



## **The Cognitive Impact of Surah Ar-Rahman: An Experimental Study on the Enhancement of Working Memory**

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### **Abstract**

*Previous studies on Surah Ar-Rehman have shown its promising effects in reducing stress, and anxiety, which are known to improve cognitive functioning, particularly working memory. However, there is lacking empirical studies that have investigated the causal association between listening to Surah Ar-Rahman's recitation and working memory. Therefore, the current study aimed to address this knowledge gap by examining the influence of Surah Ar-Rahman on working memory using a pretest-posttest true experimental design. A total of 50 university students were conveniently recruited and randomly assigned to either the experimental group (Surah Ar-Rahman) or the control group (no-task condition). Participants in both groups completed N-back working memory tasks (alphabet and shapes) before and after the assigned condition. The experimental group was exposed to a 5-minute recitation audio of Surah Ar-Rahman in the voice of Syed Sadaqat Ali. In contrast, the control group was supposed to perform no tasks during the 5-minute duration. Results showed that the Surah Ar-Rahman group demonstrated significant improvement in working memory performance, with better scores on both the alphabet and shapes N-back tasks, compared to their pre-test results. Moreover, between-group comparisons revealed that participants in the Surah Ar-Rahman group had more correct responses and fewer errors than those in the control group. These findings suggest that listening to Surah Ar-Rahman may enhance working memory. However, further research is needed to confirm these results and explore their broader implications.*

### **Keywords**

Working Memory, Surah Rahman, University Students, Experimental Study

### **Introduction**

Surah Ar-Rahman, often called the "Bride of the Quran," presents Allah as the Most Merciful and Compassionate, emphasizing his countless blessings and divine mercy. This chapter, which contains 78 verses, is the 55th chapter of the Quran and appears in Juz 27 (Nurlela et al. 2024). Revealed in Mecca during the early period of Quranic revelation, Surah Ar-Rahman highlights the importance of human responsibility, belief in the afterlife, and the Day of Judgment. It encourages believers to reflect on Allah's blessings and is frequently recited during Tahajjud, after Fajr, or in the morning, fostering spiritual peace and personal growth (Osman 2024). The structure of Surah Ar-Rahman, with its rhythmic and repetitive verses, enhances its readability and strengthens the connection between the believer and the divine. The recurring phrase, "Which of the favors of your Lord will you deny?" serves as a constant reminder of the many blessings Allah has bestowed upon humanity (Sadeddin and Fathi 2017). Through its poetic imagery, the surah spans themes from the creation of the universe to the Day of Judgment, deepening its emotional and spiritual impact (Ahmed 2017).

Numerous studies have examined the beneficial effects of Surah Ar-Rahman on mental well-being. Its rhythmic recitation has been found to reduce stress, anxiety, and depression by promoting inner peace and improving focus (Ashfaq 2016; Rafique et al. 2017). The calming impact of its verses deepens a person's bond with Allah, offering emotional solace and spiritual tranquility (Ahmed 2017; Lasheen 2022). The benefits are amplified when the verses are recited with mindful understanding, leading to greater mental peace and clarity. (Lasheen 2022). Therefore, this Surah is considered one of the most powerful surahs for enhancing mental, emotional, and spiritual well-being. Nevertheless, its effect on cognitive functioning such as memory is not well established and needs further research support as this can be proven as an effective approach in improving memory.

### **Working Memory**

Memory is a cognitive process that is generally categorized into four main types: perceptual, temporary, retentive, and working memory (Ohwovoriolole 2021). Working memory, often viewed as a form of temporary (short-term) memory, plays a crucial role in cognitive functioning by holding and manipulating information over short periods. This function is vital for tasks such as decision-making, problem-solving, and following instructions (Cowan 2014). Working memory is comprised of three key components: the central executive, which controls attention; the phonological loop, which processes verbal information; and the visuospatial sketchpad, which handles visual and spatial data (Baddeley 2000).

One common tool used to assess working memory is the N-back task, which asks individuals to determine whether a current stimulus matches one that appeared "N" steps earlier, emphasizing the importance of retaining and applying information (Kane et al. 2007). Efficient working memory enables better task performance and goal achievement by helping individuals process and manage relevant information (Baddeley 1992; Avery, Smillie and de Fockert 2013). Several tests, including those for response inhibition, recall, and reasoning, have been designed to evaluate working memory's role in cognitive processing (Wilhelm, Hildebrandt, and Oberauer 2013). Given its essential role in cognitive functioning, working memory supports activities like decision-making, problem-solving, and learning, making it an important focus for cognitive enhancement research (Cowan 2014).

