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Does Quran Memorization Influence Adolescents' Intelligence Quotient and Memory Level?: A Cross-Sectional Study in Malaysia

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Does Quran Memorization Influence Adolescents' Intelligence Quotient and Memory Level?: A Cross-Sectional Study in Malaysia

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Abstract

Background: The process of memorizing various reading materials enhances the brain capacity to process, store, and assemble memories and increases the intelligence quotient (IQ) level. However, the connection between the memorization of Quran and the enhancement of memory level is not fully understood. Hence, a cross-sectional study was conducted to examine the correlation between Quran memorization and the IQ level among Muslim adolescents from selected Islamic schools in Selangor, Malaysia.

Methods: The Wechsler Abbreviated Scale of Intelligence was used to measure the student's IQ level, whereas Digit Span and Rey Auditory Verbal Learning Test were used to evaluate the memory level. Questionnaires were distributed for demographic data collection and the Quran memorization level.

Results: The full-scale results for all the four sub-tests revealed that the studied tahfiz students had a low average level of IQ, with a mean of 88.06 ± 15.80. For the short-term verbal memory, the majority (n = 36, 56.3%) were in the normal category, whereby for long-term verbal memory, the majority (n = 20, 31.3%) were below normal. The results showed that the IQ level was non-significant (p = 0.059) but moderately correlated (r = 0.391) with the level of Quran memorization. The coefficient of determination or effect size calculation showed that Quran memorization shared 15.29% of the variability in the IQ level. Multiple linear regression analysis revealed that only the working memory is significant to predict the IQ. Provided that other influencing factors are constant, an increase of one unit in the working memory was predicted to increase 5.55 units of IQ.

Conclusions: In conclusion, the level of Quran memorization was not significantly correlated with the IQ and memory status of Muslim adolescents from the selected Islamic schools in Selangor, Malaysia.

Keywords: adolescent, intelligence quotient, Malaysia, memory, Muslim

INTRODUCTION

Tahfiz schools are centers for Quran-related studies, which include reading, memorization, and interpretation of Islam holy book. Students who enroll in such study are taught to read Quran with proper pronunciation or tajwid. They were are required to learn the meaning of verses to appreciate the teachings of the Quran. As a result, the students are expected to have well balance between religious and secular knowledge. Tahfiz schools have been under government monitoring since 1966.[1] The government efforts have been strengthened recently by the embodiment of the National Tahfiz Education Policy.[2] According to Mohamad Akhir et al., the increased demand from parents to send their children to tahfiz schools has led to an increase in the number of private tahfiz institutions in Malaysia.[3]

Reading of the Quran (holy book of Islam) provides numerous advantages. The memorization of the Quran is related to a high intelligence quotient (IQ) level and improved memory status of an individual.[4] In addition, reading of the Quran is closely linked to the enhanced mental and physical health status and quality of life of an individual.[5–7]

Memorization is defined as the process of storing knowledge in the human brain, and it involves four different aspects, namely, i) learning, ii) memory formation, iii) memory retention, and iv) ability to access memory.[8] The best way to consolidate memories is by

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memorizing the reading material that was just learned, which eventually leads to the improvement of intelligence. Memorization of the Quran can be achieved by reciting it verbally or non-verbally and retrieving the text repeatedly (rehearsal). Quran memorization is also associated with short-term memory, where one can obtain an improved short-term memory, resulting in prompt Quran memorization.[9] Over time, repetitive memorization of the Quran creates a long-term memory.

IQ is a score that demonstrates a person's cognitive abilities with regard to their respective age group.[10] It is measured by a set of standardized tests. Additionally, IQ is known as the physical and psychological potential of an individual, and it can be enhanced by engaging in good religious practices. According to Fitriani, memorization of the Quran is associated with the acquisition of a high level of IQ, emotional intelligence, and spiritual intelligence.[11] Another study has shown that memorization of the Quran improves one's mental health in terms of better brain activity.[12]

Most of the published studies are from other countries, mainly Indonesia. With the recent development of tahfiz studies in Malaysia, the exploration of the significance of memorization of Quran among tahfiz students from various perspectives is justified. Hence, this study aimed to determine the association between the level of Quran memorization with IQ and memory status among students in selected tahfiz schools and its associated factors.

