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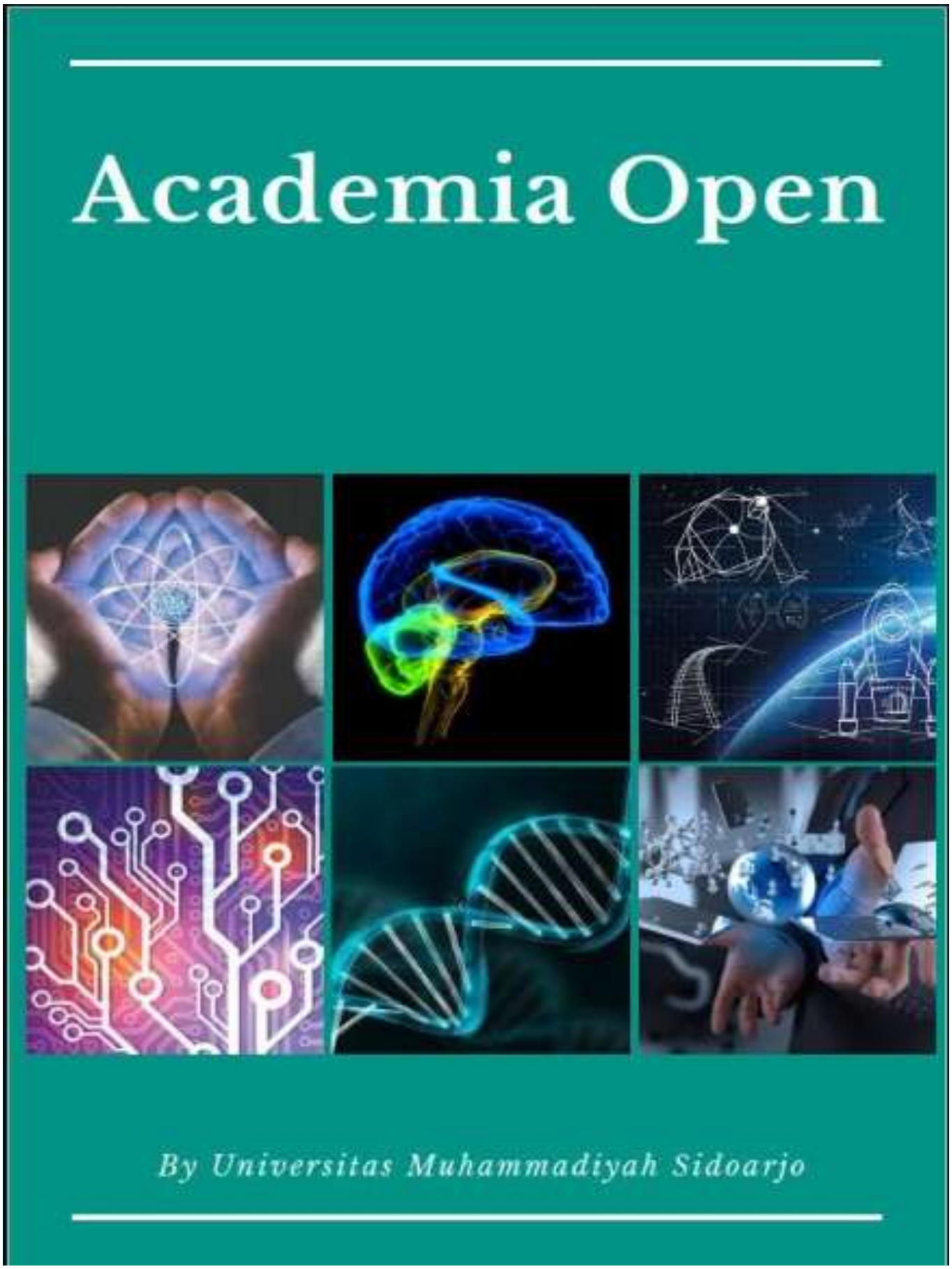

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Arabic Letter Wheel Accommodates Hijaiyah Decoding In Learners With Motor Impairments: Roda Huruf Arab Mengakomodasi Dekode Hijaiyah Pada Pembelajar Dengan Gangguan Motorik

