retrieve experiences and information.

Memory as an information processor is analogized by psychologists and neurologists as a computer. The recording process, called encoding, is the process of obtaining information conveyed to the system by translating it into neural code which is processed in the brain Acim, S. A. (2022). The brain processes sensory and motor information in various stages. At each stage, neural representations of stimulus features or motor commands are manipulated. Information is transmitted between neurons based on trains of action potentials or, less commonly, based on gradual shifts in membrane potential. 'Neural Code' refers to the neural representation of information, and its study can be divided into three interrelated questions Robbani, A. S. (2021). Coding refers to entering information into a system by translating it into a neural code that is processed by the brain. Encoding, storage, and retrieval represent what our memory system does with information.

Encoding is a critical stage in the memory process that allows information to be entered into the cognitive system. Coding involves the conversion of external information or experience into a format that can be processed by the brain, referred to as neural code. This process is similar to translating information into a language that the brain can understand. This neural code is a form of representation that can be stored by our memory system. Furthermore, after the information is encoded, the memory system must store it so that it can be accessed in the future. This storage process allows information to remain in short- or long-term memory, depending on its significance. Part of this process involves organizing and structuring information to facilitate effective retrieval. Retrieving information from memory, the third stage in this process, occurs when requiring or recalling information that has been stored. This retrieval process involves searching for and accessing previously encoded and stored information. In other words, encoding, storing, and retrieving information is a series of critical steps that form the basis of our memory function. This process allows us to overcome the complexity of the world around us, learn from experience, and adapt to environmental changes Acim, S. A. (2022).

There are several methods to improve the ability to memorize or store information and recall memory. Baddeley (1998) lists several methods, including visual imagery mnemonics, which uses visual mental images to memorize words. Mnemonic strategy-based memory training programs have been shown to be beneficial for both young and older adults in improving memory and functional performance. Memory is one of the cognitive functions that makes it possible to store, remember and retrieve information, divided into short-term memory and long-term memory Irsyad, M., & Qomariah, N. (2017). Understanding the differences and interactions between these two types of memory helps in developing more effective strategies to improve memory performance. Understanding and applying these methods can provide significant benefits in everyday life, both in the context of learning, work and general cognitive function.

Al-Ghautsani (2010; 51-52) states that there are nineteen rules for memorizing the Koran. These rules are sincerity, memorizing as a child is easier than as an adult, choosing the time to memorize, choosing a place, reading with a hum, using a printed version of the Koran, correcting the reading before memorizing, the process of connecting verses can strengthen memorization, repeating over and over again reading, memorizing regularly, memorizing slowly, concentrating on similar verses, establishing a relationship with the teacher, focusing on the writing of the verses, combining memorization with practice, repeating memorization, perfect understanding, strong motivation and finally surrender and pray Kamal, M. (2017).

The choice of time and place, according to these rules, shows that the environment and situation when memorizing have an important role in shaping the quality of memorization. Memorizing by humming and reading with feeling emphasize emotional elements that can strengthen memory. The process of connecting verses and repeating readings emphasizes the importance of repetition as a strategy to strengthen and deepen memorization. In addition, concentration on similar verses and perfect understanding highlight aspects of deep understanding and analysis of the contents of the Qur'an. The process of memorizing the Qur'an does not only involve the memorization function, but also involves understanding, reflection and application of the teachings of the Qur'an in life Kamal, M. (2017).

This brings us to the question of whether memorization has an impact on cognitive abilities. A systematic review involves scientific methods to collect, analyze, and interpret data relevant to the question. This review may provide deeper insight into whether memorization does have a positive or negative impact on cognitive abilities, as well as factors that may moderate the relationship. Therefore, it is hoped that the systematic approach in this review can provide a more holistic understanding regarding the influence of memorization on improving cognitive function. The goal of the research titled is to systematically evaluate and synthesize existing studies to determine the impact of memory training interventions on various aspects of cognitive function. This includes assessing how memory training may enhance skills such as attention, processing speed, working memory, and overall cognitive performance. By identifying patterns, strengths, and limitations in the current literature, the study aims to provide insights into the effectiveness of memory training programs and guide future research and practical applications in cognitive enhancement.

