REVIEW ARTICLE

The Impact of Qur'anic Reading and Listening Duration and Frequency on Cognitive Performance and Hippocampal Function: A Systematic Review

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ABSTRACT

Engaging with the Qur'an, whether through reading or listening, necessitates complex cognitive processing of the written or spoken Arabic language. This activity demands concentration and attention, thereby engaging cognitive functions such as selective attention, Arabic language processing, and auditory perception. The purpose of this paper is to review the effects of reading and listening to the Qur'an on hippocampal cognitive function. A literature search was conducted using online databases: ScienceDirect, PubMed/ Medline, and Scopus. The keywords used in the literature search were "cognitive", "Qur'an", and "hippocampus". This approach included six full-length articles. A manual search of the cited references was also used to find additional considerations for the discursive analysis of each topic discussed in this review. As a sacred text, the Qur'an engages both reading and listening skills and involves cognitive processes that impact memory and comprehension. Regular engagement with the Qur'anic text and its recitation can significantly improve brain activity, memory, and cognitive development. Reading and listening are essential skills for language comprehension and communication. When a person reads the Qur'an, he or she engages in visual Arabic language processing, while when listening to its recitation, the person is involved in auditory language processing. These activities stimulate different parts of the brain, contributing to a more comprehensive understanding of the Qur'an text.

Keywords:
Qur'an, cognitive function, hippocampus, reading, listening, neuroplasticity.

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INTRODUCTION

The hippocampus is an important brain structure that supports not only memory functions but also broader cognitive domains, including executive function, working memory, processing speed, and information integration.[1–3] Optimal learning depends on the interplay of these functions, and hippocampal neurogenesis plays a significant role in both cognition and behaviour[4,5] Structurally, the hippocampus comprises several subfields that may be differentially sensitive to specific aspects of cognitive performance.[4]

Reading and listening represent two fundamental modalities of language comprehension. Although distinct, they share overlapping neural substrates that process semantic meaning. The temporal lobe contributes primarily to phonological awareness and comprehension, while the hippocampus underlies declarative memory and higher-order cognition.[1,3,5] Evidence suggests that listening and reading are linked to auditory processing and cognitive mechanisms. However, studies directly examining their relationship with hippocampal-dependent cognitive functions remain limited.[6] Moreover, cognitive and metacognitive strategies such as planning, monitoring, and attentional control are essential for enhancing comprehension in both modalities, particularly during language learning.[7]

Attention plays a particularly important role in listening comprehension, as auditory information unfolds rapidly and requires immediate processing. By contrast, reading comprehension benefits from extended exposure and the gradual construction of a situation model. These

differences indicate that reading and listening rely on overlapping but partly distinct cognitive processes, with attention being more critical for listening than for reading.[8,9]

Importantly, engagement with the Qur'an through reading, listening, and memorization has been associated with unique cognitive benefits. Studies show that older adults who regularly recite or memorize the Qur'an experience enhanced memory, attention, and overall cognitive performance, with potential protective effects against dementia.[10–12] Neurophysiological findings further support this, demonstrating increased theta-wave synchronization within temporal–hippocampal networks during Qur'an recitation and listening.[13,14] However, current research remains fragmented: different cognitive tools are applied across studies (e.g., MMSE vs. MoCA-Ina), outcomes are inconsistent, and critically, no study has directly assessed hippocampal morphology or function using neuroimaging techniques such as MRI volumetry.

Despite growing evidence that Qur'an engagement benefits cognition, existing studies rely mainly on indirect cognitive measures rather than direct assessments of hippocampal function. There is limited understanding of how reading and listening to the Qur'an, especially in terms of duration and frequency, differentially influence hippocampus-related cognitive functions. Furthermore, methodological inconsistencies across studies hinder the comparability of results, and the absence of neuroimaging data leaves underlying neural mechanisms largely unexplored.[2,10–15] To our knowledge, this is the first systematic review to synthesize and critically evaluate evidence on the effects of Qur'an reading and listening on hippocampal-dependent cognitive functions. By addressing both behavioural and neurophysiological findings, this review highlights Qur'an engagement as a culturally relevant cognitive intervention and identifies pathways for future studies to integrate standardized cognitive assessments and neuroimaging. This approach provides a novel foundation for understanding the role of Qur'an engagement in supporting cognitive resilience and healthy aging.

