

Habituation-Based Method in Qur'anic Memorization at a Non-Boarding Islamic School: A Case Study of Yayasan Husnul Khatimah, Sumenep, Indonesia

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Abstract

This study examines a habituation-based method for Qur'anic memorization implemented at Yayasan Husnul Khatimah, a formal Islamic educational foundation in Sumenep, East Java, that manages four educational levels, from early childhood through senior secondary education, without operating a residential boarding structure. Using a qualitative case study design, data were collected through interviews with foundation leadership, teachers, students, and parents, supplemented by observation of recitation activities and institutional documentation. The findings show that memorization is structured around a twice-daily, six-day recitation cycle distributed across a cumulative *juz* sequence, reinforced through individual submissions every two weeks, monthly *tasmi'* sessions, and an annual *tahfidz* competition. Students and parents reported a marked reduction in the perceived effort of memorization, a pattern consistent with the reduced-effort trajectory predicted by habit-formation theory, though automaticity itself was not directly measured. The study also identifies coordination challenges in sustaining a fully cumulative habituation structure across an entire educational pathway. These findings illustrate how habituation-based *tahfidz* can be organized beyond the *pesantren* context, offering a descriptive account of how a formal, non-boarding Islamic school can cultivate sustained, low-effort Qur'anic memorization within standard instructional hours—an account whose transferability to other institutions remains to be tested through comparative research.

Keywords: habituation method; Qur'anic memorization; *tahfidz*; non-boarding Islamic school; habit formation; formal madrasah

Introduction

Qur'anic memorization (*tahfidz*) holds a central place in Indonesian Islamic education. Institutions treat it as a cognitive task and also as a means of building discipline, spiritual awareness, and moral character. Islamic boarding schools and formal madrasahs draw on a consistent set of classical methods. In *talaqqi*, students recite before a teacher who corrects them. *Tikrar* is the repeated recitation of a passage until it is retained. *Muraja'ah* is the periodic review of material already memorized. Md Yusup et al. synthesized 26 studies of *muraja'ah* among *tahfidz* students. They found that structured *muraja'ah* strengthened long-term retention when teacher training, curricular reform, and consistent institutional monitoring supported it.¹ In *tasmi'*, students recite memorized verses aloud before teachers or peers for verification. The review found that *tasmi'* was associated with more accurate pronunciation and stronger student accountability. Memorization quality therefore appears to depend on ongoing repetition combined with periodic public verification, not on any single technique. In this article, habituation translates the Indonesian pedagogical term *pembiasaan*: the deliberate, scheduled repetition of a practice until it becomes routine. It is distinct from habituation in the psychological sense of a declining response to a repeated stimulus.

This emphasis on combination has led researchers to examine how *tahfidz* methods function as an integrated instructional model. Trisnantari et al. described a habituation-based model of religious value internalization in which consistent daily practice counterbalances digital influences on students' character.² The model contributed to discipline, consistency, and moral stability, and it strengthened students' religious commitment. Nordin et al. reached a compatible conclusion for memorization in a meta-analysis. Structured and consistently applied strategies were associated with better outcomes than unstructured or self-directed approaches.³ These strategies combined repetition with teacher supervision and a supportive learning environment. Habituation,

¹ N Md Yusup, M M Abdul Rahim, and A H Borham, "Effective Strategies in Quran Memorization and Revision (Murajaah) Practices among Tahfiz Students in Malaysia: A Systematic Review," *International Journal of Modern Education* 7, no. 25 (2025): 535–54, <https://doi.org/10.35631/IJMOE.725037>.

² H E Trisnantari et al., "Internalizing Religious Values through Habituation: Strengthening Students' Character in the Digital Era," *Al-Hayat: Journal of Islamic Education* 10, no. 2 (2026): 305–22, <https://doi.org/10.35723/ajie.v10i2.284>.

³ Ossman Nordin et al., "The Art of Quranic Memorization: A Meta-Analysis," *Pertanika Journal of Social Sciences and Humanities* 31, no. 2 (2023): 787–801, <https://doi.org/10.47836/pjssh.31.2.16>.

on this evidence, is an instructional design principle. The effective programs paired repetition with supervision instead of relying on repetition alone.

Tahfidz programs nonetheless face persistent implementation problems. Al Arifi et al., conducted a systematic review of memorization instruction at the elementary level.⁴ They identified three recurring barriers: inconsistent daily practice, limited teacher capacity to sustain long-term targets across grade levels, and students' tendency to experience memorization as an imposed academic burden. This burden appears tied to the source of students' motivation. Latipah conducted a phenomenological study of Indonesian *hafizh*. Students who sustained long-term memorization relied on self-regulation grounded in intrinsic motives, such as a desire to deepen religious understanding, rather than on external pressure alone.⁵ Programs that depend mainly on extrinsic compliance may therefore be more vulnerable to this burden. Hanafi et al., further showed that self-regulated learning in Qur'anic study is effortful and socially supported.⁶ This suggests that designs that reduce the explicit self-regulatory demand on learners may also reduce the burden of memorization. A timetable slot for repetition does not by itself guarantee success. How teachers distribute, supervise, and reinforce repetition appears to decide whether it produces durable retention or repeated exposure without lasting effect.

Research on habit formation offers one explanation for how program structure might reduce this burden. Lally et al., tracked 96 participants over twelve weeks as they repeated a self-chosen eating, drinking, or exercise behavior in a stable context.⁷ Automaticity, the degree to which a person performs a behavior without conscious deliberation, rose with repetition along an asymptotic curve. Later studies identified the conditions under which this process is most likely. Stawarz et al., showed that the stability

⁴ N Al Arifi, Z Zurqoni, and R Robingatin, "Challenges in Qur'anic Memorization Learning at Elementary Schools: Systematic Literature Review," *Tafkir: Interdisciplinary Journal of Islamic Education* 7, no. 1 (2025): 188–202, <https://doi.org/10.31538/tijie.v7i1.2481>.

⁵ E Latipah, "Motives, Self-Regulation, and Spiritual Experiences of Hafizh (The Qur'an Memorizer) in Indonesia," *International Journal of Instruction* 15, no. 1 (2022): 653–72, <https://doi.org/10.29333/iji.2022.15137a>.

⁶ Y Hanafi et al., "Self-Regulation in Qur'an Learning," *Malaysian Journal of Learning and Instruction* 18, no. 2 (2021): 103–28, <https://doi.org/10.32890/mjli2021.18.2.4>.

