



Use of metacognitive strategies in the speech and language intervention of Marathi speaking individuals with cleft of lip and/or palate

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ABSTRACT

Introduction: Compensatory Articulation Disorder (CAD) is frequently seen in individuals with Cleft of lip and Palate (CLP). Speech intervention with metacognitive strategies in these individuals requires a long period of time. **Objective:** To study the use of metacognitive strategies in therapeutic intervention of individuals with Cleft of Lip and Palate. **Methodology:** 14 Marathi speaking Children with CLP between 4 to 6 years of age were evaluated for language and articulation. 7 Speech Language Pathologists devised Percentage Correct Consonants on the Photo Articulation Test for Articulation pre and post intervention. Language measures were compared pre and post therapy on the Receptive Expressive Emergent Language Scale. **Results:** There was a significant difference between articulation and language measures pre and post intervention respectively which

is attributed to the use of metacognition strategies. **Conclusion:** Severity of CAD and effectiveness of strategies used for correcting articulation errors are linked to one another. Assessment of CAD and therapy scaffolding metacognition strategies can be used in Speech treatment of individuals with CLP.

Key words: Cleft lip and palate, Marathi, metacognition, speech and language intervention

INTRODUCTION

The four main aspects of language are phonology, semantics, syntax, and pragmatics. As defined by

American Speech and Hearing Association (ASHA), speech sound disorders are an umbrella term referring to any combination of difficulties with perception, motor production, and/or the phonological representation of speech sounds and speech segments (including phonotactic rules that govern syllable shape, structure, and stress as well as prosody) that impact speech intelligibility.

ASHA further elaborates that speech sound disorders can impact the form of speech sounds or the function of speech sounds within a language. Disorders that impact the form of speech sounds are traditionally referred to as articulation disorders and are associated with structural (e.g., cleft palate) and motor-based difficulties (e.g., apraxia). Speech sound disorders that impact the way speech sounds (phonemes) function within a language are traditionally referred to as

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phonological disorders; they result from impairments in the phonological representation of speech sounds and speech segments – the system that generates and uses phonemes and phoneme rules and patterns within the context of spoken language. The process of perceiving and manipulating speech sounds is essential for developing these phonological representations.

Compensatory articulation disorder (CAD) is observed in the speech of individuals with cleft of lip and/or palate (CLP) and CAD severely affects speech intelligibility. CAD is considered to be a phonological disorder and requires a prolonged period of speech intervention.^[1] Thus, it seems necessary to explore the relationship between CAD and language development. Therapy must consider all aspects of speech and language. Intervention for CAD must comprise of linguistic skills, cognition skills, and phonological skills. Children with CAD must be provided with abstract thinking as part of linguistic skill development.^[2]

Establishment of correct placement of the articulators and appropriate air flow is the basic principle in speech therapy for CLP. In addition to linguistic skills, percentage correct consonants (PCCs) and speech intelligibility are parameters essential to be assessed for individuals with CLP. Pamplona and Ysunza *et al.* found that children with CLP benefited with an approach consisting of higher levels of language such as abstract thinking rather than only on speech production.^[3] On the other hand, Klinto *et al.* found that there was no pattern seen regarding a relationship between percent correct consonants and ability to retell a narrative in children with unilateral CLP (UCLP) and a larger proportion of children with UCLP than those without UCLP displayed problems with retelling.^[4]

The situational discourse semantic (SDS) model is one valuable tool providing a detailed assessment of language development with a detailed description of three contexts, i.e., SDS^[5,6] in ten levels of cognitive and linguistic organization. The SDS model was developed by Dr. Norris and Dr. Hoffman. It describes behavior across three dimensions: situational, discourse, and semantic. The model is a continuum of contextualized and decontextualized levels and can serve as a guide for modifying instruction. This model is a valuable tool for conducting naturalistic observation and descriptive assessment of language development. The SDS model provides age norms for each level of development based on typically developing children. In this model, the level of representation present in the activity is specified in the situational context. The discourse is scored according to the highest level of organization shown in

