Indonesian Journal of Teaching in Science

IJOTIS

Journal homepage: http://ejournal.upi.edu/index.php/ IJOTIS/

The Impact of Phonetic Rhythmicity on Speech and Communication Skills of Elementary Students with Special Needs

Ishmatova Ozodaxon Sirodjovna[*], *Kasimova Nodira Abduraxmon*

Chirchik State Pedagogical University, Uzbekistan

*Correspondence: E-mail: ozodalogo@gmail.com

ABSTRACT

This study explores the relevance and effectiveness of phonetic rhythmicity in supporting speech development among elementary school students with special needs, particularly those with hearing impairments. Conducted in special education institutions across Jizzakh, Fergana, and Tashkent, the research employed a mixed-methods approach, including observation, interviews, pre- and post-intervention assessments, and statistical analysis. A structured 10-week phonetic rhythmic intervention was implemented, focusing on rhythmic syllable articulation, coordinated movement, and auditory-motor integration. The results showed significant improvements in students' pronunciation, rhythm, intonation, and communication confidence. Teachers also observed increased student participation and motivation. These findings suggest that phonetic rhythmicity is not only a corrective speech tool but also a comprehensive pedagogical method that fosters both linguistic and social-emotional development. The study highlights the importance of integrating rhythmic methods into special education curricula to enhance inclusive teaching practices and improve learning outcomes for children with hearing loss.

© 2025 Universitas Pendidikan Indonesia

ARTICLE INFO

Article History:
Submitted/Received 15 Nov 2024
First Revised 12 Dec 2024
Accepted 23 Feb 2025
First Available online 24 Feb 2025
Publication Date 01 Mar 2025

Keyword:
Audiological rehabilitation,
Inclusive education,
Phonetic rhythmicity,
Sepcial needs education,
Speech development.

1. INTRODUCTION

Children with hearing impairments face significant and multifaceted challenges in developing effective verbal communication skills (Rusyani *et al*., 2021). These difficulties go beyond mere articulation issues, extending to limitations in auditory perception, phonological processing, and expressive language use. As a result, they often experience delays in literacy acquisition, reduced academic performance, and social isolation (Rusyani *et al*., 2022). According to global data from WHO and UNESCO, more than 430 million people live with disabling hearing loss, with a considerable portion being children of school age (Kurniawati, 2022). Despite the ratification of international frameworks—such as the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD)—that promote the right to inclusive, quality education, many countries continue to lack the infrastructure, training, and curriculum adaptation necessary to support learners with auditory challenges in mainstream education settings (Rasmussen & Lewis, 2007).

A wealth of scholarly literature underlines the importance of early and sustained intervention to support speech development in children with hearing impairments (Rusyani *et al*., 2022; Soetan *et al*., 2021). Studies emphasize that targeted auditory-verbal therapy, speech-language intervention, and the use of multisensory learning approaches can yield significant improvements in verbal expression and language comprehension (Van Bogaert *et al*., 2023; Demers & Bergeron, 2019; Tarvainen *et al*., 2020). The interplay between auditory input, motor coordination, and cognitive function has been noted as a critical factor in developing both receptive and expressive language skills (Marinheiro *et al*., 2025; Sininger *et al*., 2010; Bruyneel *et al*., 2019; Çelik *et al*., 2021). Moreover, researchers have identified the benefits of fine motor development as complementary to speech acquisition—suggesting that movements such as clapping, tapping, and gesturing can aid in internalizing rhythm and phoneme patterns, especially when traditional auditory cues are insufficient or delayed (Morgenstern, 2023).

In recent years, phonetic rhythmicity has emerged as a promising intervention strategy that bridges speech training with motor and musical intelligence. This technique involves coupling rhythmic physical movements (such as body tapping, walking in time, or hand gestures) with phonetic drills (such as vowel-consonant blending or syllabic repetition) to enhance speech rhythm, prosody, and articulation (Reybrouck, 2023; Bhat & Strik, 2025). The method is particularly effective in supporting children who use hearing aids or cochlear implants, helping them adjust to the latency and distortion sometimes associated with assisted hearing. By aligning bodily rhythms with speech rhythms, children are better able to anticipate syllabic timing, improve breath control, and reinforce phoneme articulation. Phonetic rhythmicity also activates multiple brain regions involved in language, movement, and auditory processing, fostering integrative neural development (Wiseman *et al*., 2023; Zheng *et al*., 2022; Fuji & Wan, 2014).