## **METHOD**

Articles used in systematic reviews are typically sourced from various academic databases such as PubMed, PsycINFO, Scopus, and Google Scholar. These include studies published in peer-reviewed journals. The keywords used for searching may include phrases like "memory training," "cognitive function," "cognitive enhancement," "working memory," and other related terms. This combination of keywords helps filter relevant articles. For instance, in this review, there might be 150 articles identified through the initial search. After a selection process based on inclusion and exclusion criteria, approximately 30 articles are chosen for further analysis. The articles included in the systematic review are examined systematically, following the PRISMA 2020 guidelines: Study Identification, Study Selection, Data Extraction, Analysis and Synthesis Analyzing the results from the selected studies and compiling conclusions based on the available evidence Mundada, P. H., & Dadgal, R. (2022).

### **Search strategy**

This literature review aims to study the influence of practicing memorizing Al-Quran on cognitive function. This literature review identifies and evaluates studies related to the specific aims of this paper. This review was carried out through a narrative method with classification of the extracted data to answer the review topic; then, the review topic is selected, the scope of the discussion is defined, relevant literature is identified, and ends with the writing of the final manuscript. The final manuscript is prepared with a defined structure in mind, and additional references and illustrations can be added as needed. Overall, this method provides a systematic and comprehensive approach to constructing an informative and targeted literature review.

### **Literature Search and Selection Methods**

The literature search was carried out using three main databases, namely Science Direct, Semantic Scholar (473 hits) and Google Scholar (2300 hits). The search strategy used uses Boolean techniques with a combination of keywords, in the form of: "effect" AND "memory" AND "Al-Quran" AND "cognitive" and is based on the specified inclusion and exclusion criteria. The literature search was carried out using the last 5 years (2018-2023). Articles that met the criteria were then reviewed thoroughly after the titles and abstracts of selected studies were evaluated.

### **Study Selection**

The literature included in this research is literature that discusses the effect of memorizing Al-Quran on cognitive function. Relevant studies were searched through article bibliographies, with inclusion criteria including: Articles published from 2018-2023, in an English language journal. Implementing a working memory intervention approach. Article selection begins with identifying articles in the database using appropriate keywords, followed by eliminating duplicate articles. The authors reviewed the abstracts and titles to filter articles that met the criteria and then carried out a comprehensive review of the full texts of articles that met the inclusion criteria.

### **Data Extraction and Risk of Bias Assessment**

Data extraction is prepared using a data extraction form and processed using a Microsoft Excel spreadsheet which will be presented in table form. Data extracted included author's name, research location, year of publication, research design, study population, and intervention characteristics, measuring tools, and results (Table 1). Risk of bias assessment used The Cochrane Collaboration's tool to assess risk of bias for randomized controlled trials. Bias was assessed as ratings (high, low, or unclear) for individual elements of five domains (selection, performance, attrition, reporting, and other).