⁷ P Lally et al., "How Are Habits Formed: Modelling Habit Formation in the Real World," *European Journal of Social Psychology* 40, no. 6 (2010): 998–1009, <https://doi.org/10.1002/ejsp.674>.

and salience of a contextual cue strongly shape whether a new routine becomes habitual.⁸ Judah et al., found that behaviors associated with perceived reward form habits more readily than neutral or aversive ones.⁹

In a randomized trial, Susman et al., showed that very brief daily “micropractice” can consolidate a new behavior. Their result suggests that habit strength depends more on regular repetition than on the length of any single episode.¹⁰ Wood synthesizes this work by describing habits as context-cued associations built through repeated, rewarded performance.¹¹ Once a stable cue reliably triggers a behavior, the behavior proceeds with little conscious deliberation. None of these studies examined religious practice. Their shared principle is that consistent, low-friction repetition within a stable routine lowers the effort a task demands.¹² This principle offers a plausible account of why habituation-based *tahfidz* is reported to reduce students' sense of burden.

Cognitive research on the timing of practice complements this behavioral account. Cepeda et al meta-analyzed several hundred assessments of the distributed-practice effect.¹³ They found that spacing learning episodes over time produced much stronger long-term retention than massing the same practice into fewer sessions. Dunlosky et al., reviewed ten common learning techniques.¹⁴ They rated distributed practice and practice testing, meaning repeated low-stakes attempts at recall, among the most useful across ages and subject areas. A habituation-based *tahfidz* program shares this structure. Students recite in short episodes spread across days and weeks, and teachers check retention through periodic recall instead of intensive sessions. Evidence from Qur'anic

⁸ K Stawarz et al., “What Influences the Selection of Contextual Cues When Starting a New Routine Behaviour? An Exploratory Study,” *BMC Psychology* 8, no. 1 (2020): 29, <https://doi.org/10.1186/s40359-020-0394-9>.

⁹ G Judah et al., “Exploratory Study of the Impact of Perceived Reward on Habit Formation,” *BMC Psychology* 6, no. 1 (2018): 62, <https://doi.org/10.1186/s40359-018-0270-z>.

¹⁰ E S Susman et al., “Daily Micropractice Can Augment Single-Session Interventions: A Randomized Controlled Trial of Self-Compassionate Touch and Examining Their Associations with Habit Formation in US College Students,” *Behaviour Research and Therapy* 175 (2024): 104498, <https://doi.org/10.1016/j.brat.2024.104498>.

¹¹ W Wood, *Good Habits, Bad Habits: The Science of Making Positive Changes That Stick* (Farrar, Straus and Giroux, 2019).

¹² Lally et al., “How Are Habits Formed: Modelling Habit Formation in the Real World.”

¹³ Nicholas J. Cepeda et al., “Distributed Practice in Verbal Recall Tasks: A Review and Quantitative Synthesis,” *Psychological Bulletin* 132, no. 3 (2006): 354–80, <https://doi.org/10.1037/0033-2909.132.3.354>.

¹⁴ J Dunlosky et al., “Improving Students’ Learning with Effective Learning Techniques: Promising Directions from Cognitive and Educational Psychology,” *Psychological Science in the Public Interest* 14, no. 1 (2013): 4–58, <https://doi.org/10.1177/1529100612453266>.

learning is consistent with this mapping. Sirin et al., found that memorization training was associated with gains in verbal memory, visual memory, attention speed, and semantic fluency among secondary school students.¹⁵ The finding suggests that repetitive memorization engages cognitive mechanisms beyond rote drilling.

Most research on habituation-based *tahfidz*, however, comes from Islamic boarding schools (*pesantren*) and dedicated *tahfidz* houses, where students live on site and follow a closely controlled daily routine.¹⁶ These settings favor habituation. Students stay in contact with the program through the day and evening, and continuous supervision, extended contact hours, and an immersive religious atmosphere reinforce practice.¹⁷ Some studies have examined structured memorization outside the boarding context. Kurniailah and Abu Bakar documented an organized memorization method for *santri kalong*, non-resident students who commute daily.¹⁸ Muawanah et al., evaluated a mandatory one-juz program in formal madrasahs.¹⁹ Both studies focus on a single institution type or a single memorization target. Formal non-boarding schools face constraints that boarding institutions do not. Students attend for a fixed number of hours, so memorization must fit a compressed schedule without residential supervision. The mechanisms that support habituation in *pesantren* cannot be assumed to transfer to this setting. It also remains unclear how a non-boarding institution can sustain a cumulative model, in which each level's target builds on the previous one, from early childhood to senior secondary level. A recent bibliometric mapping supports this assessment. It describes Qur'anic-memorization and cognitive-learning research as active but unevenly developed, with whole-institution and cross-level implementations under-represented.²⁰

¹⁵ S Sirin, B Metin, and N Tarhan, "The Effect of Memorizing the Quran on Cognitive Functions," *The Journal of Neurobehavioral Sciences* 8, no. 1 (2021): 22–27, https://doi.org/10.4103/jnbs.jnbs_42_20.

¹⁶ M Arif, S Dorloh, and S Abdullah, "A Systematic Literature Review of Islamic Boarding School (Pesantren) Education in Indonesia (2014-2024)," *Tribakti: Jurnal Pemikiran Keislaman* 35, no. 2 (2024): 161–80, <https://doi.org/10.33367/tribakti.v35i2.5330>.

¹⁷ S Saepudin et al., "Learning Strategies for Memorizing the Al-Qur'an of Santri at As-Salam Boarding Schools Kota Bengkulu," *At-Ta'lim: Media Informasi Pendidikan Islam* 23, no. 1 (2024): 63, <https://doi.org/10.29300/attalim.v23i1.4498>.

¹⁸ Illiyyun Kurniailah and Muhammad Abu Bakar, "Increasing the Quality of Memorizing the Qur'an for Santri Kalong through the Sisir Method," *Nazhruna: Jurnal Pendidikan Islam* 6, no. 2 (2023): 253–70, <https://doi.org/10.31538/nzh.v6i2.3378>.

¹⁹ S Muawanah et al., "Evaluating Mandatory Tahfiz Quran Program Implementation at Madrasah," *Jurnal Pendidikan Islam* 8, no. 2 (2022): 239–54, <https://doi.org/10.15575/jpi.v8i2.20330>.