the play and storytelling. Moreover, semantic context is scored for the level of meaning expressed during storytelling or play. The samples are evaluated for the highest level of meaning expressed by the child. The coding results in one level assigned for situation, one for discourse, and one for semantics for each subject.^[7] Based on the assessment using the SDS, a study was conducted to review and select specific scaffolding strategies for the intervention of compensatory articulation in the speech of individuals with CLP.^[1] These strategies were known as metacognitive strategies in which modeling,^[8,9] phonemic cues,^[2] minimal pairs,^[9,10] cycles,^[11] imitation and drills,^[12] requests for clarifications,^[13] phonetic changes,^[2] think aloud in phonemic awareness,^[14] and expansions^[8] are commonly used strategies and phonetic change, cloze procedure with phonemic cues, and/or think aloud in phonemic awareness, appear to be more effective.^[1]

In the Indian scenario, there is a paucity of studies, in which intervention using specific metacognitive strategies specified by SDS model has been demonstrated/ highlighted, more so in the speech-language intervention of Marathi speaking individuals with CLP.

The purpose of the present study was to correct articulatory patterns of Marathi speaking children with CLP with a focus on the use of metacognitive strategies. The aim of the study was to determine the efficacy of metacognitive strategies in the intervention of compensatory articulation in Marathi speaking children with CLP.

METHODS

The study was carried out at Godrej Memorial Hospital, Mumbai. Initially, written informed consent was obtained from the parents, followed by assessment and intervention. Both the assessment and intervention were conducted by the same speech and language pathologist (SLP). The study commenced after explaining to the parents/guardians about the study and after taking their written consent. The participants comprised of 14 Marathi Speaking children in the age range of 4–6 years with repaired CLP. The inclusion criteria were as follows: repaired unilateral or bilateral CLP with.

- a. No known hearing loss
- b. No neurological problems
- c. Having Marathi as their first language
- d. Having being diagnosed as velopharyngeal dysfunction as assessed perceptually using procedure provided by McWilliams and Phillips in 1979

- e. Diagnosed as having CAD demonstrated during a complete speech and language evaluation.

Compensatory articulation errors are substitution patterns that involve changing placement or direction of airflow in a way that bypasses the need for pressure generation at normal, oral place features as given by many authors - Sphrintzen and Bardach, 1999; Pamplona, 2004; <http://www.acpa-cpf.org/>, the website of the American Cleft Palate Association. There are many patterns in this category. Developmental errors are those errors in articulation seen in the developmental process. Mostly, back sounds are substituted by front sounds, and there is the presence of normal phonological processes, and these can be assessed perceptually by SLPs using perceptual tests such as photo articulation test (PAT), Goldman-Fristoe test etc. The children with developmental articulatory errors were excluded from this study.

Articulation was assessed using PAT. (Ali Yavar Jung National Institute of Speech and Hearing Disabilities AYJNISHDD, 1988). PAT assesses production/articulation of all phonemes of the Marathi language with each phoneme at the initial, medial, and final position of the target word. The scoring can be described as correct sounds, substitutions, omissions, additions, and/or distortions. The class of incorrect sounds is also described when carrying out the test and so is the type of error, for example, glottal and pharyngeal.

The participants of the study had compensatory articulations which comprised of abnormal backing of oral consonant targets, velar backing, pharyngeal backing, nasal fricatives along with phoneme specific consonant errors, nasalization of oral consonants and voice pressure consonants, frequent audible nasal emission, and weak oral pressure sounds. Children with developmental errors were excluded from the study. Speech samples were recorded in a quiet room on a Sony digital recorder model number ICD PX-440.

Language assessment was carried out on the extended Receptive-Expressive Emergent Language Scale-3 (REELS) by Bzoch, League, and Brown, 2003, which is a checklist for children up to 6 years of age. Language was assessed pre- and post-therapy. The extended REELS checklist taps receptive language age and expressive language age from 0 to 6 years of age at 3-month intervals. All participants were enrolled for speech and language intervention. None of these participants had undergone speech and language intervention earlier.

PCC is calculated by a number of incorrect consonants ÷ total number of consonants × 100. PCC was assessed by seven SLPs for each of the children's speech samples. There was no specific reason for selecting seven SLPs, but more SLPs were included to increase the reliability. These SLPs had three or more years of experiences with individuals with CLP. SLPs also rated speech intelligibility on a rating scale developed by AYJNISHDD. The intelligibility rating scale is depicted in Table 1. The duration of therapy of the participants is displayed in Table 2.