METHOD AND METHODS

Protocol and Reporting Framework

This review was conducted in accordance with the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P)* guidelines. The review process took place between October 1, 2024, and January 2025. Findings are reported following the PRISMA 2009 statement, ensuring transparency and reproducibility.

Eligibility Criteria

Inclusion criteria

Eligible studies were randomised controlled trials (RCTs), quasi-experimental studies, cohort studies, and cross-sectional studies that objectively measured cognitive or neurobiological outcomes. Specifically, studies evaluating the effects of Qur'an reading (*tilawah*) or listening (*sama'*) on hippocampus-related cognitive functions were included. Only studies published in English or Indonesian within the past 10–15 years were considered to ensure relevance to recent advances in neuroscience and religious research.

Exclusion criteria

Studies were excluded if they involved animal models, case reports, correspondence, review articles, editorials, or expert opinions.

PICO Framework

- **Population:** Adolescents and adults aged 18–65 years, with or without cognitive impairment.
- **Intervention/Exposure:** Reading (*tilawah*) or listening (*sama'*) to the Qur'an.
- **Comparison:** No exposure to Qur'anic recitation, or exposure to alternative auditory stimuli (e.g., music, non-religious texts).
- **Outcome:** Changes in hippocampus-related cognitive functions (e.g., memory, executive function, processing speed, neurophysiological measures).

Search Strategy

A systematic search was performed in PubMed/ MEDLINE, Scopus, and Science Direct. Boolean operators (AND/OR) were applied to refine results. Reference lists of eligible studies were also screened to identify additional relevant publications. Search string for Pubmed/MEDLINE database: ("Quran"[MeSH Terms] OR "Qur'an"[Title/Abstract] OR "Koran "[Title/Abstract]) AND ("Cognition"[MeSH Terms] OR "Cognitive Function "[Title/Abstract] OR "Memory" [Title/Abstract] OR "Executive Function" [Title/Abstract]) AND ("Hippocampus "[MeSH Terms] OR "Hippocampal"[Title/Abstract]). Scopus database: (TITLE-ABS-KEY (qur'an OR quran OR koran) AND TITLE-ABS-KEY (cognit* OR memory OR "executive function") AND TITLE-ABS-KEY (hippocampus OR hippocampal)) AND PUBYEAR >2008 AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Indonesian")). Science Direct database: ("Qur'an" OR "Quran") in Title, Abstract, or Keywords; AND ("cognit*" OR "memory") in Title, Abstract, or Keywords; AND ("hippocampus") in Title, Abstract, or Keywords. Filters applied: Publication years 2009-2024; Article type: Research articles.

Study Selection

Three reviewers (UR, STP, LAF) independently screened studies in three phases: title screening, abstract screening, and full text screening. Discrepancies were resolved through discussion, and unresolved disagreements were referred to an additional reviewer. A PRISMA flow diagram was used to document the selection process, including reasons for exclusion.

Data Extraction

A standardised data extraction form (Microsoft Excel) was developed prior to the review. Extracted information included: study characteristics (author, year, country, design), participant characteristics (age, sample size, health status), intervention details (reading or listening modality, duration, frequency), comparator details, cognitive or neurobiological outcome measures, and main findings. Data were independently extracted by the reviewers and cross-checked for accuracy.

Data Synthesis

Given the expected heterogeneity of study designs and outcomes, a narrative synthesis was performed. Findings were summarised according to type of exposure (reading vs. listening), duration and frequency of exposure, and cognitive outcomes related to hippocampal function.