In this context, the recitation of Quranic verses, particularly Surah Ar-Rahman, has been investigated for its potential to improve cognitive functions such as working memory. The rhythmic and repetitive nature of Surah Ar-Rahman creates a meditative and calming effect, which has been linked to enhanced focus, memory retention, and concentration (Rafique et al. 2017). Listening to Surah Ar-Rahman engages individuals in a cognitive process that requires sustained attention and auditory processing, similar to the mechanisms involved in working memory tasks. This auditory stimulation, combined with the emotional and spiritual impact of the verses, may strengthen neural pathways associated with attention, recall, and cognitive clarity, potentially improving working memory (Kannan et al. 2022). The rhythmic recitation of Surah Ar-Rahman may activate brain regions associated with memory retention and retrieval, potentially improving working memory and concentration. While the cognitive benefits align with studies on rhythmic auditory patterns, there is a lack of direct research connecting Surah Ar-Rahman to working memory. More studies are needed to scientifically confirm this causal association.

### **Working Memory Model (Baddeley and Hitch 1974)**

Working memory is referred as a type of memory that retains task-related information during cognitive functioning. It becomes challenging to follow complex tasks that involve multiple steps and processes, as working memory has limited capacity. The radial maze, for example, is used to assess working memory in animals (Penley, Gaudet, and Threlkeld 2013). In 1974, Alan Baddeley and Graham Hitch proposed a model of working memory that is closely linked to short-term memory but consists of three main components: the phonological loop, visuospatial sketchpad, and central executive. The phonological loop is responsible for processing auditory and verbal information, while the visuospatial sketchpad handles visual and spatial data. The central executive oversees the entire system, managing the flow of information and guiding decision-making and problem-solving processes. This model enables the temporary storage and manipulation of information (Baddeley and Hitch 1974). The model suggests that working memory is a system with limited capacity, which can become overloaded when faced with too much information, leading to reduced performance and a higher likelihood of errors. Furthermore, Baddeley (1992) highlights that working memory is not just

a passive storage system; instead, it actively processes information, playing a crucial role in learning and problem-solving.

This model can be connected to Surah Ar-Rahman through its rhythmic and organized auditory patterns that engage the phonological loop. Listening to or reciting Surah Ar-Rahman offers a steady stream of auditory input, potentially improving the processing and retention of verbal information, which aligns with the phonological loop's function. Furthermore, by calming the mind and reducing cognitive load, Surah Ar-Rahman may enhance the central executive's capacity to regulate information flow and concentrate on problem-solving. This auditory stimulation could strengthen the neural pathways involved in working memory, thereby improving overall cognitive performance and task efficiency (Hussain 2021). Thus, although additional empirical research is required to confirm this connection, the recitation of Surah Ar-Rahman could potentially enhance working memory, as indicated by the Baddeley and Hitch model.

### **Literature Review**

While the literature on Surah Ar-Rahman and its potential role in augmenting working memory is scarce, a large body of research has shown that listening to Quranic recitation generally links with healing effects and improvement in learning and memory. For instance, studies have highlighted the positive impact of Quranic recitation in reducing stress (Yusqi Mahfuds 2022; Khairuddin 2022), anxiety, and depression (Ashfaq 2016; Moulaei et al. 2023; Ghiasi and Keramat 2018), as well as its potential benefits for health conditions like cancer and heart disease (Abdekhoda and Ranjbaran 2022). Additionally, some research has explored the impact of Quranic recitation on memory enhancement, with both animal and human studies supporting its beneficial effects. Kraeuter, Guest, and Sarnyai (2018) experimented on rats, where the animals were randomly assigned to a group that listened to Quranic recitations for 5 hours a day over two weeks. The results showed that the experimental group performed better on a maze task, requiring less time to learn and demonstrating improved spatial memory. Similarly, (Blokland, Geraerts, and Been 2004; Bhatara et al. 2018) investigated the effect of Quranic sound exposure on hippocampal cell formation in Wistar rats and found that those exposed to Quranic recitations showed higher hippocampal cell growth. While these animal studies provide valuable insights, questions about the generalizability of these findings to humans remain.