Therapy

Metacognitive strategies and concrete to abstract thinking were used in the intervention process. Therapeutic intervention was centered essentially around metacognitive strategies such as making connections, inferring, prediction, questioning, and summarizing. Each of these parameters was used as a strategy to work on language development. For example, "making connections" involved the therapist reading or narrating to the child and the child had to make connections as to where they heard or experienced or related to a particular setting with reasoning.^[15] combining personal experience and prior knowledge with narrative content is "inferring."^[2,6,15] "Prediction" involved language users to predict and think what will happen next because.^[15] To guide comprehension and ensure solidity of future thoughts, skilled listeners used "questioning" to broaden comprehension.^[15] "Summarizing" encompasses challenging tasks such as recalling important events, using synonyms, selected vocabulary, and linking up.

To put into other words, for improving CAD, focus was to enhance an entire feature of articulatory targets within the story or activity. Role play activities had targets of articulation inculcated with work on language and nasality. Auditory feedback from nasality was one

Table 1: Speech intelligibility scale

Intelligibility rating	Description
0	Normal speech
1	Speech is understood without difficulty but sounds abnormal
2	Speech is understood with a little effort, repetitions needed occasionally
3	Can be understood with concentration and effort by a sympathetic listener, requires 2-3 repetitions
4	Understood with difficulty and concentration by only family members and not others
5	Can be understood with effort if context is known
6	Cannot be understood at all even when context is known

of the techniques used to reduce perceived nasality and improve overall speech intelligibility.

Further, from Table 2, it can be seen that not all participants were consistent with therapy based on their percentage of therapy sessions attended. However, each participant was given a detailed home program for follow-up. The children's parents send video and audio recordings of the home program followed to the therapist. Each child was instructed to have a therapy kit consisting of an auditory feedback tube, ice-cream sticks, honey, and notebook with a list of articulatory target words.

All participants were assessed for receptive and expressive language skills using the extended REELS; assessment of articulation was done using PAT and Speech intelligibility was assessed using rating scale developed by AYJNISHDD, Mumbai. The receptive

language age and expressive language age changed for participants who underwent therapy regularly and whose percentage of therapy sessions was more in comparison to other participants. Table 3 depicts the receptive and expressive skills pre- and post-therapy.

Shaded areas added in the Table 3 show the participants whose receptive and expressive skills improved post therapy. Most of the parents of children followed up with the home program consistently. It can be observed that in participant number 4, the improvement is less even though he/she has undergone 12 months of intervention. This can happen due to various reasons – follow-up was not consistent at home for this client. There are no children who did not attend therapy at all. If there have been few sessions of therapy, progress observed can be attributed to consistent follow-up at home.

Table 2: Depiction of age of participants and therapy details

Participant	Age	Duration of therapy (months)	Frequency of therapy	Consistency	Percentage of therapy sessions attended
1	6 years	17	2/week	Fair	83
2	5 years 11 months	29	3/week	Very good	100
3	4 years 4 months	12	3/week	Fair	75
4	6 years	2	2/week	Poor	50
5	3 years 1 month	2	2/week	Fair	75
6	3 years	2	2/week	Fair	75
7	6 years	4	2/week	Fair	62.5
8	3 years 6 months	12	2/week	Good	93
9	3 years	4	2/week	Fair	87
10	3 years 6 months	3	1/month	Poor	83
11	5 years	1	1/week	Good	87
12	6 years	1	1/week	Good	87
13	4 years 4 months	1	1/week	Good	87
14	4 years	24	2/week	Fair	94

Table 3: Results of Receptive-Expressive Emergent Language Scale-3 Pre- and Post-therapy