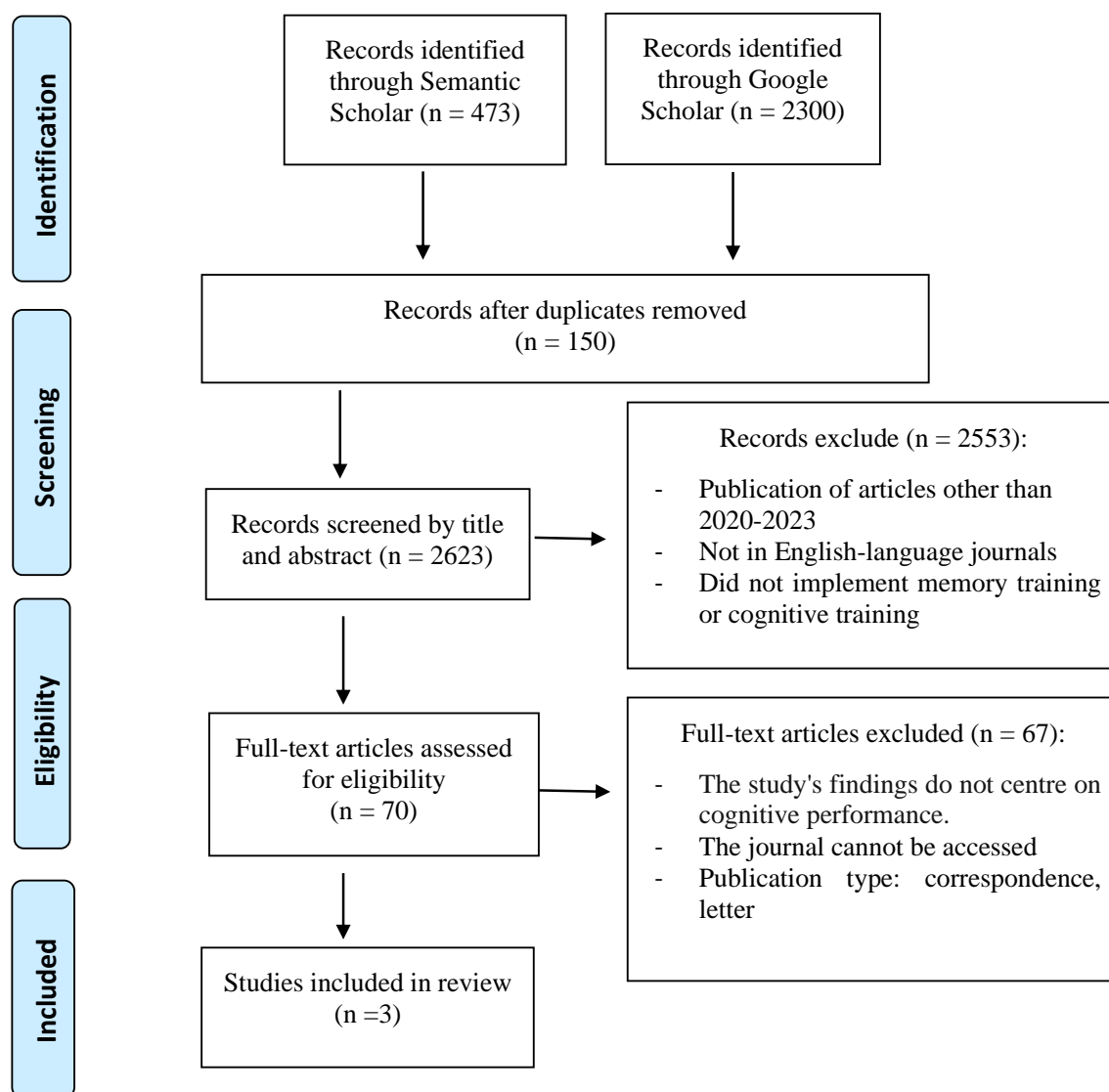


Figure 1. PRISMA flow diagram of literature searching

Table 1. Data Extraction from Literature

Author/Country/Year	Study design/Research population	Study Objectives	Measuring instrument	Study results
Che Wan Mohd Rozali WNA, Ishak I, Mat Ludin AF, Ibrahim FW, Abd Warif NM and Che Roos NA	Systematic Reviews Which includes observational studies, experimental studies, randomized controlled trials (RCTs), and quasi-	The aim of this study was to evaluate the impact of listening, reading, or memorizing the Al-Quran on physical and mental health through a systematic review of relevant literature.	<ul style="list-style-type: none"> <li>- Beck Depression Inventory-II (BDI-II)</li> <li>- Standard health questionnaire</li> <li>- Pittsburgh sleep quality index</li> <li>- Physiological parameters (eg, blood pressure, respiratory rate)</li> <li>- Spielberger's State-Trait Anxiety Inventory</li> </ul>	<p>The main finding of this research is that listening, reading, or memorizing Al-Quran has potential benefits for physical and mental health.</p> <p>These benefits include improving quality of life, reducing anxiety and depression, increasing memory capacity, and</p>