Human studies have also demonstrated the potential for Quranic recitation to enhance memory. For instance, Putra et al. (2018) found that listening to Quranic recitations, both murottal and non-murottal, led to temporary improvements in memory. Other studies have specifically linked Quranic recitation with improvements in working memory among university students. Fauzan and Abidin (2017) conducted a pre-test/post-test experimental study using audio neurofeedback training to enhance alpha waves, combined with recitation of Ayat Kursi from the Quran, over 5 weeks. They observed significant improvements in both alpha wave activity and participants' performance on the Wechsler Intelligence Test's digit span and digit symbol tasks, both of which assess working memory. These findings are supported by additional studies showing a positive association between Quranic recitation and improvements in working memory (Irfan et al. 2019; Al-Galal and Alshaikhli 2017; Hussain 2021).

Despite the fact both animal and human studies suggest that listening to Quranic recitations may enhance learning, working memory and long-term memory, further empirical evidence is needed to fully substantiate these claims. A large body of research emphasizes on unique therapeutic effects of Surah Ar-Rahman, and distinguishes its general claim of listening to Quranic recitation. Because Surah Ar-Rahman has shown greater therapeutic benefit in various medical and psychiatric conditions. In particular, in terms of cognitive benefits, its recitation has been found to reduce anxiety (Hamidiyanti and Pratiwi 2019) and lower cortisol levels (Irmawati et al. 2020; Saleem and Saleem 2021), both of which are closely linked to stress and anxiety. Since reductions in anxiety and stress are associated with boosting working memory (Wang et al. 2023; Almarzouki 2024), these findings provide a strong foundation for further research into the effects of Surah Ar-Rahman on cognitive functions such as working memory. However, this causal link has yet to be fully established. Given the therapeutic potential of Surah Ar-Rahman (Pervaiz et al. 2024; Imran, Gul, and Batool 2021), this study aims to explore the impact of Surah Ar-Rahman recitation on working memory among the Pakistani youth population.

**Methodology**

**Study Design**

This study employed a true experimental research design with a pre-test and post-test framework to examine the impact of the independent variable (recitation of Surah Ar-Rahman) on the dependent variable (working memory). The design aims to ensure accuracy and generate specific findings related to the research hypothesis (Bell 2009). By controlling all factors that could influence the results, the researcher sought to predict or determine the potential outcomes of the experiment.

**Hypothesis**

- H1: The working memory performance of Surah Ar-Rahman group will be boosted after listening to Surah Ar-Rehman recitation.
- H2: The participants in Surah Ar-Rahman group will perform better in the working memory task as compare to participant in control group.

**Sample**

Participants with the age range of 18 to 25 were recruited for this research using the non-probability convenient sampling technique. The selected participant was randomly allocated into the Surah Ar-Rahman (Experimental) group and control group by the fishbowl method to meet the basic criteria of a true experiment and minimize the chances of selection bias. The participants who did not meet the criteria of age or showed non-serious behavior during the experiment were excluded from the sample.