²⁰ A Ardiansyah et al., "Tracing Trends in Quran Memorization and Cognitive Learning: A Bibliometric Analysis from the Scopus Database," *Pakistan Journal of Life and Social Sciences* 22, no. 2 (2024): 1493–1509, <https://doi.org/10.57239/PJLSS-2024-22.2.00105>.

Yayasan Husnul Khatimah in Sumenep, East Java, offers a case through which to examine this gap. The foundation runs four levels of formal Islamic education without a boarding facility: Raudhatul Athfal (RA), Madrasah Ibtidaiyah (MI), Madrasah Tsanawiyah (MTs), and Madrasah Aliyah (MA). It has embedded a structured memorization program across all four levels as part of its institutional vision of cultivating a Qur'anic generation (*generasi Qur'ani*). This article examines how the foundation designs and implements its habituation-based method. It focuses on how the memorization cycle is sequenced across levels, how periodic evaluation reinforces it, and how students and parents experience it in a non-boarding setting. The study offers an empirical account of how a formal madrasah system without a residential structure organizes and sustains Qur'anic memorization from early childhood to senior secondary education.

It addresses three research questions: RQ1. How is the habituation-based memorization program structured and sequenced across the four educational levels (RA, MI, MTs, and MA) within a single non-boarding foundation? RQ2. Through what mechanisms of reinforcement and evaluation is the habituation cycle sustained across the academic year and across levels? RQ3. How do students and parents experience the program, particularly the perceived effort of memorization?

Research Method

We used a qualitative case study design to examine how Yayasan Husnul Khatimah in Sumenep, East Java, implements a habituation-based Qur'anic memorization method. The case is a single non-boarding institution that runs one memorization program across four educational levels. Because the program cannot be separated from the organization that designs and sustains it, a bounded case study suits the research problem.²¹ The study aimed to describe and interpret how teachers structure and implement habituation and how students, teachers, and parents experience it. This aim places the study within the exploratory and descriptive orientation of qualitative inquiry.²²

Yayasan Husnul Khatimah is an Islamic educational foundation that manages four formal units under one institutional structure: Raudhatul Athfal (RA, early childhood), Madrasah Ibtidaiyah (MI, primary), Madrasah Tsanawiyah (MTs, junior secondary), and

²¹ R K Yin, *Case Study Research and Applications: Design and Methods* (SAGE Publications, 2017).

²² J W Creswell and C N Poth, *Qualitative Inquiry and Research Design: Choosing among Five Approaches* (SAGE Publications, 2017).

Madrasah Aliyah (MA, senior secondary). We selected the foundation because it runs a structured memorization program across all four levels without a residential boarding system (pondok pesantren). It therefore offers a setting for studying habituation-based memorization outside the boarding context, which the literature review identified as underexamined.

We interviewed 42 informants: 25 students, 7 teachers (including the foundation's chairperson), and 10 parents. We selected them purposively to cover all four levels and to capture variation in grade level and length of program participation.²³ The chairperson spoke about the program's rationale, design, and long-term direction. The other teachers each held direct responsibility for daily recitation and monthly tasmi' sessions at their level. Among students, we prioritized those who had completed at least one full academic year in the program, so they could describe the habituation cycle from experience. Parents offered a perspective from outside the classroom. Data collection ran from December 2025 to June 2026.

We collected data through semi-structured interviews, direct observation, and documentation. The interview guide covered four areas: the structure of the daily recitation cycle, the rationale for the program's design, the mechanisms for reinforcing and evaluating memorization, and informants' perceptions of the program's effects. We observed the daily reading routine at the start of lessons and the monthly tasmi' sessions. These observations recorded how teachers and students carried out the cycle in practice, so the analysis did not depend only on verbal accounts. The documents included the foundation's vision and mission, the juz distribution scheme for each grade level, curriculum documents setting memorization targets, and records of program implementation and student participation. Combining the three techniques enabled technique triangulation, and interviewing four informant groups enabled source triangulation; together, these strengthen the credibility of the findings.²⁴

We analyzed the data using the interactive model of Miles et al., which involves three concurrent activities: data condensation, data display, and conclusion drawing and verification.²⁵ During condensation, we reviewed interview transcripts, observation field

²³ M Q Patton, *Qualitative Research & Evaluation Methods: Integrating Theory and Practice*, 4th ed. (SAGE, 2015).

²⁴ Creswell and Poth, *Qualitative Inquiry and Research Design: Choosing among Five Approaches*.

²⁵ Matthew B. Miles, A. Michael Huberman, and Johnny Saldana, *Qualitative Data Analysis: A Methods Sourcebook* (Washington: SAGE Publications, 2014).

notes, and documents. We then sorted them into categories matching key aspects of the program: the structure of the memorization cycle, the distribution of material across grade levels, and the mechanisms for reinforcement and evaluation. During display, we arranged the condensed data into descriptive summaries and cross-level comparisons to reveal patterns in implementation and experience at each level. Finally, we drew tentative conclusions from these patterns and checked them against the original sources for consistency across interviews, observation, and documents.

We assessed trustworthiness against Lincoln and Guba's four criteria: credibility, transferability, dependability, and confirmability. We applied source and technique triangulation.²⁶ This meant comparing accounts across the four informant groups (foundation leadership, teachers, students, and parents) and checking interview data against observation and documents. When informants' reports differed from what we observed during recitation, we recorded the discrepancy as a point for further clarification. We did not resolve it in favor of either source, following common practice in case study research.²⁷

Results

Institutional Context and Program Enrollment

In the 2025/2026 academic year, Yayasan Husnul Khatimah managed four levels of formal Islamic education, from early childhood through senior secondary level, with a combined enrollment of 303 students distributed unevenly across levels, as summarized in Table 1. The distribution shows that enrollment is concentrated most heavily at the primary level (MI), which also carries the widest range of memorization targets among the four levels, spanning from Juz 30 mastery in the early grades to Juz 2 by the end of the sixth grade.

Table 1
Number of Students by Educational Level at Yayasan Husnul Khatimah

Educational Level	Grade Range	Number of Students	Percentage of Total
RA (Raudhatul Athfal)	Early childhood	41	13.5%
MI (Madrasah Ibtidaiyah)	Grades 1 to 6	157	51.8%
MTs (Madrasah Tsanawiyah)	Grades 7 to 9	60	19.8%
MA (Madrasah Aliyah)	Grades 10 to 12	45	14.9%

²⁶ Yvonna S Lincoln and Egon G Guba, *Naturalistic Inquiry* (sage, 1985).