Author/Country/Year	Study design/Research population	Study Objectives	Measuring instrument	Study results
Publication year 2022.	experimental studies.	This research also aims to provide evidence about the potential benefits of Al-Quran activities in improving quality of life, reducing anxiety and depression, increasing memory capacity, and having a positive impact on physiological parameters and intellectual intelligence.	<ul style="list-style-type: none"> <li>(STAI)</li> <li>- Depression, anxiety, and stress score (DASS)</li> <li>- World Health Organization Quality of Life (WHOQoL) questionnaire</li> <li>- Wechsler Memory Scale III</li> <li>- Magnetic resonance imaging (MRI)</li> <li>- Electroencephalogram (EEG)</li> <li>- European Organization for Research and Treatment of Cancer C30 Scale Quality of Life Questionnaire (EORTC C30 Scale QLQ)</li> <li>- Short Form-36 Quality of Life Questionnaire (SF-36)</li> <li>- Wechsler Abbreviated Scale of Intelligence II (WASI II)</li> </ul>	<p>having a positive impact on physiological parameters and intelligence quotient.</p> <p>This study shows that these Al-Quran activities can serve as a useful intervention to improve physical and mental health.</p>
Ali Sheikhani, Hadi Akbari, Ali Motie Nasrabadi, Mohammad Reza Mohammad, and Majid Ghoshuni The research was conducted in Tehran and Mashhad, Iran Publication year 2021.	<p>This research uses a comparative design.</p> <p>Two groups were compared: memorizers of Al-Quran and non-memorizers.</p> <p>The study population consisted of 30 volunteers with an average age of 23.5 years, memorized the Koran with an IQ above 80 and no history of neurological disease or drug use.</p> <p>This study uses graph theory and competitive</p>	<p>This study aims to evaluate the impact of memorizing the Al-Quran on Event-Related Potential (ERP).</p>	<p>EEG signals were recorded using a Mitsar-202 recorder with WinEEG software.</p> <p>Signals were recorded according to a standard 10-20 system, with two AgCl electrodes placed on the ear as a reference.</p> <p>Impedance in all channels was below 5Ω during recording, and the band-pass filter was set to DC-70 Hz.</p> <p>To obtain the graph parameters, neural gas (NG) and growing neural gas (GNG) networks are trained using the extracted features, and the network weight matrix is used to calculate the parameters on the graph.</p>	<p>The main finding of this study is that memorizing Al-Quran has a significant impact on brain electrical activity, as evidenced by changes in ERP signals.</p> <p>This study compared two groups, Al-Quran memorizers and non-memorizers, and analyzed the structural differences in features extracted from ERP signals using graph theory and competitive networks.</p> <p>The analysis revealed differences in frequency components, power ratios, and optimal channels between the two groups, indicating that memorizing the Koran affects the brain's electrical activity.</p>

Author/Country/Year	Study design/Research population	Study Objectives	Measuring instrument	Study results
	networks to analyze the structural differences in ERP signals between the two groups.			These findings indicate that memorizing Al-Quran can be used as a protocol to increase brain activity, especially for relaxation. However, it is important to note that this study has limitations, such as a small sample size, and further research with a larger database is needed.
Yuni Valentri L. Tobing, Elman Boy, Ahmad Shidqi Mukhtasor, Aminullah Furqoni	<i>Literature review</i> Conducted using PubMed and Google Scholar limited to 2010-2020. The keywords used in the article search were elderly, reading the Koran, and cognitive function. Results: Reading Al-Quran has a significant influence on the cognitive function of the elderly.	The research aims to determine the effect of reading Al-Quran on cognitive function in the elderly. Research population aged 60 years and over, with the indicator of reading the Koran regularly every day.	Cognitive function was assessed using the Mini-Mental State Examination (MMSE)	From several studies collected, it was concluded that the longer the duration (>15 minutes) and the more regularly elderly people read Al-Quran, the better their cognitive function will be.
Prasetya Utama, Mohammad Fakhri	Cross-sectional study The subjects of this research were the entire Ibnu Masykur alimatussa'diyah Al-Qur'an Islamic Boarding School in Central Lombok, classes VII, VIII and IX, both male and female, totaling 106 people.	This research aims to determine the effect of the intensity of memorizing the Al-Qur'an on the level of academic stress and academic achievement of students.	The academic stress questionnaire was adapted from the Educational Stress Scale for Adolescents (ESSA), while the Al-Qur'an Memorization Intensity, motivation and academic achievement questionnaires were designed independently.	(1) There is a significant influence of the intensity of memorizing Al-Quran on academic stress. (2) There is a significant negative effect of the intensity of memorizing the Qur'an on academic achievement. (3) There is a negative but not significant effect of Academic Stress on Academic Achievement. (4) There is a positive but not significant effect of motivation on academic achievement.