**Experimental Protocol**

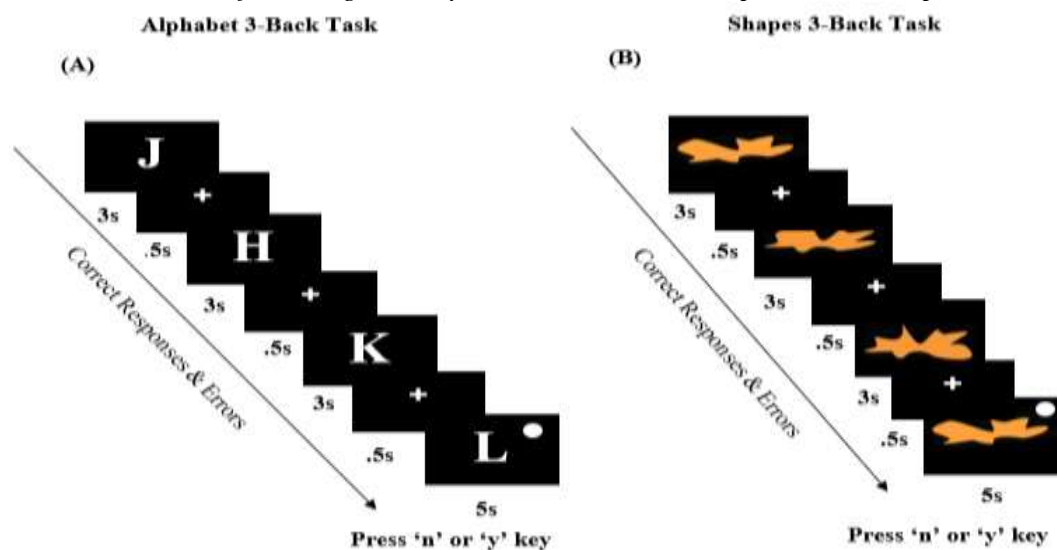
**N-Back Working Memory Task**

Baddeley (1984) recommended using n-back tasks or similar activities that require the maintenance, manipulation, monitoring, and updating of information to assess working memory. Building on this, Shamas and Mujitaba (2024) adapted and developed a 3-back working memory task on PsychoPy (version 24.04), based on Ke et al. (2019), to evaluate participants' working memory performance. This task included separate 3-back trials for alphabets and shapes, with 10 trials for each. Participants were asked to complete the alphabet trials first, followed by the shape trials.

For the alphabet trials (see Figure 1 for the presentation of both alphabet and shape trials), each trial began with a fixation cross appearing in the center of the black screen for 0.5 seconds to focus the participant's attention. Then, an alphabet letter appeared on the screen in random order, displayed for 5 seconds. After every four or six letters, a cue appeared—a letter with a white dot in the top-right corner, prompting the participant to respond. For this letter, participants had to determine if the letter with the dot had appeared three positions earlier by pressing "Y" (yes) or "N" (no). Participant responses and reaction times were recorded in a data file generated by PsychoPy. In total, participants completed 10 alphabet trials and 10 shape trials, each taking just a couple of minutes to complete. In the shape trials, the setup was similar, but orange-colored shapes were used. These shapes were 720 pixels in height and 790 pixels in width, as shown in Figure 1. Accurate judgments by participants were considered correct responses, while incorrect judgments were marked as errors.

**Figure 1**

*Schematic Presentation of Working Memory N-Back Task Trials: Alphabet and Shapes*



Note. In each trial, a random sequence of alphabet (A) was presented on a computer screen, followed by an alphabet with a white circle (prompt for participant response). On prompt participants had to guess whether they had seen the alphabet three positions back. A similar setup was used for the Shapes (B) trials, as explained in a previous study (Shamas and Mujitaba 2024).

**Procedure**

Initially, all volunteers provided informed consent and were briefed about the study's purpose, procedure, confidentiality, and the absence of any potential harm. However, during the instruction phase, participants were not informed about whether they were in the experimental or control group to maintain a single-blind design. Participants were then randomly assigned to either the experimental group (Surah Rahman condition) or the control group (no task). Both groups received identical instructions and performed the N-back working memory task in the same environment. The experiment was carefully monitored to ensure that participants did not receive any cues regarding the desired responses during the task. Participants first completed the Alphabet N-back task, followed by the Shapes N-back task. For the Surah Rahman group, after completing the tasks, they were given headphones and instructed to sit in a relaxed, and calm position. They were asked to focus on the recitation of Surah Ar-Rahman and refrain from talking or asking questions for 5 minutes. The recitation of Surah Ar-Rahman was in the voice of Qari Syed Sadaqat Ali (Ali 2017), and only 21 verses were played during the experimental phase. The Audio of the recitation can be accessed via the Youtube link provided in the supplement. In contrast, participants in the control group were instructed to sit quietly for the same duration. After 5 minutes, both groups resumed the N-back task, following the same instructions and procedures as before.

**Results**

Initial screening of data was carried out before hypothesis testing. This includes removing outlier or assessment of data, normal distribution. Data was found adequately normally distributed as skewness and kurtosis of data remained less than 1 for both group scores.

**Hypothesis 1**

Surah Ar-Rahman's group working memory task performance will improve after listening to Surah Ar-Rahman.

**Table 1**

*Paired Sample t-test Comparison of Pre-test and Post-test Working Memory Performance in the Surah Ar-Rahman Group (n=25)*

Variables	Pre-test		Post-test		t	r	p	Cohen's d
	M	SD	M	SD				
<u>Alphabet</u>								
RT	14.62	2.97	13.79	4.16	1.73	0.83	0.097	0.34
CR	5.32	1.60	6.96	1.46	-3.91	0.06	<.001	-0.78
Incr.	4.68	1.60	3.04	1.46	3.91	0.06	<.001	0.78
<u>Shapes</u>								
RT	15.89	3.46	14.48	4.22	3.78	0.90	<.001	0.76
CR	5.24	1.42	6.12	1.30	-2.77	0.32	0.01	-0.55
Incr.	4.68	1.52	3.88	1.30	2.53	0.38	0.01	0.51