METHODS

Study Design and Participants

This cross-sectional study involved 64 students aged 11–18 years old from two selected tahfiz schools in Selangor, Malaysia. The selection of schools was carried out using the purposive sampling method. The selected schools must be boarding schools and fully tahfiz without mainstream curriculum. The dependent variables were the level of IQ and memory status, and the independent variables were Quran memorization levels. The permission to conduct the study was granted by the Association of Selangor Al-Quran Tahfiz Institutions. This study was also approved by the Research Ethics Committee Universiti Kebangsaan Malaysia (Human) (UKM PPI/111/8/JEP-2018-394). Parental written consents were also obtained and documented before the execution of the study.

Sample Size Calculation

The sample size was calculated using G-power 3.1.9.2. A priori sample size was calculated using t-test family for correlation with the effect size of 0.375, alpha = 0.05, power (1-β) = 0.8, and coefficient of determination = 0.141.[13] The minimum sample size required for the study was 60 students, including a 20% drop-out.

Study Tools

Data collection was performed using standardized and validated questionnaires. The first part of the questionnaire was meant for demographic data. The level of Quran memorization was identified by the number of pages memorized. The whole Quran has 604 pages and 30 juz or sections, and each juz has about 20 pages. A Muslim who has completely memorized all juz in the Quran is known as a "hafiz." The Wechsler Abbreviated Scale of Intelligence (WASI-II) test was used to assess the level of IQ.[10] Rey Auditory Verbal Learning Test (RAVLT) was conducted to assess the short-term and long-term verbal memories of the subjects. The Digit Span test was conducted to measure short-term and working memories. All these questionnaires were administered by trained enumerators.

Level of IQ

The WASI-II test consists of four sub-tests: i) block design, ii) vocabulary, iii) matrix reasoning, and iv) similarities. Predominantly, the block design and matrix reasoning formed the Perceptual Reasoning Index (PRI), whereas vocabulary and similarities were used to determine the Verbal Comprehension Index (VCI). In addition, the total score of VCI and PRI were combined to obtain the Full-Scale IQ (FSIQ). The IQ assessment was administered by a trained enumerator and conducted in a secluded room to avoid any disruption from the external surroundings. Total raw scores were calculated and converted into a sum of T scores, which was then converted into a composite score that consisted of VCI, PRI, and FSIQ. The test lasted for about 30–45 min. The reliability of WASI-II tests for children and adults were 0.87–0.91 and 0.90–0.92, respectively.[10]

Short-Term And Long-Term Verbal Memories

RAVLT consists of two different lists (A and B) with 15 words each. The tests were administered by a trained enumerator. The subject was requested to recall as many words as possible (the order of words was neglected), and the total scores were calculated by measuring the number of words correctly repeated. After five trials of List A, List B was introduced to the subject (interference list). Immediately after the administration of List B, the subject was asked to recall List B without it being repeated back by the enumerator (short recall). After a delay of 30 min, the subject was asked to repeat List A (long recall). The test-retest reliability of the RAVLT test was 0.56 to 0.70.[14]

Short-term and Working Memories

The Digit Span test comprises two sections, including Digit Span Forward (to measure the capacity to recall numbers in the order of the presentation) and Digit Span Backward (to measure the capacity to recall words in reverse from the order of presentation). Digit Span Forward and Backward consist of sets of numbers of

the same length, and the length increases with every set. It was administered using standard instructions. Each correctly answered test was then recorded. The final score was calculated by measuring the maximum length of at least one correct trial. The discontinuation rule was applied when the subject was unable to repeat at least one of the trials of a set of similar length numbers. The test-retest reliability for the Digit Span test was 0.598 to 0.891.[15]