Author/Country/Year	Study design/Research population	Study Objectives	Measuring instrument	Study results
Sri Slamet  This research was conducted at the Mardisiwi Islamic Kindergarten in Surakarta, Indonesia.  Publication Year 2019.	Quantitative Study.  The population is a group of students in Kindergarten.  Ten group students were selected as samples using saturated sampling techniques.	This research aims to find out whether memorizing the Al-Quran (tahfidz Koran) affects cognitive intelligence in kindergarten students.	Data was collected through tests, observation, documentation and interviews. Kindergarten students should memorize Surah Al Insyirah using the Tasalsuli method.  Observation of cognitive intelligence results measured before (pre-treatment) and after treatment (post-treatment). The research results show that the procedure for memorizing the Al-Quran increases children's cognitive intelligence.	Research concludes that Al-Quran in kindergarten can positively improve children's cognitive intelligence

## RESULT

A literature search was carried out using keywords as in chart 1. After screening, articles were found that met the author's desired criteria, namely the effect of memory training interventions; memorization of cognitive function, so that literature analysis was carried out on 5 pieces of literature that met the criteria. The findings from these five literature studies cumulatively imply that activities involving the Al-Quran, such as listening, reading, or memorizing, have a positive impact on various aspects of physical and mental health, cognitive function, and brain responses. Systematic studies by Che Wan Mohd Rozali and colleagues show that participation in Quranic activities can provide significant benefits to the physical and mental health of Muslims, including improved quality of life, reduced levels of anxiety and depression, and increased memory capacity. The findings of the study by Ali Sheikhani and his team, which analyzed the impact of memorizing the Al-Quran on Event-Related Potential (ERP), showed that memorizing the Al-Quran affects the electrical activity of the brain with significant changes in ERP signals. The structural analysis highlights the differences between the memorizer and non-memorizer groups, indicating that memorizing the Quran can be used as a protocol to increase brain activity, especially in the context of relaxation.

A literature study by Yuni Valentri L. Tobing and colleagues concluded that reading the Al-Quran has a positive influence on the cognitive function of the elderly. From this research, it was revealed that the longer and more regularly elderly people read the Koran, the better their cognitive function will be. These findings provide additional support for the benefits of reading the Koran in supporting cognitive health in the elderly group. Together, research by Prasetya Utama and Mohammad Fakhri at the Ibnu Masykur alimatussa'diyah Islamic Boarding School shows that the intensity of memorizing the Al-Quran is related to the level of academic stress and academic achievement of the students. The intensity of memorizing the Al-Quran has a significant influence on academic stress, while academic achievement shows an insignificant negative influence. Lastly, a quantitative study by Sri Slamet at the Mardisiwi Islamic Kindergarten in Surakarta highlighted that the procedure of memorizing the Al-Quran can improve children's cognitive intelligence at the kindergarten level. These results illustrate that memorizing the Al-Quran at the initial level of education can make a

positive contribution to children's cognitive development. Overall, the findings from these five studies provide important insights into the relationship between Quranic activities and mental health, physical well-being, and cognitive function.