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Abstract

General Background Inclusive education demands equal access to quality educational services for all individuals, including those with physical limitations. **Specific Background** Conventional Islamic education requires fine motor skills for recognizing and pronouncing alphabetic symbols, creating significant learning barriers for children born with severe limb deficiencies. **Knowledge Gap** Existing research predominantly focuses on digital or interactive learning tools that still require manual dexterity, leaving a lack of empirical evidence on accessible pedagogical interventions specifically designed for individuals lacking upper and lower limbs. **Aims** This study applies a Single Subject Research approach with an A-B-A design to evaluate a novel rotational instrument as an adaptive instructional medium for a student with congenital physical disabilities. **Results** The adaptive rotational mechanism significantly elevated the participant's orthographic recognition performance from a 59.48% baseline to 62.58% during the intervention, ultimately reaching a highly stable 71.03% in the post-intervention maintenance phase. **Novelty** This research uniquely demonstrates that integrating multisensoryvisual and auditorystimuli through amotor-independentmechanicaltool can successfully replace traditional dexterity-reliant methods in special education. **Implications** Rural inclusive schools must adopt accessible, game-based interventions to ensure equitable participation, long-term skill retention, and independent literacy acquisition for marginalized students with severe physical limitations.

Highlights

- An interactive multisensory pedagogical instrument significantly elevates early script recognition without requiring manual dexterity.
- Quantitative assessments confirmed stable long-term retention of alphabetical mastery following the withdrawal of the intervention.
- Accessible game-based instructional strategies foster independent education and active engagement within rural inclusive environments.

Keywords

Inclusive Education; Congenital Physical Disability; Multisensory Learning; Single Subject Research; Maintenance Effect

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INTRODUCTION

Inclusive education focuses on the equal right of every child to have access to quality educational services, including children with disabilities (Hidayat & Nuruzzaman, 2024). In rural areas, the implementation of inclusive education remains a major challenge and a social responsibility because of the geographical isolation, limited educational resources, socio-economic disparities, and inadequate infrastructure that usually impede equal access to learning opportunities (Hasmyati et al., 2023). This is in line with John Rawls' theory of justice, which claims that equal educational opportunities are a fundamental principle of social justice and should be ensured irrespective of a person's physical condition or social background (Rawls, 1997; Yang, 2024). Therefore, the delivery of inclusive education in rural areas should be seen not merely as an administrative policy but as an ethical and structural commitment to ensuring that every learner receives meaningful and equitable educational experiences. In the context of Islamic education, the capability of recognizing and reading the Hijaiyah letters is fundamental for learning to read the Qur'an and is the initial step in the development of broad Islamic literacy. By mastering the letters of the Hijaiyah, students are able to move forward to proper recitation of the Qur'an, to understand the principles of tajwid, and to participate more effectively in religious learning activities. But this simple learning process presents a major challenge for children with congenital physical disabilities, particularly those born without upper and lower limbs. In conventional Hijaiyah instruction, fine motor activities such as writing, pointing to letters, manipulating flashcards, or holding the learning materials are often used, which are not accessible for learners with severe physical impairments (Dahbi et al., 2024). Consequently, these students frequently encounter barriers not in their intellectual capacities but in the limited accessibility of the existing instructional media. Such conditions highlight the urgent need for pedagogical innovations that are adaptive and can provide equitable learning opportunities while maintaining the principles of inclusive education.

One of the instructional innovations that has great potential to solve these challenges is the Arabic Letter Wheel learning media. This educational media is designed to assist in the recognition of the letters of the Hijaiyah, with a learning method that is visual, interactive and easy to access. The Arabic Letter Wheel aids learners to identify letter shapes, learn about alphabetical sequences and develop skills in visual discrimination, using an adaptive rotational mechanism that can be operated with very little physical movement or with help if needed, rather than fine motor manipulation (Mr & Hanum, 2025). This mode of instruction makes it more accessible for students with severe physical disabilities by minimizing the reliance on the traditional motor-dependent activities but at the same time provides for the active involvement of learners in the instructional process. Empirical studies have shown that interactive instructional media are effective in improving students' ability to recognize and read Hijaiyah letters (e.g. Efforts to Improve the Ability to Recognize Hijaiyah Letters through Interactive Game Methods, Marwiyah et al. (2025) stated that interactive learning activities such as letter cards, puzzles, and Hijaiyah guessing games had a significant impact on improving students' reading performance. Average achievement score increased from 55 to 85, mastery learning 85%. About 90% of the participants said that the interactive activity helps in learning Hijaiyah letters, and makes it fun. The findings show that game-based learning methods are effective to improve learning outcomes and student engagement in Islamic elementary education.