RESULT

Study Selection

The search identified 85 unique studies. After excluding duplicates, 59 abstracts were screened. Only 33 articles were assessed for eligibility. Of the 12 studies, nine were experimental, two were observational, and one was a brain wave study. Full details on the included studies are in **Figure 1**.

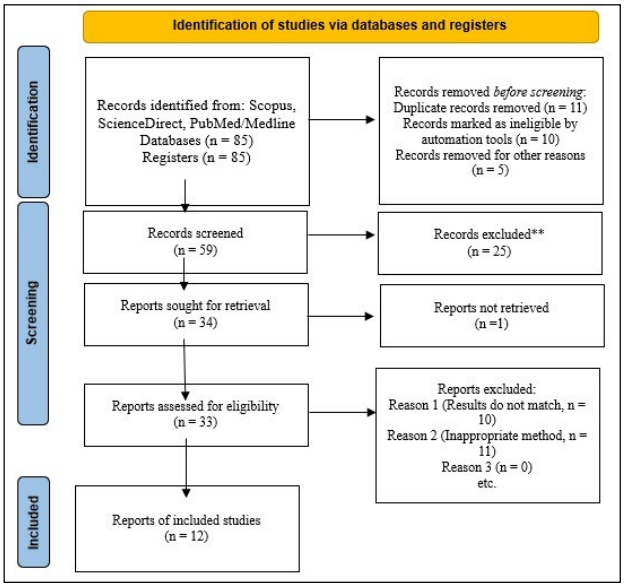

Figure 1. Figure 1: PRISMA flow chart of the inclusion process

Our analysis of the twelve included studies indicated that the majority demonstrated positive effects of Qur'anic reading or listening on various cognitive domains. Several cross-sectional studies and quasi-experimental designs demonstrated significant improvements in MMSE or MoCA-Ina scores, indicating enhanced memory and overall cognitive performance.[10,11,16]

EEG-based studies showed increased brain wave activity

Table 1. Reading and listening to the Qur'an on cognitive

No	Author (Year)	Study design	Participants	Assessment Tool	Key Findings	Ref
1	Irawati (2019)	Cross-sectional.	96	MMSE	The duration of reading the Koran affects cognitive	10
2	Nurfiani (2018)	Quasi Experiment	50	MMSE, MoCA-Ina	There is a relationship between reading the Qur'an and improving memory	11
3	Julianto (2011)	Brain waves	4	EEG	Significant increase in brain wave activity after reading the Qur'an, which has the potential to improve short-term memory abilities	12
4	Choirunnisa (2020)	Quantitative	39	Instrument	Reading the Qur'an improves cognitive	20
5	Indrijaningrum (2020)	Case-control	34	MoCA-Ina	The duration and frequency of reading the Qur'an have no relationship with cognitive	13
6	Samhani (2022)	Experiment	28	EEG	Surah Al-Fatihah (Qur'an) improves memory	15
7	Slamet (2019)	Experiment	10	Pre-post treatment	The cognitive intelligence score of children was 25.40 after the treatment	17
8	Sirin (2021)	Quantitative	33	Instrument	Significant difference in verbal learning, visual learning, attention speed, and phonemic and semantic fluency before and after memorisation training	19
9	Faqihuddin (2024)	Mixed-Methods	50	In-depth interviews	The tradition of Qur'an memorization remains strong in Muslim families and is increasingly applied to early childhood	21
10	Munawaroh (2023)	Quasi Experiment	22	Instrument MMSE	Increased scores for the word-list recall test. No significant improvement in CG. However, there was an improvement in the HQ group, represented by a significantly higher score after the treatment.	16
11	Muthohharoh (2023)	Qualitative Study	30	Children memorise the Qur'an and compare the contribution of each systemic cognitivist modelling (SCM) indicator to their average ability	The children's memorisation ability was quite good	18
12	Hussain (2021)	Experiment	50	listened to Qur'an recitation	A significant increase in working memory performance among participants in the experimental group	22

following Qur'an reading or listening, potentially strengthening short-term memory.[12,15] Research involving children reported good memorisation abilities and improved cognitive intelligence scores after memorisation training.[17,18] Interventions involving listening to the Qur'an demonstrated significant improvements in working memory among participants in the intervention group.[23] Similar findings were reported by Sirin, with improvements in verbal learning, visual learning, attention speed, and both phonemic and semantic fluency.[19]