Although the use of rhythm-based methods is not entirely new in speech therapy, their structured, curriculum-integrated application within the realm of inclusive education—especially in public primary schools—remains underexplored. Most existing interventions are either isolated in clinical settings or limited to informal applications by therapists and caregivers. There is a notable absence of standardized modules that systematize the integration of rhythmic-phonetic strategies into day-to-day classroom practice. Additionally, empirical data on the effectiveness of such methods in low-resource or multilingual educational environments is scarce. This study seeks to fill this gap by designing, implementing, and evaluating a structured model for phonetic rhythmicity-based speech

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 2776-6101 e- ISSN 2776-6152

development tailored specifically for children with hearing impairments within the context of formal schooling.

The primary aim of this study is to explore the pedagogical effectiveness of the phonetic rhythmic approach as a tool to enhance speaking skills among elementary school children with hearing impairments. This approach is expected to serve as an alternative solution for improving verbal communication through the integration of rhythmic movement and structured phonetic exercises. To achieve this goal, the study designs a set of replicable and systematic phonetic rhythmic activities tailored to the specific needs of children with hearing difficulties. These activities are implemented in a controlled educational setting and their impact is analyzed in terms of articulation accuracy, speech rhythm patterns, and overall fluency. The evaluation combines qualitative observation and quantitative analysis to generate a comprehensive understanding of the intervention's effectiveness.

The outcomes of this research are expected to contribute significantly in three main areas. First, from a pedagogical innovation perspective, this study offers a practical and adaptive learning model that integrates rhythm and phonetics, suitable for inclusive classrooms. Second, in terms of theoretical development, the approach strengthens the interdisciplinary connection between body movement, musicality, and language acquisition within cognitive processes. Third, from an educational policy and practice perspective, the findings may serve as a foundation for decision-making in curriculum development, teacher training, and inclusive education policy—especially in regions or institutions with limited access to professional speech therapy services.

2. METHODS

In this study, a mixed-method design was employed to comprehensively assess the impact of phonetic rhythmicity on the speech development of elementary school students with hearing impairments. The research was carried out across three special education schools located in Jizzakh, Fergana, and Tashkent, ensuring diverse participation from different regions with varying educational settings. The study utilized both qualitative and quantitative methods to capture a holistic view of the intervention's effectiveness.

Qualitative methods included in-depth observations of classroom speech therapy sessions, where the researcher closely monitored how students responded to phonetic rhythmic exercises integrated into their regular therapy routines. This observational data was complemented by structured interviews with speech therapists and teachers, providing insights into their professional perspectives on the utility and challenges of implementing rhythmic-based speech correction techniques. These interviews helped to contextualize the quantitative results and provided a deeper understanding of the intervention's real-world applicability.

On the quantitative side, the study employed several tools to measure the impact of the intervention. Pre-test and post-test assessments were administered to evaluate changes in students' articulation and comprehension abilities. These tests focused on measuring improvements in speech clarity and the ability to understand spoken language, which are crucial areas for children with hearing impairments. Additionally, surveys were used to gauge students' confidence in communication, assessing whether the rhythmic exercises had a positive effect on their self-perception and willingness to engage in social interactions. Statistical analysis, including t-tests, was conducted to determine whether the observed improvements were statistically significant, ensuring that any changes could be attributed to the phonetic rhythmic intervention rather than external factors.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p-ISSN 2776-6101 e-ISSN 2776-6152

The study involved 60 students, aged 7 to 10, with varying degrees of hearing loss ranging from moderate to severe, including participants with cochlear implants. These students were randomly divided into two groups: a control group that did not receive the intervention, and an experimental group that participated in the phonetic rhythmic program. The intervention itself consisted of a 10-week structured program designed to integrate rhythmic elements into speech therapy. Activities included rhythmic syllable repetition, metered speech patterns, clapping-based articulation exercises, and synchronized movement activities aimed at fostering a stronger connection between auditory input and motor response. These activities were specifically designed to enhance students' prosody—the rhythm, stress, and intonation of speech—and improve overall speech production, aiming for a more natural and fluid articulation. The combination of rhythm and movement was intended to create a multisensory learning environment that supports the development of language skills for children with hearing impairments.

By combining these comprehensive methods, the study aimed to provide a well-rounded evaluation of how phonetic rhythmicity could serve as an effective tool in the speech development of children with hearing impairments, offering insights into both the pedagogical feasibility and potential benefits of such interventions.