Statistical Analysis

The data obtained were analyzed using IBM Statistical Package for Social Science version 25.0 with a significant $p < 0.05$. Descriptive statistics were employed to determine the sociodemographic data and the level of Quran memorization. Partial Pearson correlation was used to determine the correlation between the level of IQ, memory status, and Quran memorization by controlling several factors, such as age, scores on memorizing tests, years of studying in schools, and academic background. The calculation of the effect size from the value of coefficient determination (R^2) was used to measure the amount of variability in one variable that was shared by the other. The value was then converted into a percentage (multiplied by 100).[16] Meanwhile, multiple linear regression was used to analyze the relationship between short-term verbal memory, long-term verbal memory, short-term memory, working memory, score on the memorization test, and the number of pages memorized with the level of IQ.

RESULTS

Sociodemographic Distribution

The majority of the respondents were Malay (98%) and aged 11–15 years old (78.1%). A total of 30 (47%) and 34 students (53%) were selected from Schools A and B, respectively. In terms of Quran memorization levels, 23 (36%) and 21 (32.8%) students memorized 1–5 and 6–10 juz, respectively. As for 11–15 and ≥16 juz categories, both were memorized by 10 students (15.6%) (Table 1).

Level of IQ Among the Respondents

The full-scale results for all the four sub-tests revealed that tahfiz students have a low average level of IQ, with a mean of 88.06 (± 15.79). A total of 19 students (29.7%) were in the average category, whereas 14 students (21.9%) were in the low-average category. The borderline IQ level category consisted of 17 students (26.6%), and 7 students (10.9%) were in the extremely-low category (Table 1). In addition, the VCI and PRI results showed low averages. Table 2 shows the total marks obtained by the students in each subtest of WASI-11. The highest score was obtained in the block design subtest (29.72 ± 14.71), followed by vocabulary (29.11 ± 9.35), whereas the lowest score was for the matrix reasoning subtest (15.86 ± 5.41).

Comparison of IQ Level Based on the Quran Memorization Categories

One-way analysis of variance (ANOVA) was used to compare the level of IQ based on the category of Quran memorization (Table 2). The analysis showed that the highest level of IQ was observed among students who have memorized the Quran in the category of 16 and above (up to 30). However, the level of IQ revealed no significant difference ($p = 0.798$) based on Quran memorization.

TABLE 1. Socio-demographic distribution and IQ categories of the respondents (N = 64)

Socio-demographic	Frequency (%)
Age group	
≤15 years	50 (78.1)
≥16 years	14 (21.9)
Ethnic	
Malay	63 (98.0)
Indonesian	1 (2.0)
Location	
School A	30 (47.0)
School B	34 (53.0)
Level of Quran memorization	
1–5 juz	23 (36.0)
6–10 juz	21 (32.8)
11–15 juz	10 (15.6)
≥16 juz	10 (15.6)
FSIQ Category	
Very superior (≥130)	-
Superior (120–129)	3 (4.7)
High average (110–199)	4 (6.3)
Average (90–109)	19 (29.7)
Low average (80–89)	14 (21.9)
Borderline (70–79)	17 (26.6)
Extremely low (<70)	7 (10.9)

TABLE 2. Scores obtained for each subtest of WASI-11 and comparison of IQ level based on Quran memorization categories

Category	Mean ± SD
Subtest of WASI-11	
Block Design	29.72 ± 14.71
Vocabulary	29.11 ± 9.35
Matrix Reasoning	15.86 ± 5.41
Similarities	22.16 ± 7.49
Quran memorization categories	
1–5 juz	87.43 ± 12.82
6–10 juz	89.14 ± 19.12
11–15 juz	84.30 ± 14.39
≥16 juz	91.00 ± 17.20

Short-term and Long-term Verbal Memories

The means for the short-term and long-term verbal memories were 11.47 ± 2.37 and 11.28 ± 2.87, respectively. For the short-term verbal memory, the majority (n = 36, 56.3%) were in the normal category, whereby for long-term verbal memory, the majority (n = 20, 31.3%) belonged to the below-normal category (Table 3).