However, one study found no significant association between the duration/frequency of Qur'anic reading and cognitive function (p= 0.089).[13] This variation in findings may be attributed to differences in study design, intervention duration, measurement tools, and participant characteristics. Overall, these findings support the hypothesis that reading and listening to the Qur'an can provide neurocognitive benefits, particularly in memory, attention, and executive functions involving the hippocampus.

Effects on Cognitive Functioning Based on Psychometric Assessments (MMSE/MoCA)

There were mixed findings from studies using cognitive screening tools. Two studies reported a significant positive association. A cross-sectional study by Irawati found that the duration of reciting the Qur'an significantly affected cognitive function in the elderly (p=0.001).[10] Similarly, a study by Nurfiani showed an association between reading the Qur'an and improved memory function as measured by MMSE and MoCA-Ina (p=0.000).[11] In contrast, a case-control study by Indrijaningrum found no significant relationship between the duration and frequency of reading the Qur'an and cognitive function measured using MoCA-Ina (p=0.089).[13]

Effects on Brain Activity and Memory (EEG)

Studies using neurophysiological measurements consistently show positive effects. Julianto reported a significant increase in brainwave activity after reciting the Qur'an, potentially improving short-term memory ability

($p<0.05$).[12] In parallel, an experimental study by Samhani found that listening to *Surah Al-Fatihah* also significantly improved memory, as evidenced by EEG data ($p<0.050$).[15] These findings provide objective evidence of changes in brain activity associated with memory improvement, both through reading and listening modalities

Other Effects

One experimental study by Slamet focusing on a paediatric population showed that Qur'anic memorisation interventions can improve cognitive intelligence scores.[15]

DISCUSSION

This systematic review synthesizes evidence from twelve studies investigating the relationship between Qur'anic engagement (reading and listening) and hippocampus-related cognitive functions. While the majority of included studies reported positive effects, a critical appraisal reveals a landscape of evidence that is promising yet preliminary. The significant heterogeneity in study designs, ranging from cross-sectional surveys in elderly populations to small EEG experiments in young adults, precludes definitive conclusions and highlights the need for cautious interpretation. Furthermore, the overreliance on psychometric screening tools like the MMSE, which may lack sensitivity to subtle hippocampal-dependent changes, and the scarcity of direct neuroimaging data, limit the depth of our current understanding. The central challenge, therefore, is to reconcile these varied findings by integrating them with established neuroscience to propose plausible mechanistic pathways.

Cognitive and Hippocampus

The hippocampus is a critical brain structure that undergoes several structural changes, both grossly and at the cellular level, with age. These changes have been correlated with cognitive decline in older adults. In non-demented older individuals, regional hippocampal morphology is associated with specific memory abilities and broader cognitive domains[2]. It is also involved in general information processing, including spatial information processing, temporal sequencing, and formulating relationships between objects in the environment.[3] The hippocampus is an important structure in cognitive aging, playing a role in episodic memory and broader cognitive domains.[1] The hippocampus undergoes several structural changes both grossly and at the cellular level with age, and these have been correlated with cognitive decline in older adults. In non-demented older individuals, regional hippocampal morphology is associated with specific memory abilities and broader cognitive domains.[2] The hippocampus is also involved in creating and storing representations of the physical environment, but it also plays a role in many other aspects of memory. The view that the human hippocampus acts primarily to create and store representations of the physical environment should be interpreted in the context of the abundant evidence showing that the human hippocampus plays a role in many other aspects of memory.[2,5,23,24]

