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Articulatory Errors of Spoken Bilabial Consonants in Deaf Mute Children

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Abstract

Background: Bilabial consonants, produced using both lips, are foundational to speech intelligibility. For children with hearing - loss, articulating these sounds accurately can be particularly challenging because of limited auditory feedback and potential delays in speech development.

Objectives: This research paper explores the production of bilabial consonants (/p/, /b/, /m/) in deaf mute children aged 8 to 13 years. The study examines the accuracy of articulation of these consonants in children with varying degrees of hearing loss, including severe to profound sensory neural hearing loss (SNHL) and those with cochlear implants (CI).

Methods: Data collected from ten children across different educational levels (first to fourth grade) has been analyzed to understand the impact of hearing impairment on bilabial consonant production.

Results: Children with Cochlear Implants generally showed higher accuracy in producing /p/ and /b/ as compared to those with severe to profound S.N.H.L. The ability to produce /m/ was notably lower across all participants.

Conclusion: The findings suggest that Cochlear Implants significantly improve bilabial consonant production, but challenges remain in producing the bilabial nasal consonant usually denoted as /m/.

Keywords:bilabial consonants, deaf, children, hearing loss, cochlear implants.

Introduction

Bilabial consonants, produced using both lips, are foundational to speech intelligibility. Bilabial consonants are among the first sounds that typically developing children acquire. These sounds play a critical role in early speech development and are essential for ensuring effective communication. Accurate production of these consonants is crucial to clear speech articulation and intelligibility.Understanding the specific challenges that deaf mute children face in producing bilabial consonants can suggest more effective speech therapy interventions.

Bilabial consonants are particularly challenging for children with hearing impairments. Various studies have shown that children with severe to profound SNHL often struggle with these sounds because of limited auditory feedback and delays in speech motor development (Moeller et al., 2007; Svirsky et al., 2000). Nasal consonants like /m/ present unique challenges for children with hearing - loss. Lohmander et al. (2015) found that nasal sounds require precise coordination of the velum and airflow through the nasal cavity, which can be difficult for children with hearing - impairments.

Cochlear Implants (CIs) have revolutionized the treatment of profound hearing - loss, providing significant improvements in speech perception and production (Geers et al., 2017; Nicholas & Geers, 2013). Early implantation has been associated with better speech and language outcomes (Dettman et al., 2016; Svirsky et al., 2004). Cochlear Implants have been shown to improve speech production in deaf children (Geers et al., 2017; Nicholas & Geers, 2013), but the extent to which they facilitate the production of bilabial consonants specifically has not been thoroughly examined.

For children with hearing - loss, articulating these sounds accurately can be particularly challenging because of limited auditory feedback and potential delays in speech development. This study investigates the production of bilabial consonants in deaf mute children and compares the performance of those with Cochlear Implants to that of those with severe to profound Sensory neural hearing loss (SNHL).

Methodology

Study Population: The study involved ten children with hearing - loss, aged between 8 and 13 years, falling in first to fourth grade. The participants were selected on the basis of their diagnosis and availability. These children were divided into two groups: those with Cochlear Implants (CI) and those with severe to profound SNHL (Table1).

Sr. No.	Name	Age	M/F	Diagnosis	Education Grade
1	Kanchan	13	F	Cochlear Implant	Fourth
2	Saksham	12	M	Cochlear Implant	Fourth
3	Bani	8	F	Severe SNHL	First
4	Sakshi	8	F	Severe SNHL	First
5	Harpreet	10	M	Severe SNHL	Third
6	Tofik Allam	12	M	Severe SNHL	Fourth
7	Gurpreet	10	M	Profound SNHL	Third
8	Vicky	10	M	Profound SNHL	Third
9	Raman	12	M	Profound SNHL	Fourth
10	Preeti	12	F	Profound SNHL	Fourth

Table 1: Socio - Demographic Characteristics of Deaf-Mute Children (N=10).

Articulatory assessment and transcription: The production of the bilabial consonant /p/, /b/, and /m/ was assessed during a single speech session. Each child was asked to produce each consonant sound ten times while seated in front of mirror. The accuracy of production in each case was recorded and analyzed. The assessment was conducted using a standardized

speech assessment protocol, and the results were transcribed by experienced speech-language pathologists.

Data collection: Data was collected through direct observation of each child's speech session. The recordings were analyzed using phonetic transcription to determine the accuracy of each bilabial consonant production. The results were then quantified and analysed to identify patterns and differences among the participants.

Results

The results indicate significant variation in the ability to produce bilabial consonants among the participants. The following Tables - 2 and Table - 3 show children with Cochlear Implants generally showed higher accuracy in producing /p/ and /b/ as compared to those with severe to profound SNHL. The ability to produce /m/ was notably lower across all participants.

Patient	**Sessions**									
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
3	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
4	100%	100%	100%	100%	0%	100%	100%	0%	100%	100%
5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	100%	100%	100%	100%	100%	100%	0%	100%	100%	100%
7	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
9	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table 2: Articulatory Error of Spoken Bilabial Consonant /P/ Children Mirror Session (N=10).