Similarly, Riris Wahyuningsih and colleagues (2025) found that the Hijaiyah Pop-Up Book was effective in improving the ability of children aged four to five years in recognizing and reading Hijaiyah letters. The three-dimensional visual design provided an engaging multisensory learning experience consistent with children's developmental characteristics, and the instructional support of teachers further enhanced the effectiveness of learning. The researchers concluded that the Pop-Up Book is an innovative and effective instructional medium for early childhood Islamic education. The positive impacts of technological innovations on Islamic learning have also been shown besides printed instructional media. The findings of a study conducted at Madrasah Anshoriah Al-Islamiyah, Thailand, indicated that the integration of the Iqra', Talaqqi, Musyafahah, and Tikrar (repetition) methods alongside digital technology resulted in a notable increase in the students' skill in reading the Qur'an, comprehension of Tajwid, and motivation to learn (Hasibuan, Pasaribu, & Rosmaimunah, 2025). Similarly, Ramadhani and Ali (2025) in their recent review found that different digital learning platforms such as social media, web-based learning environments, interactive educational media, audio applications, and specialized Islamic learning applications like BISA Nahwu Sharaf and Alef Education successfully created more engaging, flexible, contextualized, and interactive learning environments. These technological innovations have also been found to increase the students' motivation, participation and overall learning achievement.

These encouraging results notwithstanding, the bulk of the current literature is comprised of studies on instructional media for learners with relatively intact motor skills. Most of the interventions available, such as interactive games, pop-up books, digital applications and multimedia learning platforms, still require some level of fine motor interaction such as touching, writing, holding or manipulating learning materials. Therefore, there is very little empirical evidence regarding the media used in the learning process for learners with severe congenital physical disabilities, especially children born without both upper and lower limbs, who are only limited in participating in learning activities due to physical accessibility factors, not cognitive limitations (Nugraha & Mardiani, 2023; Riris, Putri, & Ariani, 2025). Furthermore, there is still a limited number of research on adaptive islamic learning media in inclusive schools in rural areas. This gap indicates the need for empirical studies on instructional media that can remove the dependence on fine motor skills and maximize the accessibility, independence, and meaningful participation in religious learning. Based on these considerations, this study aims to fill an important gap in inclusive Islamic education by investigating the effectiveness of the Arabic Letter Wheel as an adaptive instructional medium to improve the Hijaiyah letter reading skills of students with congenital physical disabilities. The Arabic Letter Wheel is designed to reduce reliance on fine motor skills, facilitate active visual involvement, and promote independent learning, as opposed to traditional tools of learning. Thus, the present study aims to provide empirical evidence on the effectiveness of this adaptive learning medium in supporting accessible, meaningful, and equitable Hijaiyah literacy instruction for students with severe physical disabilities in rural inclusive educational settings.

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METHOD

This research used the method of experimentation with a Single Subject Research (SSR) design with the design of A – B – A . This research was aimed to examine the effectiveness of the Arabic Letter Wheel to improve the ability to read the Hijaiyah letters of students with congenital physical disabilities. The SSR design was chosen because it allows for repeated measurements of the same participant's performance across three sequential phases: Baseline 1 (A_1), Intervention (B), and Baseline 2 (A_2). The design helps researchers to establish causation between the intervention and the participant's reading performance while reducing the influence of external variables. The research was held in January to April 2026 at SDN 009 Muara Ancalong, East Kutai Regency, East Kalimantan. The participant was a third grade student with a congenital physical disability, in which he had no upper limbs. The student's cognitive and language skills were age-appropriate. However, the student's fine motor activity difficulties restricted him to participate in conventional Hijaiyah reading instruction. The initial evaluation indicated that the participant was able to recognize some of the Hijaiyah letters when presented in sequence, but had difficulty in identifying letters presented randomly, discriminating visually similar letters, and reading syllables or simple words independently. The intervention used the Arabic Letter Wheel, an adaptive instructional medium to help the children visually recognize and read the Hijaiyah letters with the help of the rotating wheel. In the intervention phase, the learning activities incorporated visual, auditory, kinesthetic, and tactile stimulation to integrate the multisensory principles. The participant watched the letters on the wheel, heard their pronunciations, moved the rotating mechanism in an adaptive way according to the participant's physical condition, and verbally pronounced the resulting letter combinations. The learning activities were carried out systematically from recognizing individual letters to reading syllables and simple Hijaiyah words.