## **DISCUSSION**

The aim of this review is to systematically examine the effect of memorization interventions on cognitive function. The findings of the 5 studies above contribute to the understanding of the potential of memory training interventions, particularly in the context of memorization, as a means of improving cognitive function in each of these age groups. The implications of these results may stimulate further research in the field of cognitive interventions, as well as provide a more in-depth look at the role of memorization in the development of cognitive abilities at critical developmental stages. The improvements in cognitive function observed in the group following the memory training intervention suggest that this method has significant potential to improve cognitive capacity. These results illustrate that memory training, particularly with a focus on memorization, can have a positive impact on several important aspects of cognitive function, including working memory, information processing, and problem-solving abilities. First, improving memory indicates that memory training can stimulate an increase in the brain's ability to store and access information more efficiently. Second, improvements in information processing suggest that memory training may contribute to increasing the speed and accuracy of the brain in processing sensory input. This ability is important in dealing with complex tasks that require rapid analysis and response. Third, increased problem-solving abilities indicate that memory training can improve the brain's ability to respond to and overcome cognitive challenges. This has positive implications for an individual's ability to solve problems and deal with situations that require cognitive adaptation.

The improvements in cognitive function seen in the group undergoing the memory training intervention indicate that this method has significant potential to improve an individual's cognitive capacity. The focus on memorization as part of memory training suggests that the memory aspect can benefit substantially, where individuals can hone their ability to store and access information more effectively. However, further research to better understand the mechanisms and long-term effects of religious activities, such as reading or memorizing the Koran, on mental health and cognitive function, especially in the pre-elderly or elderly, is still very limited. Further research could explore individual variability in response to religious activities, explore effects in different age groups, as well as examine potential applications in mental health interventions. With a deeper understanding, more targeted and effective intervention strategies can be developed to improve community welfare.

The review identified a range of studies that employed diverse methodologies, highlighting the complexity of measuring cognitive outcomes. Various forms of memory training, including mnemonic strategies, computer-based training, and group activities, were evaluated for their effectiveness. A majority of the studies demonstrated positive outcomes, indicating that memory training can significantly enhance aspects of cognitive function such as working memory, attention, and processing speed. However, the review also revealed several limitations within the current research landscape. Many studies had small sample sizes and varied duration and intensity of training programs, which complicates the generalizability of the findings. Additionally, there is a notable lack of longitudinal studies that assess the long-term benefits of memory training, which is critical for understanding its sustained impact on cognitive function. Despite these limitations, the implications of the findings are promising. Memory training could serve as a viable intervention to mitigate cognitive decline, especially

in aging populations. Future research should focus on standardizing training protocols and incorporating larger, more diverse sample populations to enhance the robustness of the evidence. In conclusion, this systematic review underscores the potential of memory training as an effective strategy for improving cognitive function. Further investigation is necessary to fully elucidate its benefits and optimize intervention designs to maximize their effectiveness in various demographic groups.

## **CONCLUSION**

From the five studies reviewed, it can be concluded that memory training interventions, especially in the context of memorizing the Qur'an, contribute positively to the improvement of cognitive function in various age groups, including children, adolescents, adults, and the elderly. The implications of these findings give impetus to further research in the field of cognitive intervention, focusing on memorization strategies, as well as providing deeper insight into the role of memorization in the development of cognitive abilities at critical stages of life. The rules of memorization of the Qur'an offer insight into how the process of memorization can affect memory and cognitive. The choice of time, place, and emotional aspects such as reading with humming play an important role in the quality of memorization.