Patient	**Sessions**									
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	100%	0%	0%	0%	100%	0%	0%	0%	0%	100%
2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	100%	100%	100%	100%	100%	100%	0%	100%	100%	100%
7	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
9	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table 3: Articulatory Error of Spoken Bilabial Consonant /B/ Children Mirror Session (N=10).

Patient	**Sessions**									
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	100%	100%	0%	100%	100%	100%	0%	100%	100%	100%
7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
9	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table 4: Articulatory Error of Spoken Bilabial Consonant /M/ Children Mirror Session (N=10).

Discussion

The data suggests that cochlear implants significantly improve the production of bilabial consonants in deaf children. This finding aligns with previous studies that have demonstrated the overall benefits of cochlear implants on speech and language development in children with hearing- loss (Geers et al., 2017; Nicholas & Geers, 2013).

Geers et al. (2017) found that children who received cochlear implants before 18 months of age showed significant improvements in speech production as compared to those who received implants later. Nicholas and Geers (2013) reported similar findings emphasizing the importance of early implantation for optimal speech outcomes. In the present study, children with cochlear implants exhibited higher accuracy in producing /p/ and /b/ consonants, suggesting that these devices can help bridge the gap in speech development caused by hearing- loss.

Bilabial consonants are particularly challenging for children with hearing impairments. Various studies have shown that children with severe to profound SNHL often struggle withthese sounds because of limited auditory feedback and delays in speech motor development (Moeller et al., 2007; Svirsky et al., 2000).

The ability to produce the nasal consonant denoted as /m/ was notably lower across all participants, regardless of their use of cochlear implants (Table4). This finding is consistent with research conducted by Lohmander et al. (2015), who found that nasal sounds can be particularly challenging for children with hearing - impairments. The unique articulatory andacoustic properties of nasal sounds, which require precise coordination of the velum and airflow through the nasal cavity, may contribute to this difficulty.

The variability in bilabial consonant production highlights the need for individualized speech therapy approaches tailored to each child's specific needs. Speech-language pathologists should consider the unique challenges faced by children with different types and degrees of hearing-loss. For instance, therapy techniques that focus on improving nasal sound production may be particularly beneficial for children struggling with /m/ consonants.

The ability to produce bilabial consonants accurately is critical for effective communication. Children who can articulate these sounds clearly are more likely to be understood by their peers and teachers, which can enhance their social interaction and academic performance. This study underscores the importance of early intervention and the potential benefits of cochlear implants in improving speech articulation in deaf children.

Further research is needed to explore the underlying reasons for the difficulty in producing /m/ sound and to develop targeted speech therapy techniques. Longitudinal studies following children from early implantation through later childhood could provide valuable insights into the long-term effects of cochlear implants on speech development. Additionally, investigating the role of other factors such as auditory training, parental involvement and educational support could help identify strategies to enhance speech outcome for deaf children.

Conclusion

This study underscores the importance of early intervention and the potential benefits of cochlear implants in improving speech articulation in deaf children. The variability in bilabial consonant production highlights the need for individualized speech therapy approaches tailored to each child's specific needs. Further research is needed to explore the underlying reasons for the difficulty in producing /m/ sound.

References

1. Dettman, S. J., Wall, E. C., Constantinescu, G., & Dowell, R. C. (2016). Communication outcomes for groups of children using cochlear implants enrolled in auditory-verbal, aural-oral, and bilingual-bicultural early intervention programs. *Otolaryngology–Head and Neck Surgery*, 154(3), 423-438. https://doi.org/10.1177/0194599815621938
2. Geers, A. E., Strube, M. J., Tobey, E. A., Pisoni, D. B., & Moog, J. S. (2017). Long-term outcomes of cochlear implantation in the preschool years: From elementary grades to high school. *International Journal of Audiology*, 56(sup2), S30-S40. https://doi.org/10.1080/14992027.2016.1257264
3. Lohmander, A., Persson, C., Högberg, J., & Håkansson, G. (2015). A longitudinal study of speech production in Swedish children with hearing impairment using cochlear implants or hearing aids. *International Journal of Pediatric Otorhinolaryngology*, 79(6), 844-852. https://doi.org/10.1016/j.ijporl.2015.03.024
4. Moeller, M. P., Hoover, B., Putman, C., Arbataitis, K., Bohnenkamp, G., Peterson, B., Lewis, D. E., & Pittman, A. (2007). Vocalizations of infants with hearing loss compared with infants with normal hearing: Part I - Phonetic development. *Ear and Hearing*, 28(5), 605-627. https://doi.org/10.1097/AUD.0b013e31812564c9
5. Nicholas, J. G., & Geers, A. E. (2013). Spoken language benefits of extending cochlear implant candidacy below 12 months of age. *Otology & Neurotology*, 34(3), 532-538. https://doi.org/10.1097/MAO.0b013e318281e215
6. Svirsky, M. A., Teoh, S. W., & Neuburger, H. (2004). Development of language and speech perception in congenitally, profoundly deaf children as a function of age at cochlear implantation. *Audiology and Neurotology*, 9(4), 224-233. https://doi.org/10.1159/000078392
7. Svirsky MA, Chute PM, Green J, Bollard P, Miyamoto RT (2000): Language development in prelingually deaf children who have used SPEAK or CIS stimulation strategies since initial stimulation. Volta Rev 2000a; 102:199–213.