Data were collected through repeated oral reading tests, administered in each phase of the research. Reading performance was assessed on a scale of 1 (unable to read correctly with assistance) to 5 (reading independently, accurately and fluently without hesitation). The assessment was done based on three indicators, namely (1) reading Hijaiyah syllables with basic vowel marks (harakat), (2) reading two-letter open words, and (3) reading three-letter open words. The instructional media, learning materials and assessment instruments were validated by experts before implementation to ensure content validity and instructional appropriateness. Descriptive statistics and visual analysis were used to analyze the data, according to standard procedures of Single Subject Research. The analysis consisted of within-condition analysis (changes in trend, stability, variability, and level within each phase) and between-condition analysis (changes across the A1, B, and A2 phases). Changes in performance trends, level differences, stability, and data overlap were used to evaluate the effectiveness of the intervention across research phases.

RESULT AND DISCUSSION

The subject of this study was a third grade student at SDN 009 Muara Ancalong who was physically disabled since birth, both of his upper limbs were missing. The participant showed significant limitations in activities requiring fine motor skills such as writing, pointing, and manipulating learning materials; however, cognitive development and verbal communication skills were comparable to those of typically developing peers. Based on the results of the school's assessment and the initial observation of the researcher, the participant had achieved elementary recognition of some of the Hijaiyah letters when presented sequentially. However, the participant still experienced difficulties in recognizing the letters presented randomly, distinguishing between letters with similar appearance, and able to read Hijaiyah syllables and words fluently. The assessment also revealed visual perception problems, namely visual memory and visual discrimination problems, as well as problems with establishing accurate letter-sound correspondence that affected reading speed despite good receptive and expressive language skills. The participant showed avoidance behaviors when faced with difficult tasks on an emotional level, but became very motivated and actively engaged when proper instructional support was provided. The above characteristics show the importance of using adaptive, interesting, and accessible learning media in order to encourage meaningful learning and improve the reading skills of Hijaiyah letters for students with severe physical disabilities.

Baseline 1 (A1)

Baseline 1 (A1) phase was conducted to find out the initial ability of the participant to read Hijaiyah letters before the Arabic Letter Wheel intervention was introduced. Data were gathered over four sessions under naturalistic testing conditions, with no intervention or assistance by the researchers. The assessment used three indicators of reading, namely: reading Hijaiyah letters with vowel marks, reading combinations of two letters with vowel marks, and reading simple three-letter words with vowel marks. Each session contained 29 assessment items and the maximum possible score was 145. The results of phase Baseline 1 show that the participant's Hijaiyah reading ability is relatively low and there are fluctuations in the four sessions. In the first session, the participant scored 86 or 59.31%. The score decreased to 78 or 53.79% in the second session and increased to 88 or 60.69% in the third session and reached 93 or 64.14% in the fourth session. A summary of the Baseline 1 results is shown in Table 1.

Table 1. *Summary of the Participant's Hijaiyah Reading Performance during Baseline 1 (A1)*

Session	Number of Items	Maximum Score	Obtained Score	Percentage
Session 1	29	145	86	59.31%
Session 2	29	145	78	53.79%
Session 3	29	145	88	60.69%
Session 4	29	145	93	64.14%

In the first session the participant was able to read some of the Hijaiyah letters with vowel marks that were familiar, but had difficulties on identifying randomly presented letters and consistently reading letter combinations. The participant was hesitant, had a relatively long response time and showed limited confidence in answering the test items. Percentage of

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achievement under these conditions was 59.31%. In the second session, the participant's score fell to 53.79%. This decline was accompanied by reduced concentration and difficulties in distinguishing between letters with similar visual features. The participant also required repeated verbal instructions when reading two letter combinations and simple three letter words. In the third and fourth sessions, scores were gradually raised to 60.69% and 64.14%, respectively. The participant became increasingly familiar with the assessment procedures and was more responsive. However, the change observed was not large or stable enough, as no instructional intervention had been implemented at this point.