²⁷ Yin, *Case Study Research and Applications: Design and Methods*.

Total	303	100%
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Structure of the Memorization Program Across Educational Levels

The foundation's memorization program is organized as a cumulative sequence, in which each educational level is assigned a specific portion of the Qur'an to master before progressing to the next stage. At the RA level, memorization begins with 13 short surahs from the final section of the Qur'an (Juz 30), starting with At-Takatsur and concluding with An-Nas. This target is continued and completed during the first two years of MI, after which students proceed level by level through consecutive juz, culminating in Juz 8 by the final year of MA. The full distribution is presented in Table 2.

Table 2
Qur'anic Memorization Targets by Grade Level

Level	Grade	Memorization Target	Scope
RA	Early childhood	13 short surahs (At-Takatsur to An-Nas)	Part of Juz 30
MI	Grade 1	13 surahs (Al-Fajr to Al-Qari'ah)	Continuation of Juz 30
MI	Grade 2	11 surahs (An-Naba' to Al-Ghasyiyah)	Completion of Juz 30
MI	Grade 3 to 4	Juz 1	1 juz
MI	Grade 5 to 6	Juz 2	1 juz
MTs	Grade 7	Juz 3	1 juz
MTs	Grade 8	Juz 4	1 juz
MTs	Grade 9	Juz 5	1 juz
MA	Grade 10	Juz 6	1 juz
MA	Grade 11	Juz 7	1 juz
MA	Grade 12	Juz 8	1 juz

Until the end of the 2025/2026 academic year, the full sequential scheme in Table 2 was implemented only at the RA and MI levels. At MTs and MA, students took part in the daily recitation routine and the monthly tasmi', but the grade-specific juz targets were not yet enforced. From the 2026/2027 academic year, the scheme is being extended to MTs and MA, so the MTs and MA targets in Table 2 apply from that year. Because students entering these levels do not necessarily come from the foundation's own RA and MI units, memorization there will restart from Juz 30 and proceed through Juz 1 and Juz 2 before continuing to the juz assigned to each grade, rather than assuming prior mastery.

The Habituation Cycle

At the core of the program is a daily reading routine in which students recite Surah Yasin at the beginning of the first lesson period. This practice is intended to establish a consistent and low-effort point of contact with the Qur'an before formal instruction begins each day. For memorization purposes, the verses assigned to each grade level are recited twice a day over a six-day cycle. Within each cycle, the complete set of verses designated

for a particular grade level is read in its entirety at least once, after which the cycle is repeated continuously throughout the academic year.

Interviews with students consistently suggested that memorization occurred less as a consciously pursued activity than as an incidental consequence of the repeated routine. One MTs Grade 8 student explained, *"I don't feel like I'm memorizing. Suddenly I already know it, because it's been read every day"* (Student A, personal communication, 2026). A similar experience was described by another student, who expressed a relatively relaxed attitude toward the memorization target: *"It's ordinary, I don't memorize too seriously, but in the end I can still memorize it"* (Student B, personal communication, 2026). A third student described extending the routine into her own time outside school by recalling the verses at home: *"At night I briefly recall the verses read at school, almost every night"* (Student C, personal communication, 2026). This account suggests that, for at least some students, the school-based habituation cycle had begun to develop into a self-initiated review practice beyond formal instructional hours.

Another student offered a more explicit interpretation of the program, distinguishing between memorization as a formal objective and reading as the primary routine: *"I see this less as a memorization program and more as a reading habituation program, but because it's read so often, in the end I memorize it too"* (Student D, personal communication, 2026). Taken together, these accounts indicate that students with different levels of involvement, ranging from routine exposure to active review at home, described a broadly similar experience of memorization. Rather than being experienced primarily as a demanding and deliberate task, memorization emerged gradually through repeated exposure embedded in the daily learning routine.

Parents provided a complementary perspective, particularly concerning the relatively low-pressure nature of the program. One parent observed, *"My child doesn't seem to feel burdened memorizing the Qur'an since the daily recitation habit started"* (Parent 1, personal communication, 2026). Another parent described deliberately limiting the amount of memorization-related pressure placed on her child while noting that the expected target was nevertheless achieved: *"I don't force my child to memorize too much, because they still need to study other subjects. But my child has memorized what is required and it's on target"* (Parent 2, personal communication, 2026). A third parent similarly associated the habituation approach with sustained engagement, stating, *"I see*

that this habituation program doesn't make my child bored” (Parent 3, personal communication, 2026).

Teachers' accounts indicate that this low-pressure orientation was not incidental but reflected a deliberate pedagogical stance shared across the teaching staff. One teacher explained the institutional basis of the approach: *“This program is a decision of the foundation, and almost all teachers agreed with it”* (Teacher 2, personal communication, 2026). This statement suggests that the habituation-based design was adopted as a collective institutional commitment rather than as an isolated practice initiated by individual teachers. Another teacher articulated the underlying pedagogical rationale more explicitly: *“We don't push the children too hard to memorize. What matters is that they read every day and all students bring their Qur'an. I believe that once it has been read repeatedly, they will memorize it on their own”* (Teacher 3, personal communication, 2026).

Across the three informant groups, the program was thus described as a low-pressure routine in which repetition takes precedence over pressure to meet targets. Its pedagogical logic is that consistent exposure to the same material within a stable daily routine gradually turns repeated reading into retained knowledge, making memorization an accumulated outcome of habituation instead of an immediate instructional demand.

Reinforcement and Evaluation Mechanisms

Beyond the daily recitation cycle, the program incorporates several mechanisms intended to reinforce retention and verify progress, summarized in Table 3.

Table 3

Reinforcement and Evaluation Mechanisms of the Habituation-Based Method			
Mechanism	Frequency	Description	Primary Purpose
Daily recitation (Surah Yasin)	Daily	Read collectively at the start of the first lesson period	Establishing routine contact with the Qur'an
Twice-daily verse recitation cycle	Twice daily, repeated over a 6-day cycle	Assigned verses for each grade level recited repeatedly throughout the year	Reducing perceived effort through distributed repetition
Individual memorization submission (setoran)	Every two weeks	Students recite newly assigned verses individually to their supervising teacher	Monitoring individual progress and accuracy
Tasmi'	Monthly	Students recite their cumulative memorization aloud before teachers and peers	Reviewing and consolidating memorization from previous levels

<i>Tahfidz</i> competition (lomba <i>tahfidz</i>)	Annually, before haflatul imtihan	Students compete in reciting memorized material	Motivating sustained achievement and celebrating progress
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Taken together, these mechanisms distinguish the program's evaluation structure from a single end-of-term assessment. Instead, verification is distributed across the academic year, with the biweekly *setoran* functioning as a short-interval check on individual accuracy, the monthly *tasmi'* functioning as a longer-interval review of cumulative memorization from earlier grades, and the annual competition functioning as a culminating, motivational event held in conjunction with the *haflatul imtihan* closing ceremony.