Note. RT=reaction time, CR=correct responses, Incr. =incorrect responses, \*\*\*p<.001

Table 1 presents the paired sample t-test results comparing pre-test and post-test scores for the Surah Ar-Rahman group on working memory N-back tasks (alphabet and shape). In the alphabet task, reaction time slightly improved (t = 1.73, p = 0.097, Cohen's d = 0.34), with correct responses increasing significantly (t = -3.91, p < 0.001, Cohen's d = -0.78) and errors decreasing notably (t = 3.91, p < 0.001, Cohen's d = 0.78). Similarly, in the shape task, reaction time improved substantially (t = 3.78, p < 0.001, Cohen's d = 0.76), accuracy rose (t = -2.77, p = 0.01, Cohen's d = -0.55), and errors decreased (t = 2.53, p = 0.01, Cohen's d = 0.51). These findings highlight significant gains in both tasks, particularly in reducing errors and improving accuracy, for the Surah Ar-Rahman group.

**Table 2**

*Paired Sample t-test Results Comparing Pre-test and Post-test Scores of Control Group(n=25)*

Variables	Pre-test		Post-test		t	r	p	Cohen's d
	M	SD	M	SD				
<u>Alphabet</u>								
RT	13.20	2.39	10.78	2.17	6.52	0.67	.00	1.30

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CR	4.80	1.66	5.16	1.60	-1.37	0.67	.18	-.27
Incr.	5.28	1.67	4.84	1.60	1.49	0.59	.14	0.29
<u>Shapes</u>								
RT	14.23	2.24	11.35	1.77	7.73	0.58	.00	1.54
CR	4.64	1.41	4.68	1.60	-0.16	0.64	.87	-.03
Incr.	5.36	1.44	5.36	1.75	0.00	0.70	1.00	.00

**Note.** RT=reaction time, CR=correct responses, Incr. =incorrect responses, \*\*\*p<.001

Table 2 shows the results of the paired sample t-test for the control group's performance on the working memory N-back task. For the alphabet task average reaction time dropped from 13.20 seconds in the pre-test to 10.78 seconds in the post-test, indicating a significant improvement in response time ( $t = 6.52, p = 0.00$ ). The average number of correct responses increased slightly, from 4.80 to 5.16, but this change was not statistically significant ( $t = -1.37, p = 0.18$ ). Errors decreased slightly from 5.28 to 4.84, though this change was also not significant ( $t = 1.49, p = 0.14$ ).

For the shapes task the average reaction time also improved significantly, decreasing from 14.23 seconds in the pre-test to 11.35 seconds in the post-test ( $t = 7.73, p = 0.00$ ). Correct responses: There was a small, non-significant increase in mean correct scores from 4.64 to 4.68 ( $t = -0.16, p = 0.87$ ). The number of errors remained the same, at 5.36, before and after the test, showing no change ( $t = 0.00, p = 1.00$ ). It was concluded that the control group showed significant gains in reaction time for both tasks, suggesting faster response speeds. However, there were no substantial changes in accuracy, as the number of correct responses and errors did not change meaningfully.

**Hypothesis 2**

Participants of the Surah Ar-Rahman group performance will be better as compared to control group participants.

**Table 3**

*Independent Sample t test for Assessing the Difference Between Surah Ar-Rahman and Control Group in Pre-test Performance*

Variables	Surah Ar-Rahman (n=25)		Control (n=25)		t	p	Cohen's d
	M	SD	M	SD			
<u>Alphabet</u>							
RT	14.62	2.97	13.20	2.39	1.86	.07	0.53
CR	5.32	1.60	4.80	1.66	1.13	0.27	0.32
Incr.	4.68	1.60	5.28	1.67	-1.30	0.20	-0.36
<u>Shapes</u>							
RT	15.89	3.46	14.23	2.24	2.00	0.05	0.57
CR	5.24	1.42	4.64	1.41	1.50	0.14	0.42
Incr.	4.68	1.52	5.36	1.44	-1.62	0.11	-0.46

