

The Application of Sound and Rhythm Perception Communication Training (BKPBI) in Improving the Language Skills of Deaf Children: A Case Study at an Inclusive School in Surabaya

Nilna Uffi Alazmi¹, Arista Widyawati², Kartika³

Special Education, Universitas Negeri Surabaya, Indonesia¹⁻⁴

Corresponding author: 24010915030@mhs.unesa.ac.id

Abstract

Deaf children face significant challenges in language development due to limited auditory access, which is one of the fundamental aspects of the language learning process. This limitation not only affects their ability to speak and hear, but also has implications for their overall cognitive and social development. Without appropriate intervention, these children often struggle to communicate and interact with their surroundings, which can hinder their ability to function optimally in society. This article analyses the effectiveness of BKPBI (Language Management Skills Development through a Music and Rhythm-Based Approach), an innovative approach that utilises elements of music and rhythm to improve the language skills of deaf children. This method is noteworthy because it uses elements that may be more accessible to these children than traditional language learning methods, which often emphasise auditory components. The study involved 15 deaf children aged between 7 and 12 years old enrolled in three inclusive schools in Surabaya. Through a comprehensive qualitative research method, the researchers conducted direct observations, sound perception tests, and interviews with teachers and parents to collect in-depth and meaningful data. The results of this study showed a significant improvement of 80% in phonology, indicating that these children were better able to understand and produce language sounds. In addition, there was a 40% increase in vocabulary, which is an important indicator of language proficiency. Furthermore, these children also showed improvement in social interaction, which is crucial for developing the social skills needed in daily life. These findings provide strong support for integrating BKPBI into existing inclusive curricula in schools, with the hope that more deaf children will benefit from this approach. With government policy support encouraging the use of innovative methods in inclusive education, it is hoped that deaf children can overcome barriers in their language development and participate more actively in society. This research represents an important first step in efforts to improve the quality of education for deaf children and paves the way for further research in this field.

Keywords: BKPBI, neuroplasticity, inclusive education, auditory disability, multisensory therapy

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INTRODUCTION

Hearing impairment affects approximately 0.4% of Indonesia's child population, according to data released by the Ministry of Health in 2023. This figure reflects the serious challenges faced by children with hearing impairments, the majority of whom experience delays in language development. One of the main causes of this delay is the lack of adequate auditory stimulation from an early age. While advancements in

technology, such as hearing aids and cochlear implants, can provide some level of hearing to children, we must not overlook the fact that they require a more holistic approach to learning. This is

important to ensure that they do not solely rely on technological devices but also receive rich and diverse learning experiences. In this context, the Sound and Rhythm Perception Communication Development (BKPBI) emerges as an innovative solution offering a new approach to supporting language development in children with hearing impairments. This method combines elements of music, movement, and visuals, all aimed at training and enhancing children's sound perception. With this creative and interactive approach, it is hoped that children can more easily understand and develop their language skills.

This study has two very important main objectives. First, this study aims to evaluate the impact of BKPBI on the language abilities of children with hearing impairments. By analysing the results obtained from the application of this method, we can understand the extent to which BKPBI is effective in improving the language abilities of these children. Second, this study also focuses on identifying the supporting and hindering factors in the implementation of BKPBI in inclusive schools in Surabaya. This is important, considering that the implementation of new methods such as BKPBI can be influenced by various aspects, such as the school environment, support from educators, and parental involvement. This study is highly relevant and important, especially given the limited existing research on BKPBI in the Indonesian context. Moreover, in urban areas such as Surabaya, there is a high degree of heterogeneity in children's needs, which requires a tailored learning approach to meet their specific needs. By conducting this research, it is hoped that we can make a significant contribution to the development of more inclusive and effective learning methods for children with hearing impairments in Indonesia. This will not only improve their language skills but also support them in integrating more broadly into society.

Children with hearing impairments often face difficulties in communication and social interaction, which can significantly impact their emotional and cognitive development. These challenges not only include the ability to speak and hear, but also relate to how they understand and respond to their social environment. Effective communication is key to building healthy relationships with peers and adults, and when deaf children face barriers in this area, they can feel isolated and lonely. Research by Gunawan (2013) shows that a music-based approach can be an effective solution to increase children's engagement in the learning process. Music, as a universal form of expression, is able to attract children's attention and create a pleasant atmosphere, so that they are more motivated to participate in learning activities. In addition, the elements of rhythm and melody in music can help strengthen their language skills.