Institutional Rationale for the Program

When asked about the motivation behind the program's design, the foundation's chairperson situated the initiative within a broader concern about children's relationship with technology: the program was developed so that, amid the pressures of technology, children would still grow into individuals who love the Qur'an (Chairperson, personal communication, 2026). This framing positions the habituation-based method not simply as an academic memorization target, but as a deliberate response to a perceived risk that daily engagement with digital devices could displace children's engagement with religious practice, making a low-friction, repetition-based routine a way of maintaining that engagement without requiring additional instructional time beyond what the school day already provides.

Discussion

The discussion first addresses how students and parents experience the program (RQ3), then the mechanisms that sustain it (RQ2), and then its structure across levels (RQ1), which raises two further issues: its viability without a boarding structure and the discontinuity between levels. A final section considers the institutional framing of habituation as a protective practice.

Habituation and the Reduction of Perceived Memorization Effort

Addressing RQ3, the most salient finding is that students' accounts match the trajectory predicted by habit-formation research. Student A reported that “suddenly I already know it,” and Student D described the program as “a reading habituation program” in which memorization followed “because it's read so often.” Both accounts

describe reduced perceived effort, not a directly observed change in automaticity. Habit-formation theory would attribute such reports to the gradual rise in automaticity that Lally et al. documented as repetition accumulates in a stable context; because this study measured perceptions only, the reports are consistent with such a process but do not demonstrate it.²⁸ Alternative explanations also remain open: because the program is an explicit institutional priority, students' accounts may partly reflect social desirability, lowered expectations, or habituation in the psychological sense of reduced attention to a familiar task. Behavioral or psychometric measures are needed to test the proposed mechanism.

What lends the interpretation some weight is that the reduced-effort framing was echoed independently by teaching staff. Teacher 3 described the pedagogical logic in near-identical terms, placing the emphasis on consistent daily reading not on active memorization effort, on the expectation that “*once it has been read repeatedly, they will memorize it on their own*” (Teacher 3, personal communication, 2026). The convergence between learner and instructor accounts suggests that the reduced sense of effort was not merely an individual impression but reflected a shared understanding of how the program was intended to function. The parental accounts reported in the findings point in the same direction, and are consistent with evidence that parents are drawn to *tahfidz* provision they perceive as manageable and well-supported rather than onerous.²⁹ Crucially, although students experienced memorization as incidental, the conditions producing it were deliberately engineered into the timetable through the twice-daily, six-day recitation cycle, so that the foundation's program operates as an applied instance of habit-formation principles translated into a specific pedagogical structure.

This structure aligns closely with what the cognitive literature identifies as effective for durable learning. The six-day cycle distributes a grade level's assigned verses across many short sessions instead of a few intensive sittings, an arrangement that instantiates the distributed-practice effect established meta-analytically by Cepeda et al.,³⁰ and

²⁸ Lally et al., “How Are Habits Formed: Modelling Habit Formation in the Real World.”

²⁹ N H Hamzah et al., “Empowering Tahfiz Education in Malaysia: Insights into the External Factors Driving Parental Preferences,” *Asia Pacific Journal of Educators and Education* 39, no. 2 (2024): 5–37, <https://doi.org/10.21315/apjee2024.39.2.2>.

³⁰ Cepeda et al., “Distributed Practice in Verbal Recall Tasks: A Review and Quantitative Synthesis.”

identified by Dunlosky et al.³¹ as one of the highest-utility learning techniques. The biweekly *setoran* and monthly *tasmi'*, in turn, function as recurring low-stakes recall events, mirroring the retrieval-practice strategy that the same review found robustly beneficial for retention, and that Brown et al., synthesize for practitioners as the counter-intuitive principle that effortful, spaced recall produces more durable learning than repeated rereading.³² Comparative work on Indonesian *tahfidz* likewise finds that memorization outcomes track the pattern in which material is sequenced and revisited rather than the volume of material assigned.³³ Read together, these correspondences suggest that the program's apparent effectiveness is not incidental to its scheduling but a product of it: the temporal design of the routine, not merely the quantity of repetition, is doing the pedagogical work. This is also consistent with more recent behavioral findings that habit strength depends on the regularity rather than the duration of repetition,³⁴ and on the stability of the contextual cue to which a behavior is anchored,³⁵ the fixed opening of the school day.

The cognitive plausibility of the mechanism is further supported, though not proven, by evidence that Qur'anic memorization engages genuine cognitive processes. Sirin et al., reported gains in verbal memory, attention, and semantic fluency following memorization training in secondary students;³⁶ Dimyathi et al., linked targeted working-memory strategies to improved memorization and retention;³⁷ and Slamet reported cognitive gains associated with memorization at the kindergarten level, the same developmental stage as the foundation's RA cohort.³⁸ These studies vary in design and sample size-Slamet's, in particular, rests on a very small kindergarten sample-so they are

³¹ Dunlosky et al., "Improving Students' Learning with Effective Learning Techniques: Promising Directions from Cognitive and Educational Psychology."

³² P C Brown, H L Roediger III, and M A McDaniel, *Make It Stick: The Science of Successful Learning* (Belknap Press of Harvard University Press, 2014).

³³ Ermis Suryana et al., "Exploring Memorization Patterns in the *Tahfidz* and Tarjamah Qur'an Programs," *Jurnal Pendidikan Islam* 10, no. 2 (2024): 375–86, <https://doi.org/10.15575/jpi.v10i2.29969>.

³⁴ Susman et al., "Daily Micropractice Can Augment Single-Session Interventions: A Randomized Controlled Trial of Self-Compassionate Touch and Examining Their Associations with Habit Formation in US College Students."

³⁵ Stawarz et al., "What Influences the Selection of Contextual Cues When Starting a New Routine Behaviour? An Exploratory Study."