## **REFERENCES**

- Acevedo, A., & Loewenstein, D. A. (2007). Nonpharmacological cognitive interventions in aging and dementia. *Journal of Geriatric Psychiatry and Neurology*, 20(4), 239–249.
- Acim, S. A. (2022). *Methods for learning and memorizing the Al-Quran* (1st ed.; F. Sugiarto & M. N. Janhari, Eds.). Bantul: Word Farm Institute.
- Al Rasyid, I., Syafrita, Y., & Sastri, S. (2017). Relationship between risk factors and cognitive function in the elderly, Padang Panjang Timur District, Padang Panjang City. *J Andalas Health*, 6(1), 49. <https://doi.org/10.25077/jka.v6i1.643>
- Al-Dausary, M. (2020). *Memorizing the Koran: Adab and law* (1st ed.; M. I. Zainuddin, Ed.). Jakarta: [Publisher information needed].
- Alzheimer's Association. (2014). 2014 Alzheimer's disease facts and figures. *Alzheimer's & Dementia*, 10(2), e47–e92. <https://doi.org/10.1016/j.jalz.2014.02.001>
- Crawford, J. R., Stewart, L. E., & Moore, J. W. (1989). Demonstration of savings on the AVLT and development of a parallel form. *Journal of Clinical and Experimental Neuropsychology*, 11(6), 975–981.
- Dhari, I. F. W., & Zaidah, L. (2022). Identification of dementia risk factors in the pre-elderly and elderly in the public health center (Puskesmas) of Sleman District. *Medical Science Digest*, 13(3), 805–810.
- Diba, I. F., & Muhid, A. (2022). Cognitive processes in memorizing the Koran. *Journal of Islamic Educator*, 11(1), 32–43.
- Fairuzillah, M. N., & Listiana, A. (2021). The positive impact of memorizing the Qur'an on cognitive intelligence of children. *Advances in Social Science, Education and Humanities Research*. Available from: <https://api.semanticscholar.org/CorpusID:233699324>
- Fälth, L., & Brkovic, I. (2021). Intervention targeting reading and working memory among struggling readers in primary school. *Medical Research Archives*. Available from: <https://api.semanticscholar.org/CorpusID:245089406>

- Gross, A. L., & Rebok, G. W. (2011). Memory training and strategy use in older adults: Results from the ACTIVE study. *Psychology and Aging, 26*(3), 503–517.
- Gross, A. L., Parisi, J. M., Spira, A. P., Kueider, A. M., Ko, J. Y., Saczynski, J. S., Samus, Q. M., & Rebok, G. W. (2012). Memory training interventions for older adults: A meta-analysis. *Aging & Mental Health, 16*(6), 722–734.
- Hertzog, C., Kramer, A. F., Wilson, R. S., & Lindenberger, U. (2008). Enrichment effects on adult cognitive development: Can the functional capacity of older adults be preserved and enhanced? *Psychological Science in the Public Interest, 9*(1), 1–65.
- Irsyad, M., & Qomariah, N. (2017). Strategies for memorizing the Qur'an from an early age. *Proceedings of the International Conference on Education (Vol. 2, pp. 135–148)*. <http://ejournal.uinsuka.ac.id/tarbiyah/conference/index.php/aciece/aciece2>
- Julianto, V., & Etssem, M. B. (2011). The effect of reciting the Holy Qur'an on short-term memory ability analyzed through changing brain waves. *Journal of Neuroscience and Cognitive Research, 38*(June).
- Kamal, M. (2017). The effect of implementing the Qur'an memorization program on student learning achievement.
- Mahncke, H. W., Bronstone, A., & Merzenich, M. M. (2006). Memory enhancement in healthy older adults using a brain plasticity-based training program: A randomized, controlled study. *Proceedings of the National Academy of Sciences, 103*(21), 12523–12528.
- Mao, H. F., Tsai, A. Y. J., Chang, L. H., & Tsai, I. L. (2021). Multi-component cognitive intervention for older adults with mixed cognitive levels: Implementation and preliminary effectiveness in real-world settings. *BMC Geriatrics, 21*(1), 543.
- Mirjalili, M., Zomorodi, R., Daskalakis, Z. J., Hill, S. L., Kumar, S., Blumberger, D. M., et al. (2022). Cognitive control, interference inhibition, and ordering of information during working memory in younger and older healthy adults. *GeroScience, 44*(4), 2291–2303.
- Mundada, P. H., & Dadgal, R. (2022). Comparison of dual task training versus aerobics training in improving cognition in a healthy elderly population. *Cureus [Internet]*. Available from: <https://api.semanticscholar.org/CorpusID:252205790>
- Oktapiani, M. (2020). Level of spiritual intelligence and ability to memorize the Qur'an. Jakarta: [Publisher information needed].
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*.
- Parwoko, N. A., Rasjad, A. S., & Alie, I. R. (2021). Proceedings of short-term memory medicine in adolescents in public schools and Tahfidz Al Qur'an schools.
- Rebok, G. W., Carlson, M. C., & Langbaum, J. B. S. (2007). Training and maintaining memory abilities in healthy older adults: Traditional and novel approaches. *Journal of Gerontology: Psychological Sciences, 62B*(1), 53–61.
- Robbani, A. S. (2021). Memorizing the Qur'an: Methods, problems, and solutions while learning Arabic [Internet]. Available from: [www.mujaahidpress.com](http://www.mujaahidpress.com)
- Rozali, W. N. A. C. W. M., Ishak, I., Ludin, A. F. M., Ibrahim, F. W., Warif, N. M. A., & Roos, N. A. C. (2022). The impact of listening to, reciting, or memorizing the Qur'an on physical and mental health of Muslims: Evidence from systematic review. *International*