Intervention Phase (B)

The intervention phase was implemented in four sessions (Sessions 5–8) using the Arabic Letter Wheel as an adaptive instructional medium. The intervention was to improve the participant's ability to recognize, pronounce and read the Hijaiyah letters with vowel marks, two letters combination and simple three letters words. The researcher/teacher slowly turned the wheel throughout the learning activities. The participant verbally told the researcher/teacher to stop the wheel or gave a non-verbal response, such as a head movement, to decide when the wheel should stop. The participant then had to identify and say the letter or word that the wheel pointed to. The use of verbal and non-verbal responses allowed the participant to participate actively without the use of hand gestures. The intervention was comprised of visual presentation, repetition of pronunciation and progressive reading exercises. Participant learning grew from recognizing the Hijaiyah letters to reading two-letter combinations and simple three-letter words. The results obtained in the intervention phase are summarized in Table 2.

Table 2. *Summary of the Participant's Hijaiyah Reading Performance during the Intervention Phase (B)*

Session	Number of Items	Maximum Score	Obtained Score	Percentage
Session 5	29	145	74	51.03%
Session 6	29	145	81	55.86%
Session 7	29	145	102	70.34%
Session 8	29	145	106	73.10%

At the beginning of the intervention the participant scored 74 or 51.03%. This score was lower than the last Baseline 1 score, as the participant was still getting used to the structure and mechanism of the Arabic Letter Wheel. The participant faced difficulties particularly when the Hijaiyah letters looked similar to each other and the combinations of the letters were not familiar. However, the participant was interested in the rotating mechanism and was willing to engage in the learning activities. The sixth session's score was increased to 81 or 55.86%. The participant started to understand how the Arabic Letter Wheel works and started to respond more accurately to visual stimuli. The participant was able to pronounce more Hijaiyah letters with vowel marks by himself and showed improvement in reading two-letter combinations. The increase from the fifth to the sixth session appeared to show the participant beginning to adapt to the instructional medium. In the seventh session, a significant improvement was found when the participant scored 102 or 70.34%. The participant was more confident and able to read more letters, two-letter combinations and a few simple three-letter words with less assistance. There were also fewer errors in letter recognition and pronunciation. The improvement indicated that repeated visual exposure using the Arabic Letter Wheel improved the participant's association of the visual form of a letter with its corresponding sound.

The highest score of intervention was in the eighth session with score 106 or 73.10%. Then the participant could read most of the assessed Hijaiyah letters with the vowel marks and several letter combinations with minimum help. The participant was more enthusiastic, responded quicker and was more active in participating than in the initial intervention sessions.

Baseline 2 (A_2)

After the intervention was discontinued, the phase of Baseline 2 (A2) was done. This phase was intended to measure if the reading gains from the intervention could be sustained in the absence of Arabic Letter Wheel. Data were collected in four sessions, Sessions 9-12, using the same assessment instrument used in the previous phases. The participant was requested to read Hijaiyah letters with vowel marks, two-letter combinations and simple three-letter words without using the instructional medium. The results showed that the participant's Hijaiyah reading performance was relatively high and stable after the withdrawal of the intervention. For Sessions 9 through 12, the participant scored 104, 103, 102, and 103, respectively. The percentages varied from 70.34 to 71.72 %, indicating small variation between sessions. Table 3 summarizes the results.

Table 3. *Summary of the Participant's Hijaiyah Reading Performance during Baseline 2 (A_2)*

Session	Number of Items	Maximum Score	Obtained Score	Percentage
Session 9	29	145	104	71.72%
Session 10	29	145	103	71.03%
Session 11	29	145	102	70.34%
Session 12	29	145	103	71.03%

In the ninth session, right after withdrawal of the intervention, the participant obtained a score of 104 or 71.72%. The participant was able to read most of the Hijaiyah letters with vowel signs and some of the two- and three-letter combinations with minimal help. This result showed that the skills acquired during the intervention were still evident in the absence of the Arabic Letter Wheel. The score remained stable at 103 or 71.03% in the tenth session. The score dropped by a point, but the difference was not deemed meaningful. The participant continued to show accurate letter recognition and pronunciation and was able to read most of the items assessed independently. The score of the participant in the eleventh session was 102 or 70.34%. The slight decline did not indicate a significant loss of ability as performance was still significantly higher than scores attained during Baseline 1. The participant's score rose slightly to 103 or 71.03% in the last session. The participant

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was able to read Hijaiyah letters with the vowel mark, two-letter words and simple three-letter words with sufficient accuracy. The stable results across the four Baseline 2 sessions suggest that the effects of the intervention were sustained after the instructional medium was no longer in use.