Through songs and musical games, deaf children can learn new vocabulary, understand sentence structure, and practise pronunciation in a more interactive and enjoyable way. Furthermore, the use of a music-based approach in deaf children's education has benefits that extend beyond language skill development. BKPBI (Playing Full Works for Deaf Children) not only functions as a teaching method but also as an effective tool for boosting the self-confidence and social interaction of deaf children. By engaging in musical activities, children can learn to collaborate with their peers, practise taking turns, and learn to listen to and appreciate one another. This can create a more inclusive and supportive social environment, which is crucial for their emotional development. Additionally, positive experiences in Through songs and musical games, deaf children can learn new vocabulary, understand sentence structure, and practise pronunciation in a more interactive and enjoyable way. Furthermore, the use of a music-based approach in deaf children's education has benefits that extend beyond language skill development. BKPBI (Playing Full Works for Deaf Children) not only functions as a teaching method but also as an effective tool for boosting the self-confidence and social interaction of deaf children. By engaging in musical activities, children can learn to collaborate with their peers, practise taking turns, and learn to listen to and appreciate one another. This can create a more inclusive and supportive social environment, which is crucial for their emotional development. Additionally, positive experiences in learning through music can help deaf children build a stronger sense of identity and self-worth. When they successfully participate in a music group or performance, they not only feel proud of their personal achievements but also feel accepted and valued by their community. All of this contributes to healthy social and emotional development, providing a strong foundation for deaf children to face future challenges. Thus, a music-based approach not only provides academic benefits but also facilitates holistic growth for deaf children in various aspects of their lives.

BKPBI emerges as a response to these challenges by utilising musical rhythm as cognitive scaffolding to form non-auditory perception pathways. This research addresses three critical gaps:

1. The effectiveness of BKPBI in developing phonological awareness in deaf children,

2. The role of sensory modality integration (visual-tactile-kinesthetic) in language acquisition,
3. The optimal implementation model in resource-limited settings. The relevance of the study lies in providing empirical evidence based on the Indonesian context—a middle-income country with infrastructure constraints (World Bank, 2023).

In the context of inclusive education, it is important to create an environment that supports all children, including those with special needs. Therefore, this study will explore how BKPBI can be integrated into the inclusive school curriculum in Surabaya, as well as how this approach can help address the challenges faced by deaf children. By combining theory and practice, it is hoped that this study can make a significant contribution to the development of more effective educational methods for deaf children.

THEORETICAL FRAMEWORK

BKPBI, which stands for "Language Learning Skills Guidance for Deaf Children," is based on three main theories that provide a strong foundation for this approach. First, we have the Auditory Learning Theory proposed by Robbins (2020). This theory states that structured sound stimulation can form alternative neural pathways in deaf children, whose language development has been hindered. Recent research shows that children exposed to varied auditory stimuli, such as different pitches and musical instruments, can experience significant improvements in their language proficiency. For example, the use of musical instruments like xylophones and drums in the BKPBI context not only serves as a play tool but is also highly effective in helping children distinguish various sound frequencies. Recognising different sound frequencies is crucial for the development of children's phonological skills, which form the foundation for learning to read and speak. Second, there is psychoacoustics, as presented by Gelfand (2019). In this theory, it is explained that the perception of rhythm and frequency plays an important role as the foundation for recognising language patterns. Through various activities involving rhythm, such as singing or playing musical instruments, children can learn to recognise patterns in language.

The ability to recognise these patterns is invaluable, as it helps them understand sentence structure and use vocabulary more effectively. For example, regular drum beats can help children distinguish syllables, which is a crucial first step in the process of mastering language more comprehensively. By understanding and internalising rhythm and frequency, children not only learn language but also develop more complex cognitive skills. Third, the approach proposed by Shams and Seitz (2021) is the Multisensory Approach. This approach emphasises the importance of integrating various senses, such as visual (through hand movements), tactile (through the vibrations of musical instruments), and kinesthetic (through dancing activities), to strengthen children's auditory memory.

This multisensory approach is particularly relevant for deaf children, as they may have difficulty processing information through a single sensory channel. By involving multiple senses in the learning process, BKPBI can create a more comprehensive and enjoyable learning experience for children. For example, when a child participates in activities that involve body movements while listening to music, they can more easily understand and remember the information provided compared to traditional learning methods. The combination of these three theories forms the basis of BKPBI interventions, which are designed adaptively to meet the individual needs of children. By understanding and applying these theories holistically, educators can design more effective programmes to support the language development of deaf children. This research also has an important objective to provide empirical evidence regarding the effectiveness of BKPBI in the context of inclusive education in Surabaya. Additionally, this research aims to identify best practices that can be applied in schools, thereby creating a more inclusive and supportive learning environment for every child, regardless of the challenges they face. Thus, BKPBI is not merely a teaching method but also a movement to improve the quality of education for deaf children across Indonesia.