Participants	Age (years) when therapy begun	Duration of therapy (months)	Receptive language skills (months)		Expressive language skills (months)	
			Pre Therapy	Post Therapy	Pre Therapy	Post Therapy
1	3	2	27-30	33-36	24-27	33-36
2	3	4	27-30	33-36	27-30	33-36
3	3.1	2	33-36	33-36	33-36	33-36
4	3.6	12	24-27	33-36	18-20	24-27
5	3.6	1	24-27	33-36	24-27	33-36
6	4	24	24-27	36-42	21-24	36-42
7	4.4	1	54-60	54-60	48-54	48-54
8	4.4	2	24-27	36-42	20-22	33-36
9	5	1	54-60	54-60	48-54	54-60
10	5.11	30	22-24	60-66	14-16	60-66
11	6	17	36-42	66-72	36-42	66-72
12	6	2	54-60	54-60	54-60	54-60
13	6	4	60-66	66-72	60-66	66-72
14	6	1	66-72	66-72	60-66	60-66

The intervention included the use of metacognitive strategies which were provided to each and every child. This strategy is language based and also works at articulation. To reiterate language assessment, pre- and post-therapy was carried out using REELS extended version 3 where children are either observed for receptive and expressive behaviors or a parent provided relevant information. It is a retrospective study and the same SLP provided therapy for the 30-month period.

PCC was calculated by 7 SLPs pre- and post-therapy from audio speech samples. All the children received therapy for correction of CAD by the same SLP. The pre- and post-therapy PCC scores are illustrated in Figure 1.

Remembering again, error patterns were different types of compensatory articulations such as abnormal backing of oral consonant targets, velar backing, pharyngeal backing, nasal fricatives along with phoneme-specific consonant errors, nasalization of oral consonants and voice pressure consonants, frequent audible nasal emission, and weak oral pressure sounds. Errors and therapy procedure using metacognitive strategies are mentioned earlier.

A paired *t*-test was conducted to compare results of PCC and speech intelligibility pre- and post-therapy. To assess whether there is a significant difference in the pre- and post-therapy PCC scores, a *t*-test was carried out. The results of *t*-test are illustrated in Table 4.

Speech intelligibility pre- and post-therapy was rated on the 5-point rating scale developed by AYJNISHDD, Mumbai. Table 5 depicts results of speech intelligibility pre- and post-therapy.

Inter Class Co efficient which was used to compare the inter rater reliability among 7 SLPs for PCC pre and post therapy is displayed in Table 6.

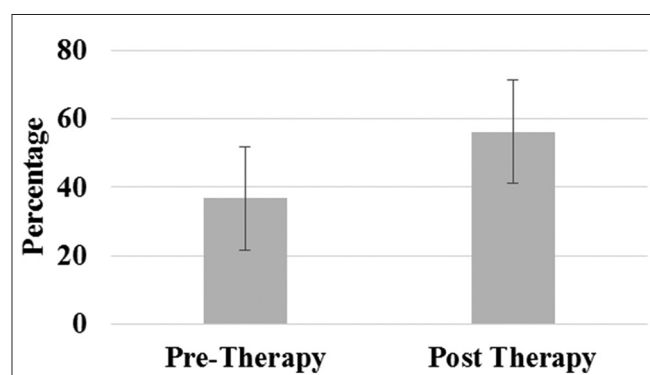


Figure 1: A is a graph depicting PCC pre and post therapy

DISCUSSION

The main aim of the study was to use metacognitive strategies for intervention of children with CLP having CAD. The results did indicate that when metacognitive strategies are used for intervention, these children did improve. Metacognitive strategies such as making connections, prediction, inferring, questioning, and summarizing and story narration as the main principles for therapy used at the center were beneficial in enhancing language development and improving the language age on the REELS.^[2,6,7,14-16]

Children with CLP as compared to typically developing children differ in their receptive and expressive language age. It was found by Rescorla^[17] that language differences persist up to the age of 17 years in late talkers consisting of weaknesses in grammar, vocabulary, higher order language, narration, definition, explanation, description, exposition, and reading.^[6,8,9,11-13,15,18] Scarborough and Dobrich's reported similar findings.^[19] Thus, it is essential to focus on metacognitive strategies to enhance language development in individuals with CLP.^[15]

In addition to delay in language development, CAD is observed mainly in children with CLP. Furthermore, CAD is considered as a phonological disorder and not just a phonetic disorder, in which one "phoneme" (sound) is substituted by another. CAD being a phonological disorder has many implications. One of the implications first coming to the mind is that the phonological system is integrated with the language system. Hence, one