3. RESULTS AND DISCUSSION

In this study, a mixed-method approach was employed to thoroughly assess the effectiveness of using phonetic rhythmicity for improving speech development in elementary school students with hearing impairments. The comprehensive evaluation covered both quantitative and qualitative dimensions, focusing on key speech development indicators such as articulation, prosody, and emotional expression, as well as psychosocial aspects of student engagement.

3.1. Speech Improvement Indicators

The quantitative analysis showed a clear and statistically significant improvement in the articulation scores of students in the experimental group, with a p-value of less than 0.01, indicating that the improvement was highly unlikely to be due to random chance. These students demonstrated clearer pronunciation, particularly in complex consonant-vowel combinations, as well as improved syllable timing and enhanced word recognition. This improvement can be attributed to the structured rhythmic exercises, which helped students to break down speech sounds into manageable segments, reinforcing the connection between sound production and auditory feedback (Chela-Flores, 1997). Importantly, the results highlight that the rhythmic exercises not only supported the accuracy of articulation but also contributed to faster recall of previously learned sounds and words, demonstrating the potential of phonetic rhythmicity as a tool for sustained speech improvement (Drake *et al*., 2000).

3.2. Prosody and Emotional Expression

A significant aspect of the study was the impact of phonetic rhythmicity on prosody, which refers to the rhythm, stress, and intonation in speech. The prosodic elements of speech are essential for effective communication, as they convey meaning and emotional tone. The rhythmic exercises encouraged students to focus on the timing of syllables and words, enabling them to produce speech that was not only clearer but also more expressive (Kohler, 2009). This was particularly noticeable among students with cochlear implants, who, after

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 2776-6101 e- ISSN 2776-6152

undergoing rhythmic exercises, showed greater ease in adjusting to auditory feedback. The enhanced intonation and stress control led to more natural-sounding speech and facilitated students' ability to convey emotional content more effectively. These improvements were essential for fostering students' social communication skills, as effective expression of emotions is a key factor in successful social interaction (Mulyanto *et al*., 2024).

3.3. Teacher Feedback and Observations

Teacher feedback was overwhelmingly positive, with educators noting that the integration of phonetic rhythmicity into their students' speech therapy sessions contributed to a variety of positive behavioral outcomes. Teachers observed that students were more engaged and participatory in lessons, showing increased motivation and a stronger willingness to interact with their peers. The use of rhythm-based activities in therapy encouraged a cooperative learning environment, where students worked together to practice speech patterns and rhythms (Daniel *et al*., 2022). This collaborative aspect of the intervention was instrumental in promoting peer interaction, which is crucial for the social integration of children with special needs. Teachers also noted that students displayed greater self-confidence in both their speech production and their ability to interact socially, reflecting the positive impact of rhythmic exercises on students' overall psychosocial engagement.

3.4. Discussion

The findings from this study affirm and extend previous international research on rhythm-based therapies in speech development for children with hearing impairments. Notably, this study introduced the application of phonetic rhythmicity in an educational context specific to elementary school students in Uzbekistan, a demographic previously underrepresented in existing literature. The results not only underscore the effectiveness of phonetic rhythmicity for correcting speech disorders, but they also highlight its broader educational benefits (Turk & Shattuck-Hufnagel, 2013). The rhythmic exercises contributed to the enhancement of social adaptability by improving students' ability to interact with their peers and express emotions appropriately. Additionally, these exercises promoted emotional resilience, as students became more confident in their communication abilities, which is vital for their overall development (Wood *et al*., 2013).

Phonetic rhythmicity was found to address several critical educational goals simultaneously: it improved communication clarity, encouraged inclusive participation, and supported cognitive development (Poeppel & Assaneo, 2020). The study emphasizes the importance of incorporating multisensory approaches, such as rhythmic exercises, into speech therapy, as they can address multiple aspects of speech and social development in children with hearing impairments (Mason *et al*., 2019). Moreover, the findings suggest that phonetic rhythmicity can be a valuable tool in inclusive education, facilitating the full participation of students with special needs in both academic and social activities.