Visual Analysis Within Conditions

Within-condition visual analysis was used to study the participant's performance changes on reading Hijaiyah across the three phases of the Single Subject Research (SSR) design: Baseline 1 (A1), Intervention (B), and Baseline 2 (A2). The analysis was concentrated on six indicators: condition length, trend direction, stability, data path, stability range and level change. These indicators helped to reveal the consistency and magnitude of the behavioral changes throughout the study. Each phase included four observation sessions allowing equal chances to compare the participant's performance before, during and after the implementation of the Arabic Letter Wheel intervention.

Table 4. *Summary of Visual Analysis Within Conditions*

Analysis Component	Baseline 1 (A1)	Intervention (B)	Baseline 2 (A2)
Condition Length	4 sessions	4 sessions	4 sessions
Trend Direction	↑ Increasing	↑ Increasing	→ Stable
Stability	75% (Variable)	0% (Variable)	100% (Stable)
Data Path	↑↓↑	↑↑↑	→→→
Level Change	+4.83%	+22.07%	−0.69%

As shown in Table 4, there were four sessions of observation for each research condition, which enabled an equivalent comparison of behavioral changes throughout the study. For Baseline 1 (A 1), the participant demonstrated a gradual increasing trend with variability, which accounts for only minimal natural improvement before the intervention. In contrast, the Intervention (B) phase showed a clear positive trend with the largest level change (+22.07%) reflecting substantial improvement following implementation of the Arabic Letter Wheel. The intervention phase was categorized as variable (0% stability), but this variability reflected rapid positive behavioral change rather than inconsistent performance. After the intervention was withdrawn, the participant's reading performance remained highly stable in Baseline 2 (A2), with 100% stability and a negligible change of level (−0.69%). This stable maintenance phase shows that the reading skill acquired during the intervention was maintained even though the instructional medium was not used. Overall, the visual analysis within condition provided strong evidence that the Arabic Letter Wheel was effective in improving and maintaining the participant's Hijaiyah reading skills with congenital physical disability.

Visual Analysis Across Conditions

Visual analysis across conditions was performed to evaluate the changes in the participant's performance of reading Hijaiyah between the consecutive phases of the Single Subject Research (SSR) design. This analysis compared the change from Baseline 1 (A1) to Intervention phase (B), and from Intervention phase (B) to Baseline 2 (A2). The analysis was based on five indicators: number of variables measured, changes in trend direction and their effects, changes in stability, level changes and data overlap. These indicators together give proof of the effectiveness of the Arabic Letter Wheel in enhancing and preserving the performance of reading Hijaiyah.

Table 5. *Summary of Visual Analysis Across Conditions*

Analysis Component	B/A1	A2/B
Number of Variables	1	1
Trend Direction	↑ to ↑	↑ to →
Effect	Positive	Positive
Stability Change	Variable → Variable	Variable → Stable
Mean Level Change	+3.10%	+8.45%
Data Overlap	25%	100%

Table 5 shows that only one dependent variable, Hijaiyah reading ability, was measured in all research phases. The comparison of Baseline 1 and the Intervention phase showed a positive change in trend direction, with reading performance continuing to increase after the implementation of the Arabic Letter Wheel. Both phases were described as variable in terms of stability, but this pattern is a reflection of the participant's rapid behavioral improvement during the intervention rather than inconsistent performance. Another positive effect was observed in a 3.10 percentage point increase in mean performance level from Baseline 1 to the Intervention phase. Comparison between Intervention phase and Baseline 2 also indicated positive effect. After the withdrawal of the instructional medium the trend changed from increasing to stable and stability improved from variable to stable. The mean reading performance showed an additional increase of 8.45 percentage points, suggesting that the participant successfully maintained and consolidated the reading skills acquired during the intervention. This maintenance effect indicates that the Arabic Letter Wheel promoted not only short-term improvement but also longer-term retention of Hijaiyah reading skills.

Moreover, analysis of data overlap lends support to the efficacy of the intervention. The overlap between Baseline 1 and the Intervention phase was 25%, indicating limited similarity between the two phases and that the intervention resulted in meaningful behavioral change. In contrast, the overlap between the Intervention phase and Baseline 2 was 100%, indicating that the participant's performance post-intervention was within the range established during treatment. This complete overlap does not reflect the lack of intervention effect, but the successful maintenance of improved reading performance after the instructional medium was withdrawn. In general, the analysis of visuals between conditions indicates positive and sustained improvements in the ability to read Hijaiyah after the introduction of Arabic Letter Wheel. The combination of

positive changes in trend over time, increased mean levels of performance, decreased overlap between baseline and intervention phases, and complete stability in the maintenance phase provide compelling visual support for the effectiveness of the intervention for a student with a congenital physical disability.