The hippocampus plays an important role in supporting spatial navigation and memory. It performs these functions through Cognitive Mapping, where it is responsible for creating and maintaining mental representations of the physical environment. These maps allow us to navigate and remember spatial information, such as the location of objects or landmarks.[25,26] The hippocampus organises spatial information relationally, which helps us understand the relationship between objects and locations, thereby forming accurate and detailed spatial memory. This structure also enables cognitive map flexibility, allowing us to update and adapt our spatial representations based on new information or changes in the environment. This flexibility is important for efficient navigation and memory formation.[26] The hippocampus interacts with other memory systems, such as the dorsal striatum, to support spatial navigation. These interactions contribute to various navigation scenarios and allow for the integration of different types of memory, including spatial and episodic memory.[25] Spatial navigation training has been shown to protect the hippocampus from age-related changes. Studies have found that hippocampal volume decreases with age, but spatial navigation training can help mitigate these changes and preserve cognitive function.[27]

Cognitive, Listening, and Hippocampus Mechanism

The hippocampus supports cognitive processes by forming and comparing relational memory representations. This mechanism allows for the integration of different types of information, including visual and auditory inputs, from specialised cortical regions. It enables the hippocampus to combine disparate inputs and contribute to perception and online processing.[28] This type of memory is essential for cognitive listening as it allows individuals to retain and retrieve information they have heard. The interplay between the hippocampus and other brain regions, such as the prefrontal cortex, is crucial for memory consolidation.[25] Coordinated replay between the hippocampus and neocortical areas is believed to be a key mechanism in consolidating memories,[2] which helps in the long-term retention of information obtained through cognitive listening. While the traditional view of the hippocampus is that it creates a mental map of physical space, recent research suggests that it may also play a role in mapping social space.[5] This cognitive mapping function can contribute to understanding and navigating social interactions, which are essential aspects of cognitive listening in social contexts. The hippocampus is involved in general information processing, including spatial information processing, temporal sequencing, and formulating relationships between objects in the environment.[3] These cognitive processes are relevant to cognitive listening as they contribute to comprehending and interpreting auditory information.

Cognitive listening refers to actively and attentively engaging with auditory information, such as speech or music, to understand and interpret its meaning. It involves various cognitive processes, including attention, perception, memory, and comprehension. The hippocampus, a brain structure located in the medial temporal lobe, is related to mental listening through its involvement in several cognitive functions; the hippocampus plays a critical role in encoding and retrieving memories, including verbal and auditory information.[2,25] It helps form new memories of what has been heard during cognitive listening and retrieve those memories when needed. Declarative memory, which involves recalling facts and events, is supported by the hippocampus.[5] The hippocampus is involved in relational processing, which refers to the ability to understand and integrate relationships between different elements of information.[28]

This is relevant to cognitive listening as it enables the comprehension and interpretation of auditory information by connecting and organising different pieces of information. While traditionally associated with creating cognitive maps for physical space, recent research suggests that the hippocampus may also play a role in mapping social space.[5] This cognitive mapping function can contribute to understanding and navigating social interactions, which are essential aspects of cognitive listening in social contexts.

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Listening comprehension plays a prominent role in reading comprehension.[5] Evidence has shown that oral language comprehension is important for reading comprehension across different languages.[5] Regarding cognitive skills, vocabulary, and word reading fluency are shared contributors to reading and listening comprehension.[29] A study compared the brain activation patterns associated with comprehending written and spoken sentences in Portuguese. The results showed modality effects and individual differences in language comprehension.[12] Regarding the reading versus listening debate, a neuroscientist explains that both reading and listening have brain benefits in common. In both situations, the brain is working to connect the puzzle pieces, making sense of the plot and attempting to predict what will happen next.