³⁶ Sirin, Metin, and Tarhan, "The Effect of Memorizing the Quran on Cognitive Functions."

³⁷ Mohammad Syairozi Dimyathi et al., "The Cognitive-Pedagogical Link: Working Memory Strategies and the Enhancement of Qur'an Memorization and Retention," *Jurnal Pendidikan Islam* 11, no. 2 (2025): 376–89, <https://doi.org/10.15575/jpi.v11i2.44968>.

³⁸ S Slamet, "The Effect of Memorizing Quran on the Children Cognitive Intelligence," *Humanities and Social Sciences Reviews* 7, no. 3 (2019): 571–75, <https://doi.org/10.18510/hssr.2019.7384>.

best read as converging suggestive evidence rather than as decisive proof. Nonetheless, taken together with Rijan et al.'s finding that comprehension bears only a weak relationship to memorization performance, they support the interpretation that habituation-based memorization proceeds primarily through repeated, distributed exposure rather than requiring prior deep comprehension.³⁹ This is not to deny that contemporary *tahfidz* curricula increasingly aspire to move beyond rote retention toward higher-order engagement with the text;⁴⁰ rather, it locates the specific mechanism at work in the present program in distributed repetition, with comprehension developing alongside rather than as a precondition. Finally, the reduced-effort experience may reflect a reduction in the explicit self-regulatory demand placed on students: where sustaining memorization ordinarily requires effortful self-regulation,⁴¹ embedding recitation in a fixed institutional routine shifts part of that regulatory burden from the individual learner to the structure of the school day.

Distributed Evaluation as a Sustaining Mechanism

Addressing RQ2, the reinforcement mechanisms the biweekly *setoran*, the monthly *tasmi'*, and the annual competition-correspond closely to the pattern Md Yusup et al., identified across the *tahfidz* literature, in which sustained *muraja'ah* supports long-term retention while *tasmi'* strengthens accuracy and accountability.⁴² In the present case these functions operate at different time scales: the biweekly *setoran* is a short-interval check on individual progress, while the monthly *tasmi'* consolidates memorization carried over from earlier grades. Beyond spacing, the annual competition and the public nature of *tasmi'* introduce a reward and accountability dimension that behavioral research associates with stronger habit formation: Judah et al. found that behaviors linked to perceived reward form into habits more readily than neutral ones, which offers a plausible reading of why periodic public recitation and competition, rather than repetition alone, appear to sustain engagement.⁴³ This layered structure distributes the monitoring of

³⁹ M H M Rijan et al., "The Influence of Quran Understanding on Tahfiz Students Memorization Performance," *Global Journal Al-Thaqafah*, 2025, 57–69, <https://doi.org/10.7187/GJATSI102025-4>.

⁴⁰ M F M Saad et al., "Minds Illumination: Exploring Higher Order Thinking Skills (HOTs) in the Tahfiz Integrated Curriculum," *Islamiyyat* 47, no. 1 (2025): 96–106, <https://doi.org/10.17576/islamiyyat-2025-4701-08>.

⁴¹ Hanafi et al., "Self-Regulation in Qur'an Learning"; Latipah, "Motives, Self-Regulation, and Spiritual Experiences of Hafizh (The Qur'an Memorizer) in Indonesia."

⁴² Md Yusup, Abdul Rahim, and Borham, "Effective Strategies in Quran Memorization and Revision (Murajaah) Practices among Tahfiz Students in Malaysia: A Systematic Review."

⁴³ Judah et al., "Exploratory Study of the Impact of Perceived Reward on Habit Formation."

retention across several recurring checkpoints rather than concentrating it in a single high-stakes assessment, which may help explain why the program has been sustained through the primary years. This reading is consistent with curriculum-evaluation research showing that *tahfidz* effectiveness depends on structured sequencing and periodic verification built into the program design rather than on repetition alone.⁴⁴ A plausible avenue for further strengthening such reinforcement, not present in the case examined here, is the use of gamified revision tasks, which have been associated with improved engagement in *muraja'ah*.⁴⁵

The durability of this evaluation structure also appears to rest on institutional legitimacy rather than individual teachers' discretion. As Teacher 2 explained, the program “is a decision of the foundation, and almost all teachers agreed with it” (Teacher 2, personal communication, 2026), suggesting that the *setoran* and *tasmi'* schedules were adopted as shared policy rather than maintained as informal classroom habits. This lends qualified support to Trisnantari et al.'s observation that habituation grounded in continuous, low-pressure routines tends to produce more consistent outcomes than periodic, high-intensity intervention, while adding that institutional buy-in among teaching staff may be a precondition for that consistency.⁴⁶

A Habituation Model Without a Boarding Structure

Addressing RQ1 at the institutional level, the central contribution of this study is to show that a cumulative habituation model can be organized and sustained within a non-boarding structure, a context still comparatively underexamined relative to the *pesantren*-based settings that dominate the literature.⁴⁷ Unlike boarding environments, in which continuous residential supervision and communal routines afford extended, largely

⁴⁴ A R Abd Ghani, M Huda, and N Lyndon, “Curriculum Evaluation for Tahfiz (Sciences of Memorization Education): Empirical Evidence from Private Education Institution of Johor, Malaysia,” *Journal of Curriculum and Teaching* 15, no. 2 (2026): 194–204, <https://doi.org/10.5430/jct.v15n2p194>; W M H W A Halim, M Abdullah, and S Ariffin, “Analysis of the Effectiveness of the Tahfiz Method in Quran Memorization: A Case Study,” *AlBayan* 23, no. 3 (2025): 602–25, <https://doi.org/10.1163/22321969-12342310>.

⁴⁵ A M Ahmad et al., “Diversifying Quranic Revision Methods Using Gamification-Based Teaching Material for Tahfiz Education,” *International Journal of Evaluation and Research in Education* 13, no. 2 (2024): 987–96, <https://doi.org/10.11591/ijere.v13i2.26218>.

⁴⁶ Trisnantari et al., “Internalizing Religious Values through Habituation: Strengthening Students' Character in the Digital Era.”

