

Phonetic Placement Approach for Individuals with Repaired Cleft Lip and Palate: A Case Study

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Abstract

Speech sound errors in individuals with repaired cleft lip and palate (RCLP) are classified into obligatory and compensatory errors. Compensatory articulation (CA) include those that result from maladaptive articulatory placements learnt by children during development. Some speech therapy techniques given in western studies to remove CA include phonetic placement techniques, auditory discrimination and the use of visual, verbal and tactile cues. Phonetic placement approach (PPA) is an articulation technique that uses all these methods. There are limited studies in the Indian context pertaining to specific therapy techniques to reduce CA in individuals with RCLP. In the current study, a 4-year-old client with RCLP was given sixteen 45 minutes sessions of speech therapy using PPA over a period of two months. The improvement in articulation and intelligibility were evaluated using the Malayalam Diagnostic Articulation test, a 5-point rating scale and a conversational speech intelligibility assessment, pre and post therapy using PPA. Increased phonemic inventory, intelligibility rating and intelligibility percentage were noted post therapy. The phonemic inventory increased from just a few to more than 25 phonemes. The intelligibility rating and intelligibility percentage improved from 4-5 to 2-3 and from 5% to 25% respectively, indicating PPA being an effective therapy technique to reduce compensatory articulation and improve speech intelligibility. This study adds useful information to the area of articulation therapy for individuals with RCLP in India.

Keywords: Repaired cleft lip and palate, Compensatory articulation, Phonetic placement approach

Traditional and Phonological Models

The two main models for treatment of Speech Sound Disorder include the Traditional model and the Phonological model (Bowen, 2005). Traditional models focus on motoric manipulation of articulators for individual speech sounds (McDonald, 1964; Van Riper, 1972), while the phonological model concentrates on groups of speech sounds at a time (Fey, 1985; Klein, 1985 (as cited in Klein, 1996)). Though some studies suggest better results with phonological models (Klein, 1996), the traditional phonetic placement approach (PPA) may prove more useful for individuals who have difficulty achieving the correct placement of articulators for different speech sounds (Van Riper, 1978), such as individuals with repaired cleft lip and palate (RCLP) who exhibit compensatory articulatory errors due to incorrect learning (Golding-Kushner, 2001; Peterson-Falzone, Trost-Cardamone, Karnell, & Hardin-Jones, 2016).

Obligatory and Compensatory Errors

Speech sound errors in individuals with cleft lip and palate (CLP) are broadly classified into two kinds: obligatory and compensatory errors, according to Trost-Cardamone (as cited in Bzoch, 2004). Errors as a consequence of structural abnormalities such as residual clefts, oronasal fistula, malaligned tooth etc., are termed obligatory errors. These errors cannot be treated through speech therapy unless the underlying structural deformity is fixed. While, compensatory articulation (CA) include those that result from maladaptive articulatory placements learnt by children during development. These errors are usually developed as compensatory behaviors secondary to velopharyngeal insufficiency and vocal tract differences (McWilliams, Morris, & Shelton, 1990; Pamplona, Ysunza, Guerrero, Mayer, & Garcia-Velasco, 1996). For example, plosive sounds such as /p/ or /k/ may be replaced with glottal stop. These can be usually corrected through speech therapy but requires a prolonged period (Pamplona, Ysunza, & Espinosa, 1999; Kuehn & Moller, 2000).

Objectives of Speech Therapy for CLP

As per the guidelines of the American Speech Language Hearing Association (ASHA), the objectives of speech therapy for CLP are to correct oral placements for consonant misarticulations and to establish direction of airflow and appropriate valving of airflow at target place during production of oral sounds. Teaching correct oral placements will involve bringing backed oral articulations forward, teaching correct oral place, and establishing oral pressure buildup and release. ASHA also suggests the initial therapy goal to be the elimination of compensatory articulation as these tend to have a greater impact on intelligibility than do other types of speech sound errors. Once these errors are treated, the therapy can address developmental articulation or phonological errors, if present.

Some of the techniques that are helpful to remove compensatory articulatory errors from CLP speech include phonetic placement techniques, auditory discrimination and the use of visual, verbal and tactile cues (Golding-Kushner, 2001; Peterson-Falzone, Trost-Cardamone, Karnell, & Hardin-Jones, 2016). Phonetic placement approach is based on the concept that an individual can follow the motor plan suggested by the therapist (Van Riper, 1978). The therapist gives specific auditory and visual cues on where to place the articulators. However, if individuals are unable to respond well to auditory and visual cues alone, they provide an additional tactile-kinesthetic cue to learn the correct place of articulation (Bahr & Rosenfeld-Johnson, 2010).

According to Van Riper (1958), the training of every phoneme should begin with stimulating the auditory system (auditory training), then proceed to providing an auditory-visual model for the client to imitate (stimulation method). If these two steps alone do not teach the client the correct production of phoneme, objects can be used to provide a tactile feedback about the phoneme production. This is called the phonetic placement method. An overview of Van Riper's traditional PPA as given by Marshalla (2012) has been given in figure 1.