Research suggests that listening and reading activate almost identical brain activity and that the brain's representation of meaning does not depend on which

sense acquires the words that convey it. Both reading and listening comprehension share some cognitive components, such as language comprehension and decoding.[29,30] However, they also have some differences. For example, reading requires the decoding of text, while listening does not.[30] The cognitive process involves constructing meaning from text and requires skills such as attention, visual discrimination, sequential processing, immediate memory, and working memory. These skills must be automatic for successful reading; many struggling readers lack these skills. Some common cognitive biases that can impact listening include confirmation bias, anchoring bias, availability bias, hindsight bias, and overconfidence bias.[31] To overcome these biases, individuals can actively seek additional information, consider alternative perspectives, and seek feedback from others.[29]

Reading and listening to the Qur'an can have cognitive benefits and enhance cognitive abilities. Memorising the Qur'an, in particular, is believed to develop several cognitive skills, strengthening an individual's aptitude.[8] However, the specific cognitive benefits of reading the Qur'an have yet to be extensively studied. Reading the Qur'an involves cognitive skills such as attention, visual discrimination, sequential processing, immediate memory, and working memory.[32] These skills are essential for successful reading and comprehension. The cognitive benefits of reading Al-Qur'an may extend beyond the development of basic cognitive skills. For many individuals, reading and reciting the Qur'an has spiritual and psycho-spiritual significance. The Qur'an is considered sacred, and its recitation is often associated with religious devotion and spiritual growth.[32]

Reading and listening to Al-Qur'an can have potential cognitive benefits, particularly for seniors. Here are some points related to reading, listening to the Al-Qur'an, and cognitive function: A review of the literature suggests that listening to Al-Qur'an has potential as a psycho-spiritual therapy and may have positive effects on cognitive function.[8]

Evidence suggests that oral language comprehension is essential for reading comprehension, and the two are closely related.[29,31,33] This relationship may be particularly relevant for seniors who may experience declines in cognitive function. Online resources are available for learning to read and listen to Al-Qur'an, including one-to-one classes and websites that offer reading and listening practice. Reading and listening to Al-Qur'an requires cognitive skills such as attention, memory, and visual processing.[29] Some studies suggest that reading, listening, and memorizing Al-Qur'an may stimulate the brain's nerves and positively impact cognitive function.[34]

The Qur'an possesses a unique harmony that other sentences do not have. The verses in the Qur'an contain words full of goodness so that they have a positive effect and give peace.[35] When listening to the recitation of the Qur'an, a series of sound waves from the Qur'an that reaches the brain will positively affect the responsiveness of its cells. Following the nature of Allah SWT, the brain will respond in the right direction.

Towards a Mechanistic Understanding: Potential Pathways

Based on the synthesized findings and established neuroscience, we propose several non-mutually exclusive hypotheses for how Qur'anic reading and listening might influence hippocampal function:

1. Auditory Entrainment and Theta Synchronisation: As discussed above, the rhythmic and melodic nature of Qur'anic recitation may serve as an auditory driver for cortical and hippocampal theta rhythms. This entrainment could optimise the brain's internal state for learning and memory consolidation, a mechanism similar to that proposed for certain types of music therapy.
2. Modulation of Neurotrophic Factors: Regular cognitive engagement, particularly complex tasks like memorising a foreign language (Classical Arabic), is known to upregulate Brain-Derived Neurotrophic Factor (BDNF), a key protein supporting hippocampal neurogenesis and synaptic plasticity. The intense cognitive training involved in Qur'anic memorisation may exert its long-term benefits, as suggested in studies with children and the elderly,[17, 19] through this BDNF-mediated pathway.

3. Stress Reduction and Neuroendocrine Effects: Listening to the Qur'an has been associated with reduced anxiety and inducing a state of peace.[35] Psychological stress elevates cortisol levels, which have a known neurotoxic effect on the hippocampus. It is plausible that the stress-reducing (psycho-spiritual) effect of engaging with a sacred text protects the hippocampus from glucocorticoid-related damage, thereby preserving cognitive function and potentially slowing age-related decline.[10,11,16] This pathway may be particularly relevant for the positive findings in elderly populations.