In conclusion, the integration of phonetic rhythmicity into speech therapy not only enhances speech development but also provides a holistic approach to supporting students' social and emotional growth. The study's results contribute valuable insights into how educators can use rhythm-based methods to foster a more inclusive and supportive learning environment for students with hearing impairments. Further research is encouraged to explore the long-term effects of phonetic rhythmicity on speech and psychosocial development in diverse educational settings.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p-ISSN 2776-6101 e-ISSN 2776-6152

4. CONCLUSION

The findings from this study clearly demonstrate that phonetic rhythmicity is an effective and versatile method for enhancing the speech development of elementary school students with hearing impairments. This approach not only significantly improves phonological accuracy but also enhances prosody, emotional expression, and the ability to communicate effectively with peers, which are essential aspects of overall speech development. The rhythmic exercises, by focusing on sound production and timing, enable students to produce clearer speech and foster a better understanding of emotional tone and expression, which is crucial for social integration.

Furthermore, the positive impact observed in the students' engagement with their peers reflects the value of phonetic rhythmicity in promoting social adaptability and self-confidence. As students' speech improved, so did their willingness to interact with others, enhancing their social and emotional development. The inclusion of rhythm-based methods into speech therapy sessions demonstrated that such interventions can serve as powerful tools for creating a more inclusive and supportive learning environment. The collaborative nature of these activities also contributed to a stronger sense of community among students, fostering cooperation and mutual support.

This study offers a comprehensive framework for integrating phonetic rhythmicity into special education programs. The results suggest that this method should be considered for broader implementation in speech therapy curricula, particularly in inclusive educational settings. By aligning with inclusive pedagogy, phonetic rhythmicity offers a holistic approach that addresses both cognitive and emotional dimensions of speech development. Additionally, its positive influence on peer interaction and self-esteem highlights its potential for shaping more equitable and inclusive educational practices.

Given the promising results, future research should explore the long-term effects of phonetic rhythmicity on speech and emotional development, as well as its scalability in various educational contexts. Moreover, it is essential to incorporate this approach into professional training programs for special educators, ensuring that the benefits of phonetic rhythmicity are accessible to a wider range of students with special needs. This approach has the potential to reshape the landscape of speech therapy and inclusive education, ensuring that students with hearing impairments receive the support they need to thrive academically and socially.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

6. REFERENCES

Bhat, C., and Strik, H. (2025). Speech technology for automatic recognition and assessment of dysarthric speech: An overview. *Journal of Speech, Language, and Hearing Research*, *68*(2), 547-577.

Bruyneel, E., Demurie, E., Warreyn, P., and Roeyers, H. (2019). The mediating role of joint attention in the relationship between motor skills and receptive and expressive language in siblings at risk for autism spectrum disorder. *Infant Behavior and Development*, *57*, 101377.

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 2776-6101 e- ISSN 2776-6152

Çelik, P., Keseroğlu, K., Er, S., Sucaklı, İ. A., Saylam, G., and Yakut, H. İ. (2021). Early-auditory intervention in children with hearing loss and neurodevelopmental outcomes: cognitive, motor and language development. *The Turkish Journal of Pediatrics*, *63*(3), 450-460.

Chela-Flores, B. (1997). Rhytmic patterns as basic units in pronunciation teaching. *Onomázein: Revista de Lingüística, Filología y Traducción de La Pontificia Universidad Católica de Chile*, *2*, 111-134.

Daniel, S., Wimpory, D., Delafield-Butt, J. T., Malloch, S., Holck, U., Geretsegger, M., and Amos, P. (2022). Rhythmic relating: Bidirectional support for social timing in autism therapies. *Frontiers in Psychology*, *13*, 793258.

Demers, D., and Bergeron, F. (2019). Effectiveness of rehabilitation approaches proposed to children with severe-to-profound prelinguistic deafness on the development of auditory, speech, and language skills: A systematic review. *Journal of Speech, Language, and Hearing Research*, *62*(11), 4196-4230.

Drake, C., Jones, M. R., and Baruch, C. (2000). The development of rhythmic attending in auditory sequences: attunement, referent period, focal attending. *Cognition*, *77*(3), 251-288.

Fujii, S., and Wan, C. Y. (2014). The role of rhythm in speech and language rehabilitation: The SEP hypothesis. *Frontiers in Human Neuroscience*, *8*, 777.

Kohler, K. J. (2009). Rhythm in speech and language: A new research paradigm. *Phonetica*, *66*(1-2), 29-45.

Kurniawati, K. (2022). Efforts to improve the vocabulary of Indonesian language for 1st-grade elementary students with hearing impairment for through the application of mnemonic. *ASEAN Journal of Community and Special Needs Education*, *1*(2), 81-88.