Table 3 also shows the analysis of the Digit Span memory test, which was used to measure the short-term and working memory levels. The mean short-term memory level was 6.13 ± 1.16, and the working memory level was 4.08 ± 0.96. For short-term memory level, the above-normal category consisted of 6 students (9%), the normal category included 53 students (83%), and the below-normal category had 6 students (8%). As for the level of working memory, 23 students (36%) were in the normal category and 41 students (12.5%) in the below-normal category.

Comparison of Memory Levels based on Quran Memorization Categories

One-way ANOVA was employed to compare the differences in memory level based on the level of Quran memorization (Table 4). The Quran memorization ≥ 16 showed the highest mean value for short-term (12.9 ± 2.18) and long-term (12.0 ± 3.43) verbal and working memories (4.5 ± 1.08). The highest mean of short-term memory was observed among the 6–10 (6.24 ± 1.37) Quran memorization category. However, no significant difference (p > 0.05) was observed in the memory level based on the level of Quran memorization.

TABLE 3. Categories of short-term and long-term verbal memories based on the RAVLT memory test and categories of short-term and working memories on the Digit Span memory test (N = 64)

Categories	Frequency (%)
Short-term verbal memory	
Very good performance	-
Good performance	-
Above normal	13 (20.3)
Normal	36 (56.3)
Below normal	11 (17.2)
Poor performance	2 (3.1)
Very poor performance	2 (3.1)
Long-term verbal memory	
Very good performance	3 (4.7)
Good performance	1 (1.6)
Above normal	8 (12.5)
Normal	6 (9.4)
Below normal	20 (31.3)
Poor performance	17 (26.6)
Very poor performance	9 (14.1)
Short-term memory	
Above normal	6 (9.0)
Normal	53 (83.0)
Below normal	5 (8.0)
Working memory	
Above normal	-
Normal	23 (36.0)
Below normal	41 (12.5)

TABLE 4. Comparison of memory status based on Quran memorization categories

Quran memorization categories	Short-term verbal	Long-term verbal	Short-term memory	Working memory
1–5 juz	11.17 ± 2.57	11.09 ± 3	6.04 ± 0.928	3.96 ± 1.022
6–10 juz	11.38 ± 2.334	11.29 ± 2.572	6.24 ± 1.37	4.05 ± 0.865
11–15 juz	10.9 ± 1.853	11.0 ± 2.944	6.0 ± 1.333	4.0 ± 0.9
≥16 juz	12.9 ± 2.183	12.0 ± 3.432	6.2 ± 1.135	4.5 ± 1.08
P	0.204	0.850	0.929	0.510

TABLE 5. Partial correlation between IQ level, memory status, and Quran memorization after controlling other factors

Variables	Level of Quran Memorization (IQ Level)	
	r	*p*
Age, scores on memorization test, years of study and academic background	0.391	0.059
Short-term verbal memory	0.064	0.768
Long-term verbal memory	0.145	0.500
Short-term memory	−0.167	0.435
Working memory	0.319	0.129

Correlation between IQ Level, Memory Status, and Quran Memorization

A partial Pearson correlation test was used to determine the correlation between the IQ and memory status with the level of Quran memorization. Factors, such as age, scores on memorization tests, years of studying in schools, and academic background, were controlled in the analysis. The results showed that the IQ level was non-significant (p = 0.059) but moderately correlated (r = 0.391) with the level of Quran memorization. The coefficient of determination or effect size calculation showed that Quran memorization shared 15.29% of the variability in the IQ level. A non-significant (p = 0.768) weak correlation was also observed between the level of Quran memorization with short-term verbal memory (r = 0.064) with the effect size of 0.4%, long-term verbal memory (r = 0.145) with the effect size of 2.1%, and working memory (r = 0.319) with effect size calculation showing that Quran memorization shared 10.1% of the variability in the IQ level. However, the short-term memory level showed a very weak and non-significant (p = 0.435) negative correlation with the level of Quran memorization (r = −0.167), with the effect size value of 2.8% (Table 5).