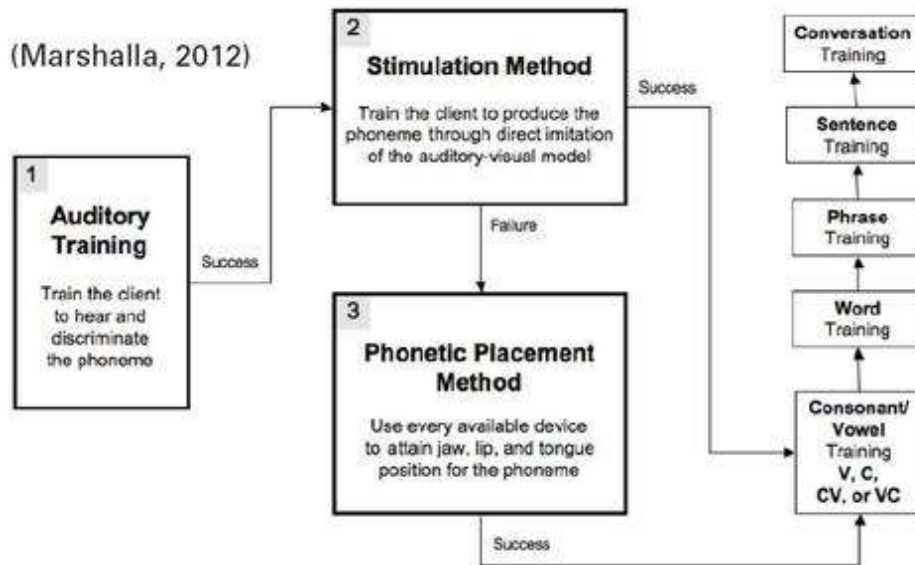


Figure 1. Van Riper's traditional phonetic placement approach.

Some of the objects used in traditional articulation therapy include hands/fingers, tongue depressors, spoons, stick candy, sugar, blunt toothpicks, cotton, tissue paper, sponges, etc. (Van Riper, 1947, 1954). Van Riper's phonetic placement methods are used even now for individuals who experience difficulty achieving the correct place of articulation (Bahr & Rosenfeld-Johnson, 2010; Merkel-Walsh, 2016).

Need for the Study

Since compensatory articulation in individuals with RCLP affect speech intelligibility to a great extent, it is necessary to study therapy techniques which help correct these incorrect articulations. There have been various western studies regarding the usefulness of different articulation therapy approaches in eliminating compensatory articulation in children with RCLP (Pamplona, Ysunza, & Morales, 2014; Hardcastle, Gibbon, & Jones, 1991). In the Indian context, though there have been studies emphasizing the importance of early intervention, prosthetic management etc. (Pushpavathi, Kavya, & Akshatha, 2017; Dhakshaini, Pushpavathi, Garhnyak, & Dhal, 2015), studies specific to articulation approaches for teaching correct phoneme production have been limited. Hence there is a need for more studies regarding the usefulness of various articulation approaches for Indian children with RCLP. This study is an attempt to study the effectiveness of the phonetic placement approach in removing compensatory articulation in a child with RCLP, who is a native speaker of Malayalam, a south Indian language used in the state of Kerala.

Objective

To study the effectiveness of the Phonetic Placement Approach in eliminating compensatory articulation and improving speech intelligibility in an individual with repaired cleft lip and palate.

Method

Participant

A four-year old child with repaired cleft lip and palate (Client A) participated in the study. The details of client A is given in table 1.

Table 1. *Participant details.*

Age	Gender	Age of surgery (months)		Language age (months)	
		Lip	Palate	Receptive	Expressive
4 years	Male	3	12	36-42	36-42

Client A did not attend any speech therapy before the current speech therapy sessions. He was recommended speech therapy after surgery, but the parents did not understand the importance of this until recently when people started to frequently complain about an inability to understand the client's speech. Client A communicated his needs mainly through 2-4 word unintelligible sentences accompanied with gestures and pointing.

Procedure & Analysis

The client was enrolled for speech therapy at the age of 3 years 10 months. The phonetic placement approach was used to teach the correct place and manner of articulation of various vowels & consonants. The details of the speech therapy sessions are given in table 2.

Table 2. *Speech therapy details for Client A.*

Total duration of therapy	Duration of a single session	Number of sessions	Training levels of PPA
2 months	45 minutes	16 (2 per week)	consonant/vowel training & word training

The usefulness of PPA in reducing compensatory articulation was assessed using pre and post therapy measurements using the following methods:

1. Malayalam Diagnostic Articulation Test, MAT (Maya, 1990)
2. 5-point rating scale
3. Conversational speech intelligibility assessment

MAT was administered by an unfamiliar Speech Language Pathologist with a Masters degree and a 5 year experience in the field of speech language pathology. The broad transcription method of International Phonetic Alphabet for Malayalam (Asher & Kumari, 1997) was used for transcription.