**Note.** RT=reaction time, CR=correct response, Incr.=incorrect response, \*\*\*p<.001

Table 3 summarizes the independent sample t-test results for comparing pre-test scores of the Surah Ar-Rahman and control groups before any intervention took place. For alphabet task reaction time, the Surah Ar-Rahman group had a slightly longer average reaction time ( $M = 14.62, SD = 2.39$ ) than the control group ( $M = 13.20, SD = 2.17$ ). Although this difference was not statistically significant ( $t = 1.86, p = 0.07$ ), it showed a moderate effect (Cohen's  $d = 0.53$ ). The Surah Ar-Rahman group also had a slightly higher average of correct responses ( $M = 5.32, SD = 1.66$ ) as compared to the control group ( $M = 4.80, SD = 1.60$ ). However, this difference was not significant, as indicated by  $t = 1.13, p = 0.27$ , with a small effect size (Cohen's  $d = 0.32$ ). The Surah Ar-Rahman group made fewer errors ( $M = 4.68, SD = 1.67$ ) compared to the control group ( $M = 5.28, SD = 1.60$ ), but this difference was not significant ( $t = -1.30, p = 0.20$ ) and had a minor effect (Cohen's  $d = -0.36$ ).

Similarly, for the shapes task, the Surah Ar-Rahman group took a longer reaction time ( $M = 15.89, SD = 3.46$ ) than the control group ( $M = 14.23, SD = 1.77$ ). This difference was statistically none significant, with  $t = 2.00, p = 0.05$ , and showed a moderate effect size (Cohen's  $d = 0.57$ ). The Surah Ar-Rahman group's correct responses ( $M = 5.24, SD = 1.41$ ) were slightly higher than the control group's ( $M = 4.64, SD = 1.60$ ), but this was not statistically meaningful ( $t = 1.50, p = 0.14$ ) and had a small effect size (Cohen's  $d = 0.42$ ). The Surah Ar-Rahman group made fewer errors ( $M = 4.68, SD = 1.44$ ) compared to the control group ( $M = 5.36, SD = 1.75$ ). Although this showed a moderate effect size (Cohen's  $d = -0.46$ ), this too statistically not significant ( $t = -1.62, p = 0.11$ ).

While the Surah Ar-Rahman group generally had slower reaction times than the control group, they also tended to make fewer errors in both Alphabet and Shapes tasks. However, the performance differences between both groups were not statistically significant in pre-testing. This comparison suggests the effective management of individual differences between the Surah Rehman and Control groups.

**Table 4**

*Post-test Comparison between Surah Ar-Rahman and Control Group Using Independent Sample t-test*

Variables	Surah Ar-Rahman (n=25)		Control (n=25)		t	p	Cohen's d
	M	SD	M	SD			
<u>Alphabet</u>							
RT	13.79	4.16	10.78	2.16	3.21	.002	.908
CR	6.96	1.45	5.16	1.59	4.16	.001	1.17
Incr.	3.04	1.45	4.84	1.59	-4.16	.001	-1.17
<u>Shapes</u>							
RT	14.47	4.21	11.34	1.77	3.42	.001	.96
CR	6.12	1.30	4.68	1.60	3.49	.001	.98
Incr.	3.88	1.30	5.36	1.75	-3.38	.001	-.95

*Note.* RT=reaction time, CR=correct responses, Incr.=incorrect responses, \*\*\*p<.001

Table 4 compares post-test scores between the Control and Surah Ar-Rahman groups, showing notable differences in both alphabet and shapes tasks. For reaction time, the Surah Ar-Rahman group was slightly slower on both tasks, but their accuracy was significantly better. In the alphabet task, the Surah Ar-Rahman group took longer (mean react time =13.79 seconds) compared to the Control group (mean reaction time =10.78 seconds) but scored higher on correct answers (Surah Rehman: 6.96, Control: 5.16) and made fewer mistakes (Surah Ar-Rahman:3.04, Control:4.84). The differences in accuracy and errors were statistically meaningful, with strong effect sizes, showing that the Surah Ar-Rahman group performed more accurately overall. In the shape task, a similar pattern was observed: the Surah Ar-Rahman group again had slower reaction times (Surah Ar-Rehman group: 14.47 sec, Control: 11.34 sec) but achieved higher correct mean scores (Surah Ar-Rahman: 6.12, Control: 4.68) and made fewer errors (Surah Ar-Rahman: 3.88 Control: 5.36). These findings underscore that while the Surah Ar-Rahman group responded more slowly, they excelled in accuracy and made fewer errors in both tasks compared to the Control group, indicating an overall stronger performance.