Discussion

The results of the present study show that the use of Arabic Letter Wheel has a significant effect on improving the Hijaiyah reading ability of students with congenital physical disability. The Single Subject Research (SSR) design demonstrated clear improvement across the three experimental phases. During Baseline 1 (A1), the participant's average reading performance was relatively low (59.48%) and fluctuated, indicating that the participant has not yet mastered the ability to consistently identify and decode Hijaiyah letters. Then, after the intervention phase, the average reading score increased to 62.58% after the application of the Arabic Letter Wheel, and the average reading score showed a clear upward trend from session to session. More importantly, the improvement was kept in Baseline 2 (A2) with an average performance of 71.03% with 100% data stability. The fact that performance remained better after the intervention was withdrawn demonstrates that the participant had successfully retained the acquired reading skills and was not just showing a temporary gain in learning. These maintenance effects are considered an important mark of successful behavioral intervention in Single Subject Research, in that they indicate that newly acquired skills are relatively permanent and do not fade away after treatment is withdrawn (Stieger et al., 2024; Dashti et al., 2023).

The results are consistent with previous research that have shown that visual and interactive instructional media can effectively enhance the Hijaiyah reading skills. According to Noor and Istiqomah (2024), flashcard media can improve children recognition of Hijaiyah letters gradually from 48.07% in the pre-cycle to 97.11% in the third instructional cycle. Furthermore, Dwiriani et al. (2025) reported that flashcards also significantly effective in improving the Hijaiyah reading ability of children aged five to six years old. Furthermore, Aisyah et al. (2022) revealed that interactive flashcard activities can enhance learners' engagement during the learning process. Overall, these studies indicate that the use of instructional media of hijaiyah symbols with interesting visual stimuli and active involvement of learners results in better letter recognition and early reading skills development. The present study extends these findings by demonstrating that similar benefits can be obtained for learners with congenital physical impairments through the use of an adaptive instructional medium designed to accommodate their physical limitations. The effectiveness of the Arabic Letter Wheel can be explained by the multisensory learning theory which states that learning is more effective when information is processed simultaneously through multiple sensory modalities (Nurjanah et al., 2024; Gori et al., 2022). The Arabic Letter Wheel, instead of relying only on visual presentation, required the participant to visually attend to the spinning wheel, predict the stopping position, make a verbal and non-verbal response, and verbally pronounce the symbols of the Hijaiyah. The combination of visual perception, auditory processing, attention and verbal production strengthens the neural connections between orthographic symbols and their phonological representations, thus facilitating more durable learning (Atkin et al., 2023). Thus, the continued exposure to these multisensory learning experiences would have helped to gradually improve the participant's Hijaiyah reading performance seen throughout the intervention.

The intervention also seemed to increase the participant's motivation to learn and engagement in the classroom. Before the intervention, the participant was often pausing in reading Hijaiyah letters, taking longer to respond and sometimes avoiding difficult reading activities. However, the participant demonstrated increased attention, confidence and active participation in the learning activities in the intervention sessions. These behavioral changes support previous studies that link motivation, engagement, and enjoyment to successful early reading acquisition (Stutz et al.,., 2016). The game-like features of the Arabic Letter Wheel converted repetitive reading practice into an enjoyable learning activity, promoting continued participation and reducing anxiety when encountering unfamiliar Hijaiyah symbols. One of the important findings of this study is that the participant's improvement was not only limited to the recognition of letters but also reading two letter combinations and simple three letter Hijaiyah words. This progression shows the growth of decoding skills, not just the rote learning of isolated symbols. Decoding is the process of translating written symbols to their spoken equivalents and blending those sounds into meaningful linguistic units (Ehri, 2022). The participant was able to distinguish the visually similar Hijaiyah letters gradually and correctly combine them into pronounceable word forms during the intervention. This finding implies that the Arabic Letter Wheel contributes not only to orthographic recognition but also to the acquisition of the essential decoding skills needed for fluent Qur'anic reading.