LIMITATIONS

This systematic review has several limitations that should be considered when interpreting the findings. First, the included studies themselves were methodologically heterogeneous, with variations in design, sample size, and cognitive assessment tools, preventing a meta-analysis. Secondly, many of the studies, particularly the EEG investigations, had very small sample sizes, increasing the risk of type II errors and reducing the generalisability of the results. Third, the reliance on behavioural and neurophysiological measures means the direct evidence linking Qur'anic engagement to hippocampal morphology or function via neuroimaging (e.g., fMRI) is still absent. Finally, the potential for publication bias, wherein studies with null findings are less likely to be published, cannot be ruled out. Future research should prioritize larger, randomized controlled trials with standardised outcome measures and incorporate direct neuroimaging to elucidate the underlying neural mechanisms.

CONCLUSIONS

Reading and listening are essential skills for language comprehension and communication. When a person reads the Qur'an, he or she engages in visual language processing, whereas when the person listens to the recitation of the Qur'an, he or she are involved in auditory language processing. These activities stimulate different brain parts, contributing to a more comprehensive understanding of the Qur'an text.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest.

INSTITUTIONAL REVIEW BOARD (ETHICS COMMITTEE)

None.

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AUTHOR CONTRIBUTIONS

Conceptualization was contributed by UR, STP, LAF, and FM; Design was carried out by UR and FM; Supervision was provided by UR; Data collection was conducted by UR, STP, and LAF; Data analysis was performed by UR and FM; Manuscript writing was carried out by UR and FM. All authors have read and agreed to the published version of the manuscript.

REFERENCES

1. Valdés Hernández M del C, Cox SR, Kim J, Royle NA, Muñoz Maniega S, Gow AJ, et al. Hippocampal morphology and cognitive functions in community-dwelling older people: Neurobiol Aging. 2017;52:1–11.
2. Eichenbaum H. Hippocampus: cognitive processes and neural representations that underlie declarative memory. Neuron. 2004 Sep;44(1):109–20.
3. Sweatt JD. Hippocampal function in cognition. Psychopharmacology (Berl). 2004 Jun;174(1):99–110.
4. O'Shea A, Cohen RA, Porges EC, Nissim NR, Woods AJ. Cognitive Aging and the Hippocampus in Older Adults. Front Aging Neurosci. 2016;8:298.
5. Eichenbaum H. The Hippocampus as a Cognitive Map … of Social Space. Neuron. 2015 Jul;87(1):9–11.
6. Anacker C, Hen R. Adult hippocampal neurogenesis and cognitive flexibility-linking memory and mood. Nat Rev Neurosci [Internet]. 2017;18(6):335–46.
7. Rohman M. Theory of Cognitif in al-Qur'an [Internet]. 2012 [cited 2025 Sep 24].