**Discussion**

This study provides promising insights into the potential cognitive benefits of listening to Surah Ar-Rahman. The findings highlight, that the experimental group, which was exposed to surah Ar-Rahman Recitation, improved distinctively working memory performance. To be more precise, the experimental group was quicker in reaction times, made more correct responses, and had fewer incorrect responses in both alphabets and shapes tasks. The large effect sizes and significant p-values in post-test comparisons suggest that the Surah Ar-Rahman group surpassed the control group across all measures, indicating the effectiveness of listening to the Surah Ar-Rahman recitation. The first hypothesis posited that participants in the Surah Ar-Rahman group would demonstrate improved working memory task performance following the auditory intervention. Paired sample t-test results demonstrate that participants who listened to Surah Ar-Rahman experienced significant enhancements in several areas. Notably, the significant increase in correct responses for both the alphabet and shapes tasks (p < .001) suggests that the intervention effectively facilitated accuracy in working memory tasks. The reduction in incorrect responses also supports this notion, indicating that participants not only were more accurate but also made fewer errors after listening to the Surah. Interestingly, while the reaction time for the alphabet task showed a non-significant decrease, the shapes task revealed significant improvements, suggesting a refined effect of the intervention on different types of working memory tasks (Alphabet and Shapes). The large effect sizes for both correct and incorrect responses further substantiate the effectiveness of Surah Ar-Rahman in enhancing working memory capabilities, indicating a strong relationship between auditory experience and cognitive function.

These results align with existing literature suggesting that auditory stimuli, particularly those with rhythmic and melodic qualities, can enhance cognitive processing and memory retention

(Chanda and Levitin 2013; Riviati and Indra 2024). This suggests that performance through working memory is associated with listening to Surah Ar-Rahman's enhancement of working memory aligns with studies such as those by Hussain (2021), which argues that listening to the Quran enhanced working memory performance so it significantly reduced post-test mood disturbance among Maldives university students. The second hypothesis assessed that; the Participants of Surah Ar-Rahman group performance will be better compared to control group participants as the objective of the study also justified that effectiveness of working memory can be enhanced by Surah Ar-Rahman. When comparing the examination of the Surah Ar-Rahman group with the control group, the results were striking. The control group did show some improvements in reaction times; however, these were not accompanied by significant changes in accuracy measures. Findings proposed that while participants in the control group became faster, probably they were not effectively engaged in their working memory processes to enhance their accuracy. This observation supports previous research indicating that speed does not always equate to improved cognitive function (Tucker and Bader 1993). Furthermore, the significant differences in performance metrics between the two groups, particularly the post-test assessments, highlight the effectiveness of the Surah Ar-Rahman intervention. The Surah Ar-Rahman group outperformed the control group across all measures, which is indicative of the intervention's potential to enhance cognitive function significantly. This aligns with the hypothesis posited by McPherson and Keelan (2003), who suggested that specific auditory stimuli can lead to improved cognitive processing capabilities. Results indicated significant improvement in working memory. A study was conducted on 159 Malaysian students and observed clear improvement in physical QoL, serotonin levels, and cognitive performance. (Ishak et al. 2021). This finding supported that, listening to surah Ar-Rahman improves attention span for working memory and is supported by the literature particularly work by Yaqin et al. (2023), which demonstrated that students' attention spans for working and responses toward murottal Al-Qur'an specifically for Surah Ar-Rahman showed significant results.

### **Conclusion**

In conclusion, this study reinforces the concept of listening Surah Ar-Rahman could implement a significant positive influence on working memory. The findings align with the previous literature that supports the effect of Surah Ar-Rahman, demonstrating that "exposure to Surah Rahman, particularly Saleem et al. (2019), can enhance the impact on cortisol levels and performance. Further, it is evident in current research that listening to Surah Ar-Rahman significantly enhances working memory performance, as demonstrated by improved accuracy and reduced errors in cognitive tasks. The Surah Ar-Rahman group's superior performance compared to the control group suggests that specific auditory stimuli can effectively enhance cognitive performance. Findings strongly supported to literature on the advantages of cognitive performance for music and auditory stimuli, clearing the path for additional investigation in this promising field of study.

### **Supplement**

An Audio link for Surah Ar-Rehman recitation used in this study as an intervention can be found here: ([https://youtu.be/CP5g7NrL\\_H8?si=x45-zKBn3BwUBBFh](https://youtu.be/CP5g7NrL_H8?si=x45-zKBn3BwUBBFh)).

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