The findings, from the perspective of inclusive and special education, reinforce the principle that physical disability should not be seen as a constraint to academic achievement. The subject was born with congenital amputation of both upper limbs and had severe limitations in fine motor activities. Significant improvement was achieved when instruction was changed based on individual characteristics of learning. These results are in line with prior research suggesting that students with physical disabilities have comparable academic potential to their peers when provided with appropriate accommodations and instructional supports (Bertills et al., 2018; Römhild & Hollederer, 2024; Chang et al., 2025). Similarly, inclusive education stresses that the success of learning is mainly affected by the existence of accessible learning environments and not on the disabilities of the learners (Ranbir, 2024; Jardinez & Natividad, 2024; Darwin, 2025; Singh, 2024). The Arabic Letter Wheel demonstrates how relatively simple instructional adaptations can remove barriers to participation and promote equitable learning opportunities. The stable performance in Baseline 2 further illustrates the educational value of the intervention. Even after the Arabic Letter Wheel was no longer used, the participant continued to read at a consistent level indicating that the reading skills that were learned had become internalized. This phenomenon in Single Subject Research is often considered as a maintenance effect, i.e., the behavioral changes are maintained after the intervention phase (Stieger et al., 2024; Dashti et al., 2023). The full stability in Baseline 2 suggests that the repeated practice may have consolidated the participant's visual memory, letter discrimination, and phonological associations enough so that the participant was able to perform independently without ongoing instructional support for reading. Noor and Astutik (2019) and Mahardhika et al. (2023) also reported the similar long-term effects of structured instructional media.

The findings can also be interpreted from a behaviorist point of view which explains learning as the result of repeated stimulus–response associations reinforced by positive feedback (Muthmainna et al., 2025; Apriliani & Aprilia, 2022b). In the intervention, each rotation of the Arabic Letter Wheel was a visual stimulus that prompted the participant to identify and pronounce the Hijaiyah symbol that was displayed. The teacher consistently reinforced correct responses with praise and immediate feedback to increase the probability that accurate reading behaviors would be repeated in subsequent learning trials (Mutiarasari & Laily, 2024). Through repeated practice and reinforcement, the participant's reading performance gradually improved in accuracy and fluency across the intervention sessions. The present findings generally show that the Arabic Letter Wheel is an adaptive instructional medium that can be used to improve the Hijaiyah reading ability among students with congenital physical disabilities. The intervention not only improved the learners' letter recognition and decoding skills, but also improved their motivation, active participation in the classroom, self-confidence and the long-term retention of the learned reading skills. This result is in line with recent studies that have revealed the educational advantages of adaptive and interactive learning media for students with special educational needs (Irmawati, 2024b; Mustafidah & Ibroiyah, 2025; Selvira & Hanum, 2026; Sungke et al., 2026). Therefore, the Arabic Letter Wheel can be proposed as an innovative, practical and inclusive teaching alternative to teach Hijaiyah reading in special and inclusive educational

CONCLUSION

This research shows that the Arabic Letter Wheel is an appropriate adaptive instructional medium to improve the Hijaiyah reading ability of a student with congenital physical disability. The Single Subject Research (SSR) A-B-A design demonstrated a consistent growth in reading performance during the intervention period and a stable maintenance of the learned abilities once intervention was withdrawn. The findings show that the Arabic Letter Wheel improved the participant's performance in recognizing the Hijaiyah letters, decoding two-letter combinations, and reading simple three-letter words and also withstood the test of time as seen by the 100% stability during the maintenance phase. These results suggest the importance of multisensory, interactive and adaptive instructional media in order to reduce learning barriers and ensure equitable learning opportunities for students with special educational needs. Thus, the Arabic Letter Wheel provides a viable, evidence-based instructional alternative for supporting Hijaiyah reading instruction in inclusive and special education contexts. Future studies are encouraged to investigate the effectiveness of the Arabic Letter Wheel with larger numbers of participants, varied disability characteristics and extended follow-up periods to enhance the generalizability of the findings. For educational practice, it is recommended that teachers in inclusive schools and special education classes implement adaptive game-based learning media such as the Arabic Letter Wheel in learning Hijaiyah reading and adapt the implementation according to the individual learning needs of students based on a comprehensive assessment. "Schools should also encourage the development and availability of innovative adaptive learning media and collaborative instructional planning to enhance inclusive, accessible and learner-centered educational practices.

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