8. Gulamhusein TA, Momanyi M. The Role of Memorizing the Quran In Enhancing the Cognitive Abilities of Students in Bohra Islamic Schools of Karachi, Pakistan. OSR Journal of Humanities And Social Science (IOSR-JHSS). 2020;25(12):52–62.
9. Riviati N, Indra B. Reading Holy Quran Associated With Better Cognitive Function in Older Adults: A Systematic Review. Gerontol Geriatr Med. 2024;10
10. Irawati K, Madani F. Durasi Membaca Al-Qur'an dengan Fungsi Kognitif pada Lansia. Mutiara Medika: Jurnal Kedokteran dan Kesehatan. 2019;
11. Nurfiani AZ. Hubungan Mendengarkan Al-Qur'an Terhadap Fungsi Memori Diukur Dengan Mini-Mental State Examination (MMSE) dan Montreal Cognitive Assessment Versi Indonesia (MOCA-INA) pada Lansia di Panti Sosial Tresna Werdha Budi Mulia 1 Jakarta dan Tinjauannya Menurut P. Universitas YARSI; 2018.
12. Julianto V, Etsem MB. The Effect of Reciting Holy Qur an toward Short-term Memory Ability Analysed trought the Changing Brain Wave. Jurnal Psikologi. 2011;38(1):17–29.
13. Indrijaningrum PST, Hamdan M. Correlation Between Frequency And Duration On Reading Thequr ' An With Cognitive Function at Elderly. International Journal of Psychosocial Rehabilitation. 2020;24(02):4062–71.
14. Samhani I, Rohayah H, Tahamina B, Hafizan J, Zamzuri I, Jafri M, et al. Attentional Process During Listening to Quantitative Quranic Verses (Fatihah Chapter) Associated with Memory, Speech and Emotion. Asian Journal of Medicine and Biomedicine. 2018 Nov 4 [cited 2025 Sep 24];2 (1):36–43.
15. Samhani I, Faruque M, Hanifah M. Rhythms Synchronization Effects on Cognition during Listening to Quranic Recitation. Malaysian Journal of Fundamental and Applied Sciences. 2022;18:603–17.
16. Munawaroh S, Hastami Y, Suwandono A, Probandari AN, Hartono, Wiyono N, et al. Reading the Holy Quran to Improve Episodic Memory in the Elderly. Futurity Medicine [Internet]. 2023 Sep 30 [cited 2025 Sep 24];2(3):4–11.
17. Slamet S. The Effect Of Memorizing the Quran on the Children. Humanities & Social Sciences Reviews. 2019;7(3):571–5.
18. Muthohharoh NM, Rusydiyah EF, A'la BA, Khoiriyah N. Memorizing the Qur'an: The Science Behind Children's Remarkable Ability. 2023 May 22 [cited 2025 Sep 24];103–13.
19. Sirin S, Metin B, Tarhan N. The Effect of Memorizing the Quran on Cognitive Functions. The Journal of Neurobehavioral Sciences [Internet]. 2021 Jan [cited 2025 Sep 24];8(1):22–7.
20. Choirunnisa R, Katni K, Laksana SD. Pengaruh Kemampuan Menghafal al-Qur'anTerhadap Konsentrasi Belajar Siswa Madrasah Ibtidaiyah Muhammadiyah 6 Ponorogo. Jurnal Pendidikan Nusantara. 2021 Dec 2;1(1):11–20.
21. Faqihuddin A, Firmansyah MI, Muflih A. Multisensory Approach in Memorizing the Al-Quran for Early Childhood: Integration of the Tradition of Memorizing the Al-Quran with Digital Technology. AL-ISHLAH: Jurnal Pendidikan [Internet]. 2024 Jun 30 [cited 2025 Sep 24];16(2):1289–302.
22. Hussain MH. The Effect of Quran as a Stimulus in Enhancing Working Memory and Mood . International Journal of Islamic Psychology [Internet]. 2021 [cited 2025 Sep 24];4(1).
23. Bettio LEB, Rajendran L, Gil-Mohapel J. The effects of aging in the hippocampus and cognitive decline. Neurosci Biobehav Rev. 2017 Aug;79:66–86.
24. Ishak I. Does Qur'an Memorization Influence Adolescents' Intelligence Quotient and Memory Level?: A Cross-Sectional Study in Malaysia. Makara Journal of Health Research [Internet]. 2021 [cited 2025 Sep 24];25(3).
25. Eichenbaum H. The role of the hippocampus in navigation is memory. J Neurophysiol. 2017 Apr;117 (4):1785–96.
26. Goodroe SC, Starnes J, Brown TI. The Complex Nature of Hippocampal-Striatal Interactions in Spatial Navigation. Front Hum Neurosci. 2018;12:250.
27. Lövdén M, Schaefer S, Noack H, Bodammer NC, Kühn S, Heinze HJ, et al. Spatial navigation training protects the hippocampus against age-related changes during early and late adulthood. Neurobiol