Factors that Influence the IQ Level

Multiple linear regression analysis was performed to determine the factors that influence the level of IQ (Table 6). A significant F (6.57) = 2.294 (p < 0.05) model was derived (IQ level = 21.24 + 1.80 verbal short-term memory − 0.44 verbal long-term memory + 1.48 short-term memory + 5.55 working memory − 0.01 number of Quran pages memorized + 0.32 memorizing Quran test score), and it accounted for 23% of IQ level variance through variables including memory level, the number of pages memorized, and memorization test score. Provided that the other influencing factors were constant, an increase of one unit of working memory was predicted to increase 5.55 units of IQ. However, this research is not a causal analysis, and the IQ level influencing Quran memorization is possible. Further studies are warranted to explain this matter.

TABLE 6. Factors that influence the IQ level

Categories	B	Beta	p
Verbal short-term memory	1.799	0.266	0.167
Verbal long-term memory	−0.438	−0.076	0.686
Short-term memory	1.480	0.105	0.387
Working memory	5.547	0.333	0.013*
Number of Quran pages memorized	−0.010	−0.097	0.427
Memorizing Quran test score	0.318	0.148	0.233
Constant	21.236	-	
R^2	0.231		

*significant at p < 0.05

DISCUSSION

This study was carried out to assess the level of IQ and memory status among students studying in tahfiz schools. The respondents were required to memorize the Quran as a part of their tahfiz education syllabus. However, no standardized non-tahfiz academic syllabus is available. The students were not compelled to learn other subjects, such as mathematics, English language, and science. This condition resulted in the difficulty of IQ level assessment. For the same reason, the relationship between academic syllabus and IQ analysis could not be performed. However, our enumerators were well trained in administrating the test to minimize biases and obtain meaningful assessments.

Memorization of the Quran increases the level of intelligence and memory status. Following this information, IQ and memory capacity have been postulated to be positively correlated with the level of Quran memorization. Thus, in this study, we attempted to explain the relationship between the habitual practice of memorizing Quran and the IQ and memory levels. In addition, the other factors that may influence this relationship, such as demographic factors and educational background, were considered. In our study, only male students were included as subjects to limit the influence of internal factors related to gender biases, such as hormonal influence.

A total of 64 male students from two schools were involved in this study, and all of them were from the same population of students from private and non-syllabus academic schools. The memorization categories of the Quran was divided into four different categories of constituents: juz 1–5, 6–10, 11–15 and, 16 and above. The purpose for such differentiation was to ensure that each category had an approximately the same number of respondents from the total sample size obtained. The majority of the respondents were in the age category of 15 years and below, and the data collection was carried out at the beginning of the year. A total of 21.9% of the participants were older students. The WASI-II IQ test showed that the students obtained a mean score of 88.06 ± 15.79. The overall scores of all four sub-tests in WASI-II were in the low-average category. In addition, the VCI and PRI results had low averages. The observed low scores could have been influenced by the respondents' basic educational background. A meta-analysis study by Ritchie & Tucher showed the beneficial effects of education on cognitive abilities or intelligence.[17] This finding can be explicated with descriptive analysis, where 26.6% of the participating students exhibited incomplete or no formal education. Basic formal school education is among the main factors that influence IQ test scores. Accumulated evidence demonstrated that education influences general intelligence or cognitive abilities.[18-20]