The 5-point rating scale used was taken from the 'Quick Screener child speech assessment procedure' (Bowen, 1996). It is as follows:

- 1: completely intelligible in conversation
- 2: mostly intelligible in conversation
- 3: somewhat intelligible in conversation
- 4: mostly unintelligible in conversation
- 5: completely unintelligible in conversation

The pre and post therapy ratings were collected from 5 individuals familiar to client A. The conversational speech intelligibility was calculated using a 200-250 words spontaneous speech sample elicited from client A before and after speech therapy using pictures and toys. The recording was done using the Praat software (version 6.0.29). The sample was given to an unfamiliar naive listener to assess. The listener was instructed to mark words understood with a '+' sign and the words not understood with a '-' sign on a sheet of paper. The listener was allowed to listen to each word twice if needed. The final intelligibility score was calculated by dividing the number of '+' signs by the total number of '+' & '-' signs, multiplied by 100.

Results & Discussion

Pre and post therapy results using the Malayalam Diagnostic Articulation Test:

The phonemic inventory of client A before and after phonetic placement therapy is shown in Table 3.

Table 3. *MAT results pre and post phonetic placement approach.*

Sound class	Phonemes present pre-therapy	Phonemes present post-therapy
Vowel	/a/, /e/, /u/	/a/, /i/, /u/, /o/, /e/
Labial	/m/	/p/, /b/, /m/
Labiodental	replaced with glottal stops	/f/, /v/
Dental	replaced with glottal stops	/t/, /d/ & /n/ (replaces /d/ inconsistently with glottal sound)
Alveolar	replaced with glottal stops	/n/ /l/ (distortion in final position inconsistently) /s/ (distortion in middle and final position of words inconsistently) /r/ (distortion present)
Retroflex	replaced with glottal stops	/ʈ/, /ɖ/ (inconsistent omission in middle position) /ʌ/, /ɳ/ in middle & final positions most of the time (inconsistent de-retroflexion in middle position) /ɹ/ (distortion present)
Palatal	replaced with glottal stops	/tʃ/, /dʒ/, /j/, /ɲ/, /j/

Velar	replaced with glottal stops	/ŋ/, /k/ & /g/ inconsistently (replaced by glottal stops remaining time)
Glottal	replaced with glottal stops	/h/
Others	-	Cluster reduction present in all positions

The table reveals an increase in the phonemic inventory of the client post phonetic placement therapy. Before therapy, the client's speech was restricted to just a few vowels, /m/ consonant and glottal stops. After PPA, most of the sound classes were achieved at the phonemic and word levels, though distortions, cluster reductions and some glottal stops remained. The results throw light on the usefulness of PPA in establishing the correct place and manner of articulation for various phonemes in a child with RCLP. Golding-Kushner (2001) and Peterson-Falzone, Trost-Cardamone, Karnell, and Hardin-Jones (2016) also suggested techniques similar to the ones used in PPA to improve cleft palate speech.

Pre and post therapy results using the 5-point rating scale:

The ratings of the client's speech by various individuals are given in table 4.

Table 4. *Pre & post PPA therapy intelligibility ratings by individuals familiar to client A.*

Individuals	Mother	Sister	Father	Grandmother	Teacher	
Rating						
	Pre	4	4	5	4	5
	Post	2	2	3	3	2

Though subjective rating scales are highly unreliable (Bowen, 2011), they give us an idea about the general impression of people, about intelligibility. The ratings obtained here show an improvement in speech intelligibility post PPA therapy further proving its effectiveness.

Pre and post therapy results using conversational intelligibility assessment:

The conversational intelligibility percentage before and after therapy are given in table 5.

Table 5. *Pre & post PPA therapy conversational intelligibility percentage.*

Therapy	Pre	Post
Intelligibility (%)	5	25

As seen in the table, the conversational intelligibility percentage has improved from 5% to 25% after speech therapy using PPA. Though this needs to improve much more to reach age appropriate speech intelligibility (Coplan & Gleason, 1988; Bowen, 2011), it is reasonable improvement considering the lack of speech therapy and use of mislearned articulatory patterns during the first few essential developmental years (Siegler, 2006). Moreover, the phonetic placement therapy for the client is still in progress as only the consonant/vowel and word levels have been worked upon till date. An increase in the conversational intelligibility score can be expected once the phrase, sentence and conversational training is given.

Conclusion

This study was done to find out the use of the phonetic placement approach in reducing compensatory articulation and improving speech intelligibility in a child with repaired cleft lip and palate. An increase in the client's phonemic inventory and an overall improvement in the speech intelligibility were observed after sixteen 45 minutes sessions of PPA. Therefore, we can conclude that PPA is an effective therapy technique for eliminating CA and improving speech intelligibility. As CA usually requires a prolonged period of speech therapy, we can expect greater improvement in the intelligibility ratings and intelligibility percentage of the client with continued speech therapy involving PPA. Working on the next levels of PPA will give a clearer idea regarding the usefulness of PPA in bringing speech intelligibility to age appropriate levels. Also, applying PPA for more individuals with RCLP will help us get a more definite picture of the effectiveness of PPA for the RCLP population.

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