⁴⁷ Al Arifi, Zurqoni, and Robingatin, “Challenges in Qur'anic Memorization Learning at Elementary Schools: Systematic Literature Review.”

uninterrupted repetition,⁴⁸ the program examined here compresses habituation into two short recitation sessions within the regular school day. This constraint is not unique to Yayasan Husnul Khatimah: Indonesian madrasahs more generally must reconcile a national curriculum with religious instruction, and many resolve the resulting time pressure precisely by adopting pesantren-based or full-day boarding models.⁴⁹ Others, however, embed memorization within the ordinary school day without a residential structure—as in the day-school *tahfidz* program documented by Alwi et al., which relied on routine *muraja'ah* and *sima'i* practice—indicating that the non-boarding arrangement examined here belongs to a small but real category rather than being singular.⁵⁰ There is also evidence that integrating structured memorization into regular school hours need not come at the expense of academic attainment: Awang et al., found that a school-embedded “Plus Tahfiz” program was associated with maintained, rather than diminished, academic performance.⁵¹ Against that backdrop, sustaining a cumulative memorization sequence on a low-intensity, non-residential footing is a notable alternative rather than a routine arrangement.

That this compressed structure nonetheless produced the reduced-effort experience students and parents described invites the interpretation that the decisive ingredient in habituation-based *tahfidz* may be the consistency and predictability of the routine rather than the sheer volume of contact time. This proposition is theoretically plausible—it accords with Lally et al.'s⁵² emphasis on consistent repetition in a stable context and with Stawarz et al.'s⁵³ findings on contextual cues—and it is rendered more credible by evidence that structured memorization can succeed outside boarding settings, as in Kurniailah and

⁴⁸ Saepudin et al., “Learning Strategies for Memorizing the Al-Qur'an of Santri at As-Salam Boarding Schools Kota Bengkulu.”

⁴⁹ Aminullah Aminullah et al., “The Impact of Madrasah Integration in the National Education System on the Academic Quality of Madrasah Aliyah Alumni in South Sulawesi,” *Ulumuna* 28, no. 2 (2024): 1017–48, <https://doi.org/10.20414/ujis.v28i2.1091>; I Ihsan et al., “The Contestation of National and Religious Curricula in Indonesia's Madrasahs since the Passage of the UUSPN,” *Educational Studies* 50, no. 4 (2024): 434–47, <https://doi.org/10.1080/03055698.2021.1958757>.

⁵⁰ Toto Alwi, Kms Badaruddin, and Febriyanti, “Pelaksanaan Pembelajaran *Tahfidz* Al-Qur'an Dalam Membentuk Karakter Islami Siswa,” *Munaddhomah* 4, no. 3 (2023): 756–66, <https://doi.org/10.31538/munaddhomah.v4i3.466>.

⁵¹ A B Awang et al., “The Effectiveness of the Plus Tahfiz Programme in Strengthening Quran Memorisation and Its Impact on Students' Academic Performance,” *AlBayan* 23, no. 3 (2025): 426–46, <https://doi.org/10.1163/22321969-12342304>.

⁵² Lally et al., “How Are Habits Formed: Modelling Habit Formation in the Real World.”

⁵³ Stawarz et al., “What Influences the Selection of Contextual Cues When Starting a New Routine Behaviour? An Exploratory Study.”

Abu Bakar's⁵⁴ account of *santri kalong* who commute daily. It must nonetheless be stated clearly as a hypothesis, not a conclusion. Establishing that consistency outweighs contact time would require a comparative design contrasting boarding and non-boarding programs while holding other factors constant; the present single-site case includes no boarding comparator and therefore cannot adjudicate the trade-off. What the case does establish is an existence proof—that such a model can be built and maintained without a residential structure—together with a specific, testable claim for future comparative research. For the many formal Islamic schools in Indonesia seeking to strengthen memorization without adopting a residential system, this suggests that a carefully designed, low-intensity but highly consistent routine is at least a viable candidate, pending such comparison.

Sequential Discontinuity Across Educational Levels

The findings also expose a structural vulnerability directly relevant to RQ1. Consistent with the sustainability challenges documented by Al Arifi et al the fully sequential scheme had, until the 2025/2026 academic year,⁵⁵ been implemented only through the MI level; because students entering MTs and MA do not necessarily come from the foundation's own RA and MI units, memorization at these levels will restart from Juz 30 rather than continuing from where MI graduates leave off. This is a coherent design response to a real problem rather than an oversight, and habit theory clarifies why: habits are cue–behavior associations that decay when repetition lapses,⁵⁶ so the foundation cannot assume that incoming secondary students carry an intact memorization habit—or intact prior memorization—from schooling elsewhere. That maintaining Qur'anic memorization is difficult once learners leave a supervised, residential routine is well documented; M. R. Ahmad et al. report that university students struggle to retain earlier hifz without the sustaining structure they previously relied.⁵⁷ Restarting the sequence is, in effect, a way of rebuilding the cue behavior association from a known baseline.

⁵⁴ Kurniailah and Abu Bakar, “Increasing the Quality of Memorizing the Qur’an for Santri Kalong through the Sisir Method.”

⁵⁵ Al Arifi, Zurqoni, and Robingatin, “Challenges in Qur’anic Memorization Learning at Elementary Schools: Systematic Literature Review.”

⁵⁶ R Edgren, D Baretta, and J Inauen, “The Temporal Trajectories of Habit Decay in Daily Life: An Intensive Longitudinal Study on Four Health-Risk Behaviors,” *Applied Psychology: Health and Well-Being* 17, no. 1 (2025): e12612, <https://doi.org/10.1111/aphw.12612>.

⁵⁷ M R Ahmad et al., “The Issues and Challenges of Plus Tahfiz Students in Maintaining the Memorisation of The Quran in UiTM,” *Journal of Fatwa Management and Research* 27, no. 2 (2022): 27–36, <https://doi.org/10.33102/jfatwa.vol27no2.435>.

Framed more broadly, this is an instance of a well-documented problem in the transitions literature rather than a purely local administrative gap. Beatson et al.'s systematic review of interventions supporting the move from primary to secondary schooling found that discontinuities in curriculum, pedagogy, and institutional coordination recur across systems whenever students cross educational stages, even within a single overarching structure.⁵⁸ Read against this evidence, the coordination difficulty at Yayasan Husnul Khatimah reflects a structural feature of multi-level pathways and suggests that habituation-based programs may encounter distinct coordination challenges when extended across an entire pathway rather than confined to a single grade band a caution that qualifies the more optimistic picture offered by single-level studies.