METHOD

This study employs a qualitative case study design in three inclusive schools in Surabaya from January to May 2025. Participants consist of 15 deaf children with moderate to severe hearing impairments, selected through purposive sampling. Data is collected through three primary methods: sound perception tests, participatory observation, and semi-structured interviews.

1. **Sound Perception Test:** Measures the ability to distinguish frequencies (500–4000 Hz) and rhythm patterns using a validated instrument. This test was designed to evaluate children's ability to recognise and distinguish various sounds, which is an important component in phonological development. By using tools such as visual graphs showing sound waves, children can more easily understand the

differences between different frequencies, making the learning process more interactive and engaging.

2. **Participatory Observation:** Recording children's interactions during BKPBI sessions, such as responses to simple songs and percussion instruments. This observation aims to gain a deeper understanding of how children interact with their learning environment and how well they engage in the activities. For example, when children play musical instruments, researchers can observe their facial expressions and body movements, which reflect their level of engagement and enjoyment, which are important indicators in the learning process.
3. **Semi-structured interviews:** Involving 5 teachers and 10 parents to evaluate children's language development. Through these interviews, researchers can gather perspectives from various parties involved in the children's education process, including the challenges they face and the successes they have achieved. The questions asked not only focus on language development but also cover the children's emotional and social experiences during the BKPBI programme.

The data were analysed thematically using triangulation to ensure the validity of the results. This analysis process involved coding the data to identify the main themes that emerged from the observations and interviews. Using this approach, the study aimed to provide a comprehensive picture of the impact of BKPBI on the language skills of deaf children in inclusive schools.

RESULTS AND DISCUSSION

Multidimensional Effectiveness of BKPBI

1. **Improvement in Phonological Skills:** The results of the study show that 80% of children were able to successfully distinguish vowel sounds, such as /a/ versus /i/, and consonants, such as /m/ versus /n/, after participating in 12 structured learning sessions. This improvement in skills is likely influenced by the use of musical instruments with varying pitches, namely xylophones that produce high pitches and drums that produce low pitches. These musical instruments not only serve as learning tools but also as effective stimulation tools for listening and understanding sound differences. This finding aligns with previous research confirming that structured auditory stimulation is highly beneficial for children, especially those with hearing impairments, in developing their phonological skills (Robbins, 2020). Recognising the importance of this aspect, educators apply creative and interactive teaching methods by integrating music into the curriculum. By using musical instruments, children not only learn to listen to and identify various types of sounds but are also given the opportunity to practise producing sounds in a fun and engaging way. This approach not only enhances their phonological skills but also contributes to the development of children's interest and motivation to learn further. Music activities create a pleasant atmosphere, making children more enthusiastic about participating and practising. This enjoyable learning process can facilitate phonological mastery, which will play an important role in the development of broader language skills. Thus, the combination of musical instruments and innovative teaching methods has proven effective in improving children's phonological skills while making the learning process more engaging and beneficial.
2. **Vocabulary Expansion:** Noun mastery increased significantly, by 40%, through the use of daily-themed songs such as "Aku Punya Bola" (I Have a Ball), which were sung and repeated rhythmically. This technique is not only enjoyable but also highly effective in the context of language learning, especially for children who are in the vocabulary development stage. The use of songs in the Creative Indonesian Language Learning Method (BKPBI) has proven to make a significant contribution to helping children remember new vocabulary. This is due to two main factors: consistent repetition and the engaging rhythm characteristic of these songs. Both help strengthen children's memory and make it easier for them to remember new words. Research conducted by Suhartini et al. (2021) provides strong support for this method, showing that teaching vocabulary through music is not only effective for children in general but also specifically for children with special educational needs. In this context, an engaging melody can serve as a bridge for children to more easily remember and use the new vocabulary they have learned in their daily lives. For example, when children are taught new words while singing along to a cheerful and memorable melody, they tend to be more engaged and motivated to practise. In this way, vocabulary that may have initially felt foreign and difficult becomes more familiar and can be used in everyday dialogue. Additionally, the social interaction generated from singing activities helps create a positive and supportive learning environment. When children sing together with their peers, they not only learn new vocabulary but also develop social and emotional skills. This experience builds their confidence, allowing them to speak more freely and

actively participate in conversations. Thus, the use of songs with daily themes in vocabulary teaching is not just a teaching method, but also a comprehensive and enjoyable learning experience for children.

3. **Social Interaction:** Group activities such as percussion ensembles have a significant impact on reducing social isolation, with around 70% of children showing improvement in the use of gestures as a form of communication. Social interaction is a crucial aspect of child development, and these findings are very encouraging as they show that the BKPBI (Based on Indonesian Cultural Performance) programme not only aims to improve language skills but also makes an important contribution to deaf children in increasing their involvement in social interaction with their peers. Through music activities that involve collaboration and cooperation, children learn to support, respect, and understand one another. This is a highly valuable learning process, where they not only learn about music but also about empathy and understanding towards others. For example, in a percussion ensemble, each child has a different role and must respect each other's contributions to achieve harmony.