Table 4: Results of *t*-test for percentage correct consonants scores pre- and post-therapy

Status for PCC	Mean	SD	<i>t</i>
Pretherapy	36.77	15.11	<i>t</i> =-7.92, df=13, <i>P</i> =0.0001*
Posttherapy	56.22	16.88	

P < 0.05 considered as statistically significant. PCC: Percentage correct consonants, SD: Standard deviation

Table 5: Results of *t*-test for speech intelligibility pre- and post-therapy

Status for speech intelligibility	Mean	SD	<i>t</i>
Pretherapy	3.66	0.88	<i>t</i> =4.98, df=13, <i>P</i> =0.0001*
Posttherapy	2.47	0.65	

P < 0.05 considered as statistically significant. SD: Standard deviation

Table 6: Pre- and post-therapy intra-class correlation coefficient pre- and post-therapy

	Pretherapy	Posttherapy
ICC	0.81	0.75

ICC: Intraclass coefficient

most important recommendation is that the language of children with CAD should also be assessed and treated during intervention. Further, an assessment and analysis of phonological processes have to be made mandatory, in addition to phonetic analysis. Finally, for speech intervention, metacognitive strategies which are not only language based but are also aimed at modifying the articulation system should be used.

These strategies are useful for scaffolding the child's communicative turns to increase his/her speech and language performance. Using these strategies (which include various types of prompts, questions, information, restatements, and other procedures), support is provided to the child as he/she is actively engaged in the process of communicating a message. While communicating, a message practice is provided to the child to also articulate the sound appropriately. Many authors have described that these strategies are useful for facilitating a better way to communicate and/or articulate the sounds of speech.

Pre- and post-therapy PCC scores were different and statistically significant. Children with irregular therapy had a poorer PCC and intelligibility rating as compared to those with consistent and long-term therapy. Speech therapy is essential to improve speech intelligibility and correct CAD in individuals with CLP.^[20] CAD and language delay can occur in children with CLP.^[21] Intervention in children with CLP and CAD should focus on the articulation processes and aspects of language development.^[15] At a time, one speech sound was not corrected, but an entire feature was selected to be worked on. For example, for fricatives, the feature of aspiration was introduced, and then all sounds with aspiration were selected belonging to a particular class of sounds. Place of articulation was shown to children; stability and generalization were worked on more in group activities. Perceived nasality was also worked upon with an auditory tube to improve overall speech intelligibility.

Further, it was also found that children from families with a low socioeconomic status exhibit deficits in grammar, narratives, phonological development, and processing speed.^[5] For instance, the proportion of children living in poverty whose language development reflects the influence of socioeconomic status is likely to be >22%.^[15] Pamplona and Ysunza found that children with CAD and language delay at their centres also belonged to families from low socioeconomic status and thus were at higher risk for language delay.^[15]

In addition to the main aim of the study, it was also found that children who underwent a greater number of sessions and were regular in therapy showed a change in status in the REELS age pre- and post-therapy as compared to children who were irregular and attended a lesser number of sessions. Reasons for poor follow-up and consistency included long-distance travel, expenses for conveyance and therapy, school timings, and parents' working timings; parents send videos and audio recordings of their child's therapy home follow-up. This made it easy for the therapists to guide the parent and modify the child's home program. In the Indian scenario, it is challenging for parents coming from villages and the outskirts of cities to follow up for consistent therapy, but technology proved as a boon for such parents. PCC and speech intelligibility were significant pre- and post-therapy.

CONCLUSION

Intervention in children with CLP and CAD should focus on the use of metacognitive strategies which are aimed not only at language development but also phonological processes. Use of these strategies not only improves the language level (both receptive and expressive) but also improves the articulation of phonemes. However, one must remember to use these strategies only for children with CLP who have CAD; studies by various researchers suggest that these strategies may not be applicable to children with CLP having developmental articulation errors.

Limitations and future implications

The sample size was small and reduced over a period of time. A comparison of two groups/cohorts having CAD can be done – one receiving traditional therapy for improving articulation and one receiving metacognitive therapy for improving language and thus reducing the use of phonological processes, thereby improving articulation. Such a comparison was not done in the study.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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