The Institutional Framing of Habituation as Protective Practice

The chairperson's framing of the program as a response to children's growing exposure to technology adds a dimension the *tahfidz* literature has largely left implicit, treating habituation as an instructional strategy for memorization outcomes rather than as a counterbalance to competing claims on children's attention. This framing finds its closest empirical parallel in the Indonesian early-childhood context that most resembles the present case: Muthohar et al.,⁵⁹ studying teachers across twelve Islamic early-childhood institutions in Indonesia, described how educators deliberately structure and mediate children's engagement with digital media within religious routines, treating guided, bounded practice as a way of managing screen exposure rather than eliminating it. Convergent evidence from elsewhere in the region, Ford et al.'s finding that religious practice was associated with fewer psychiatric symptoms among youth in Thailand's Muslim-majority southernmost provinces-suggests that structured religious engagement can carry protective value against digital-age stressors in Southeast Asian settings comparable to Indonesia;⁶⁰ work on Muslim youth in Central Asia similarly documents

⁵⁸ R Beatson et al., "Improving Primary to Secondary School Transitions: A Systematic Review of School-Based Interventions to Prepare and Support Student Social-Emotional and Educational Outcomes," *Educational Research Review* 40 (2023): 100553, <https://doi.org/10.1016/j.edurev.2023.100553>.

⁵⁹ S Muthohar et al., "Guided Digital Mediation in Early Childhood Islamic Education: Multisensory Approaches to Religious Identity Formation," *Qualitative Research Journal*, 2026, 1–15, <https://doi.org/10.1108/QRJ-12-2025-0456>.

⁶⁰ K Ford et al., "Mental Health among Youth in a Conflict Area: A Cross-Sectional Study of the Effects of Parental Absence, Social Media, Family Support and Religious Practice on Psychiatric Symptoms in Thailand's Southernmost Provinces," *Conflict and Health* 20, no. 1 (2026): 12, <https://doi.org/10.1186/s13031-026-00750-z>.

religious engagement operating alongside, rather than being simply displaced by, social media use.⁶¹ A large US survey by Upenieks and Hill reported an analogous pattern, in which religious participation, but not religious identification alone, buffered against the adverse effects of heavy social media use; we cite this as convergent evidence while noting that its US, survey-based, non-Muslim-majority context limits direct transfer to an Indonesian madrasah, and we do not treat it as establishing the mechanism here.⁶²

Understood in this light, the twice-daily recitation cycle functions not only as a memorization technique but as a mechanism for preserving a minimum, non-negotiable daily point of contact with the Qur'an within a day that might otherwise be increasingly occupied by digital media. This reading should be treated as an institutional rationale articulated by the foundation's leadership, not as an empirically established causal claim, since the study did not measure students' technology use or attempt to isolate its effect on memorization. It nonetheless points to a fruitful direction for future research into whether, and how, institutions design habituation-based religious practices as protective routines—an interpretation that resonates with Trisnantari et al.'s argument that religious habituation can serve as an intentional counterweight to the risks of unsupervised digital exposure rather than functioning merely as an instructional device.

Limitations

This study has five limitations. First, as a single-site qualitative case study, it reflects the institutional conditions of Yayasan Husnul Khatimah. Its findings should not be generalized to other non-boarding Islamic schools without comparative research. Second, we relied on informants' self-reports and institutional records and did not measure memorization accuracy or retention with standardized instruments. Quantitative memorization scores therefore cannot corroborate claims of reduced perceived burden. Third, the fully sequential memorization scheme had not yet been extended to the MTs and MA levels during data collection (December 2025–June 2026); this extension began in the 2026/2027 academic year. We could not observe the outcomes of this expanded structure, and longitudinal research should examine them. Fourth, the study had no boarding comparison case. We therefore present the interpretation that routine

⁶¹ B Shabdan, "Social Media and Religious Engagement among Muslim Youth in Kyrgyzstan," *Central Asian Survey*, 2026, <https://doi.org/10.1080/02634937.2026.2623158>.

⁶² L Upenieks and T D Hill, "Religion and Social Media Use: Protective Factors for Youth Well-Being in the Digital Age?," *Journal of Psychology and Theology* 54, no. 2 (2026): 109–28, <https://doi.org/10.1177/00916471251404432>.

consistency matters more than contact time as a hypothesis for comparative testing, not as a demonstrated result. Finally, informants who knew the program was an institutional priority may have described their experiences favorably.

Conclusion

This study examined a habituation-based Qur'anic memorization method at Yayasan Husnul Khatimah, a non-boarding Islamic foundation in Sumenep that manages four levels from early childhood to senior secondary education. The program runs a twice-daily, six-day recitation cycle, reinforced by submissions every two weeks, monthly tasmi' sessions, and an annual competition. Students and parents reported that memorization demanded less effort over time. This pattern matches the reduced-effort trajectory that habit-formation theory predicts. It suggests that participants experience memorization as a by-product of a deliberately designed routine, not as the result of direct instruction. We did not measure automaticity, so it remains a hypothesized mechanism.

The study makes two contributions. Theoretically, it applies habit-formation principles, which have rarely been used to explain *tahfidz*, to a non-boarding madrasah that spans an entire educational pathway, whereas research on habituation-based *tahfidz* has focused mainly on pesantren. It also generates a testable proposition: routine consistency, more than extended residential contact time, may drive habituation-based memorization. Testing this proposition requires comparing boarding and non-boarding programs. Practically, the study describes one workable program structure that other non-boarding Islamic schools may adapt, though its transferability remains untested. The findings also reveal coordination problems in sustaining a cumulative structure across levels, especially when incoming secondary students have no prior exposure to the program. Comparative and longitudinal research across multiple institutions is needed to assess how far these findings apply beyond this case.

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Ethics Statement

This study received research approval from Yayasan Husnul Khatimah, Sumenep (No. 036/YAHOSMAH/VI/2026). All adult informants gave informed consent before their interviews. Parents or guardians gave consent for students under 18 to take part, and the students themselves gave verbal assent. Participation was voluntary, and informants could withdraw at any time. To protect confidentiality, we anonymized all informants in transcripts and in this article. Because the foundation is named, its chairperson is identifiable by role and consented to being described in that role.

Conflict of Interest Statement

The authors declare no conflict of interest.

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Author Contributions

Zatmiyatul Ummah: Conceptualization, Methodology, Investigation, Writing-original draft. Syamsul Rijal: Supervision, Formal analysis, Data curation, Writing – review & editing. Amiruddin: Supervision, Validation, Writing – review & editing. All authors read and approved the final manuscript.

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During the preparation of this work, the authors used Claude to improve the language and readability of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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