Hason demonstrated that students who are exposed to vocabulary at schools, peers, neighborhoods, or social media gained high scores for VCI and PRI components in WASI-II.[21] In general, a student's vocabulary becomes broader based on their daily learning. However, Flynn and Flynn disputed the influence of vocabulary and stated that extensive education and a complex culture, such as language, have an impact on one's level of intelligence.[19]

This study showed that the highest level of IQ was observed among the students who memorized the Quran in the category of juz 16 and above. In general, the brain becomes more active when memorizing words because it affects neuroplasticity of the hippocampus, which is the center of learning and memory in the brain.[20] According to Ibrahim *et al*., increasing repetitions to memorize the Quran in stages increase the cognitive abilities and memory of the hafiz gradually.[22]

The mean for the short-term verbal memory score was 11.47 ± 2.37, and the majority of the students were at least at the normal level. The students in our study showed a higher short-term verbal memory level compared with similar types of memory among the gifted Iranian students (aged between 12–14 years old).[23] This finding showed that memorization of the Quran improves the short-term verbal memory.

In addition, Lau *et al*. reported that moods can affect one's memory level, with positive moods being associated with good short-term verbal memory and fast processing speed.[24] Existing knowledge can also help the memory to process new information, where it provides a good integration structure to new information.[25] If one was to memorize new things, the process would be considered as short-term memory. According to Sulianti *et al*.,[26] short-term memory not only includes numbers but also more complex problems, such as activities involving language. However, not only the educational factor but also other variables that play an important role should be considered in determining the memory level of an individual. Despite a high level of knowledge and education, if both are not used appropriately, they would not benefit the memory level of an individual. Shing and Brod explained that activating such knowledge is important to support the brain neurocognition process.[27]

Our study showed that the level of memory based on the memorization category of the Quran resulted in a high value for the juz 16 and above category. This result indicated that a higher level of memory was obtained with a more advanced level of Quran memorization.

Working memory is important in the cognitive ability related to intelligence.[28-30] Tourva *et al*. proved that working memory is a strong predictor of crystallized and natural intelligence.[31] In addition, Schweizer *et al*. demonstrated that working memory is an important factor in studying cognitive intelligence.[32] The level of working memory can influence one's ability to receive new knowledge and skills.[34]

After the analysis of the two different tahfiz schools independently, the results showed a weak positive correlation for the level of IQ, memory, and Quran memorization. Comparatively, studies by Ibrahim *et al*. and Ismarulyusda *et al*. showed a positive correlation between IQ and memorization level of the Quran.[4, 22] Moreover, both studies included a great number of samples, and the respondents consisted of those who have memorized the Quran from the initial to the final section. Meanwhile, students in the current study focused more on the earliest verses or juz of the Quran. The initial analysis using bivariate correlation showed a very weak correlation between IQ, memory, and Quran memorization level. Further analysis using partial correlation analysis was engaged to control covariates, such as age, scores on memorization test, years of studying in tahfiz school, and academic background. The correlation coefficient for the level of IQ versus Quran memorization increased after controlling the factors. Working memory also showed improvement. However, after employing multivariate analysis, memorization of the Quran did not significantly envisage IQ. Instead, only the working memory can be used to predict the IQ of the participants.

Our group was the first to quantitatively measure and analyze the IQ, memory, and related factors among tahfiz students in Malaysia. Given that this work is a preliminary research, we expect further studies to be carried out on this particular subject. We also realized several limitations of this present study. Future studies should include both genders and perform their analysis accordingly. Tahfiz schools operate in various settings, namely, government supported, privately run, and non-governmental organization-run institutions. Further studies should systematically select these schools to ensure better representation and more generalized findings.

CONCLUSIONS

Our results did not demonstrate any significant correlation between Quran memorization and all the studied parameters. Although not significant, students who had high Quran memorization levels also revealed high IQ and memory levels. Lastly, working memory was the only influencing factor of the IQ score.

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CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

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