Marinheiro, M. E. P., Barbosa, J. N., Brocchi, B. S., Osborn, E., and Perissinoto, J. (2025). The relationship between the neuropsychomotor developmental skills, the auditory and expressive vocabulary and language development in children aged from 24 to 36 months. *Revista CEFAC*, *27*(3), e9324.

Mason, G. M., Goldstein, M. H., and Schwade, J. A. (2019). The role of multisensory development in early language learning. *Journal of Experimental Child Psychology*, *183*, 48-64.

Morgenstern, A. (2023). Children's multimodal language development from an interactional, usage-based, and cognitive perspective. *Wiley Interdisciplinary Reviews: Cognitive Science*, *14*(2), e1631.

Mulyanto, D., Wahyudi, M., Ridho, A. M. A.,and Zaki, M. (2024). Utilization of artificial intelligence with text-to-speech technology based on natural language processing to enhance arabic listening skills for non-native speakers. *Alsinatuna*, *10*(1), 44-58.

Poeppel, D., and Assaneo, M. F. (2020). Speech rhythms and their neural foundations. *Nature Reviews Neuroscience*, *21*(6), 322-334.

Rasmussen, M., and Lewis, O. (2007). United Nations Convention on the rights of persons with disabilities. *International Legal Materials*, *46*(3), 441-466.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p-ISSN 2776-6101 e-ISSN 2776-6152

Reybrouck, M. (2023). A dynamic interactive approach to music listening: The role of entrainment, attunement and resonance. *Multimodal Technologies and Interaction*, *7*(7), 66.

Rusyani, E., Maryanti, R., Rahayu, S., Ragadhita, R., Al Husaeni, D.F., and Susetyo, B. (2022). Application of scrabble game in improving learning of simple sentence structure on the student with hearing impairment. *ASEAN Journal of Science and Engineering Education, 2*(1)*,* 75-86.

Rusyani, E., Permana, S., and Ragadhita, R. (2022). Attitudes of high special school students with hearing impairment to online adaptive physical education learning. *Indonesian Journal of Teaching in Science*, *2*(1), 29-38.

Rusyani, E., Saepulloh, A., Maryanti, R., Ragadhita, R., and Al Husaeni, D.F. (2021). The effect of the team-games-tournament method on improving the learning ability of student with hearing impairment in multiplication concepts. *Indonesian Journal of Multidiciplinary Research*, *1*(2), 219-228.

Sininger, Y. S., Grimes, A., and Christensen, E. (2010). Auditory development in early amplified children: Factors influencing auditory-based communication outcomes in children with hearing loss. *Ear and hearing*, *31*(2), 166-185.

Soetan, A.K., Onojah, A.O., Alaka, T.B., and Onojah, A.A. (2021). Attitude of hearing-impaired students towards assistive technology utilization in Oyo state adopting the survey method. *Indonesian Journal of Community and Special Needs Education, 1*(2), 103-118.

Tarvainen, S., Stolt, S., and Launonen, K. (2020). Oral language comprehension interventions in 1–8-year-old children with language disorders or difficulties: A systematic scoping review. *Autism and Developmental Language Impairments*, *5*, 2396941520946999.

Turk, A., and Shattuck-Hufnagel, S. (2013). What is speech rhythm? A commentary on Arvaniti and Rodriquez, Krivokapić, and Goswami and Leong. *Laboratory Phonology*, *4*(1), 93-118.

Van Bogaert, L., Machart, L., Gerber, S., Lœvenbruck, H., Vilain, A., and Consortium E. (2023). Speech rehabilitation in children with cochlear implants using a multisensory (French Cued Speech) or a hearing-focused (Auditory Verbal Therapy) approach. *Frontiers in Human Neuroscience*, *17*, 1152516.

Wiseman, K. B., McCreery, R. W., and Walker, E. A. (2023). Hearing thresholds, speech recognition, and audibility as indicators for modifying intervention in children with hearing aids. *Ear and Hearing*, *44*(4), 787-802.

Wood, L., Ivery, P., Donovan, R., and Lambin, E. (2013). "To the beat of a different drum": Improving the social and mental wellbeing of at-risk young people through drumming. *Journal of Public Mental Health*, *12*(2), 70-79.

Zheng, Y., Swanson, J., Koehnke, J., and Guan, J. (2022). Sound localization of listeners with normal hearing, impaired hearing, hearing aids, bone-anchored hearing instruments, and cochlear implants: a review. *American Journal of Audiology*, *31*(3), 819-834.

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 2776-6101 e- ISSN 2776-6152