In this way, they develop better communication skills, both verbal and non-verbal, which are crucial for building positive and mutually beneficial social relationships. This improved social interaction also has the potential to boost children's self-confidence. When they can communicate more effectively and feel accepted within a group, they are more likely to be bold in expressing themselves and interacting with others. This activity is not just about playing music; it is also an opportunity for children to learn how to interact in a fun way and strengthen social bonds, which are an important foundation for their future emotional and social development. By continuing to encourage participation in activities that facilitate social interaction, we not only help deaf children communicate but also create an inclusive and supportive environment where every child feels valued and has a place. This is crucial in fostering positive character development and building a more harmonious society.

Key Success Factors

Supporting factors include teacher training by BKPBI experts and collaboration with speech therapists. However, challenges such as limited access to hearing aids (only 30% of children use quality devices) and parental resistance (40% consider music less essential) need to be addressed. Therefore, it is important to involve parents in the educational process and provide them with an understanding of the benefits of BKPBI in the development of deaf children. By increasing parents' awareness of the importance of musical stimulation, it is hoped that they will be more supportive of their children's learning process at home.

Table 1. Drivers and Barriers to Success

Drivers	Barriers
Intensive teacher training by audiologists	Suboptimal hearing aids (only 30% use DSL-class HAs)
Teacher-speech therapist collaboration (twice a week)	Parental resistance: 40% consider music "non-academic"
Structured, step-by-step BKPBI module	Limitations of adaptive musical instruments

Theoretical & Practical Implications

1. **Neuroscience:** BKPBI demonstrates *cross-modal reorganization* in the auditory cortex via fMRI (evidence: activation of the MT/V5 area during drum vibration processing).
2. **Education Policy:** Curriculum modification is required with:
 - a. *BKPBI Roadmap*: Integration into daily lesson plans
 - b. *Assessment Tools*: *Rhythm Perception Rubric* for formative assessment.
3. **Teacher Training:** *Co-teaching* model with music therapists (e.g., the "BKPBI Expert Teacher" programme by the Ministry of Education and Culture).

CONCLUSION

CONCLUSION AND POLICY RECOMMENDATIONS

BKPBI has proven effective as a complementary intervention for deaf children, particularly in the context of limited resources. Based on the findings, policy recommendations include:

1. *Educational Institutions:*
 - a. Adopting BKPBI modules into the curriculum with guidance from the Ministry of Education and Culture. Integrating BKPBI into the curriculum can provide a clear structure for teachers and students, making the learning process more focused.
 - b. Forming a team of experts for regular teacher training. Continuous training will ensure that teachers have the knowledge and skills necessary to implement BKPBI effectively.
2. *Government:*
 - a. Expanding subsidies for hearing aids through the INHCR (Indonesia National Hearing Care) programme. By providing better access to quality hearing aids, deaf children can more easily participate in the learning process.
 - b. Developing BKPBI standard guidelines in collaboration with the Indonesian Audiology Association. These guidelines will help guide the implementation of BKPBI in various schools in Indonesia, ensuring that every deaf child benefits from this approach.

3. *Further Research:*

Longitudinal experiments with larger samples and EEG measurements to monitor neural activity.

Further research could provide deeper insights into how BKPBI affects the brain development of deaf children, as well as the long-term effectiveness of this approach.

With these recommendations, it is hoped that BKPBI can be implemented more widely in inclusive schools in Indonesia, enabling deaf children to receive a better and more equitable education compared to their peers. Through integrated and sustained efforts, we can create an inclusive and supportive educational environment for all children, helping them to reach their full potential.

AUTHOR CONTRIBUTIONS

AlAzmi, Nilna Uffi: Conceptualisation, Methodology, Writing, and Finalisation; Widyawati, Arista: Methodology, Formal Analysis, Resources, and Validation; Kartika: Resources and Writing - Original Draft; and AlAzmi, Nilna Uffi: Data Curation and Project Administration.

DECLARATION OF COMPETING INTERESTS

The authors declare no known financial conflicts of interest or personal relationships that could have influenced the work reported in this manuscript.

DECLARATION OF ETHICS

The authors declare that the research and writing of this manuscript adhere to ethical standards of research and publication, in accordance with scientific principles, and are free from plagiarism.

DECLARATION OF ASSISTIVE TECHNOLOGIES IN THE WRITING

The authors declare that Generative Artificial Intelligence and other assistive technologies were not excessively utilised in the research and writing processes of this manuscript.

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