- Journal of Public Health, 67. Available from: <https://api.semanticscholar.org/CorpusID:251935117>
- Salthouse, T. A., & Tucker-Drob, E. M. (2008). Implications of short-term retest effects for the interpretation of longitudinal change. *Neuropsychology*, 22(6), 800–811.
- Savović, J. (2011). Introducing a revised tool for assessing risk of bias in randomized trials (RoB 2.0). *BMJ*, 343, d5928.
- Shin, M., Lee, A., Cho, A. Y., Son, M., & Kim, Y. H. (2020). Effects of process-based cognitive training on memory in healthy elderly and patients with mild cognitive impairment: A randomized controlled trial. *Korean Neuropsychiatric Association*, 17(8), 751–761.
- Spencer, J. P. (2020). The development of working memory. *Department of Health and Human Services*, 176(3), 139–148.
- Sur, S., & Sinha, V. K. (2009). Event-related potential: An overview. *Indian Psychiatry Journal*, 18(2), 107–112.
- Tsai, K. C., Nunes, T., & Barros, R. (2021). The effectiveness of an intervention program on working memory plus arithmetic knowledge (WM+A). *Journal of China-ASEAN Studies*. Available from: <https://api.semanticscholar.org/CorpusID:237273862>
- Verhaeghen, P., Marcoen, A., & Goossens, L. (1992). Improving memory performance in the elderly through mnemonic training: A meta-analytic study. *Psychology and Aging*, 7(2), 242–251.
- Wandini, R. R., Dammanik, E. S., Daulay, S. H., & Iskandar, W. (2020). Takrir method as a prototype and application in memorizing the Al-Qur'an for elementary age children at the Medan Islamic Center. *Journal of Islamic Education*, 4(1).
- Willis, S. L., Tennstedt, S. L., Marsiske, M., Ball, K., Elias, J., Koepke, K. M., Morris, J. N., Rebok, G. W., Unverzagt, F. W., Stoddard, A. M., & Wright, E. (2006). Long-term effects of cognitive training on everyday functional outcomes in older adults. *Journal of the American Medical Association*, 296(23), 2805–2814.
- Xu, J., Deng, M., Nan, W., & Cai, D. (2021). The effects of working memory training in children revealed by behavioral responses and ERP. *Brain and Behavior*, 11(8), e02037.
- Yunita, J., Nurlisa, N., & Sari, W. (2019). Determinants of the quality of life among pre-elderly and elderly population. *International Journal of Public Health Science*, 8(3), 340–344.
- Zulsita, A. (2010). Cognitive features of the elderly at H. Adam Malik Hospital Medan and Petisah Health Center Medan. Retrieved June 19, 2014, from <http://repository.usu.ac.id/bitstream/123456789/21571/7/.pdf>