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RESEARCH ARTICLE

A PRELIMINARY STUDY ON ANALYSIS OF PHONOLOGICAL PROCESSES IN TAMIL SPEAKING HEARING IMPAIRED CHILDREN WITH COCHLEAR IMPLANTS

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Abstract

Phonological Processes are simplification of sounds which occur among the children during the younger age and will gradually diminish giving an adult like speech form. The aim of the present study is to analyze the occurrence of phonological processes among hearing impaired children who underwent cochlear implant surgery during their younger age as an early intervention. The subjects included in the study were 10 children (5 male and 5 female) who were diagnosed with congenital total hearing impairment and underwent cochlear implant surgery and attending Auditory verbal therapy. The task given to the subjects in the present study is to repeat the words in Tamil Articulation Test followed by the Clinician. The words were recorded and further analyzed for the occurrence of phonological processes. The results show that a total of 26 phonological processes (both typical and atypical) occurred with a maximum occurrence of Depalatalization and minimally of Final Consonant Deletion. The results of the present study help in providing a better knowledge about the occurrence of phonological processes which helps the speech language pathologist in intervening hearing impaired children with cochlear implants and to improve their speech intelligibility.

Introduction:-

Phonology is the study of formulation of sounds which are put together to form words and other linguistic units. Phonology demonstrates the patterns of distinctive sound contrast in a language and to explain the ways speech sounds are organized and represented in mind. Storkel (2006) & Stoel-Gammon (2011) mentioned a close relationship appears to exist between young children's phonological knowledge and their acquisition of vocabulary. Young children usually have difficulty in co-ordinating the movements of their vocal apparatus which results in simplification of complex words. These simplifications results in pronunciation errors and these errors are mentioned as "Phonological Processes" or "Phonological Deviations". As children begin to organize their speech sounds to match those of adult speech forms, the phonological processes will gradually diminish giving an adult speech form.

Bankson and Bernthal (1990) defined phonological processes as "Simplification of a sound class in which target sounds are systematically deleted and/or substituted". Samayan (2015) explained phonological processes are not

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random but predictable in nature. Phonological processes found to be varying between languages and within languages across different age groups.

Bharathy (2001), reported that among Tamil speaking typically developing children between the age range of 3 -4 years, the phonological processes like cluster reduction, epenthesis, stopping for liquids and fricatives, nasal assimilation, voicing assimilation, initial consonant deletion, unstressed syllable deletion, affrication and deaffrication can be seen. In addition to this, literature also suggested that the phonological processes like backing, lateralization, medial syllable deletion, gliding, inter vocalic deletion, fronting and palatalization persisted in Tamil speaking children of same group. Radhakrishnan (2001) conducted a study on normally developing 3 -4 year old Tamil speaking children. He used Tamil Articulation test as the stimuli and observed total of 15 different processes and even as the age advanced from 3 -4 years Cluster reduction, epenthesis, voicing and assimilation persisted. However unstressed syllable deletion, gliding, stopping of liquids, stopping of fricatives, nasal assimilation, initial consonant deletion, final consonant deletion, deaffrication were found to decrease as the age advanced from 3 – 4 year.

Children with congenital bilateral profound hearing loss usually have difficulties in the acquisition of verbal communication and speech intelligibility because of lack of auditory feedback. Smith (1975) had mentioned numerous segmental errors which related to poor speech intelligibility in children with hearing loss, which includes vowel errors, final consonant deletion, voiced voiceless cognates confusion and manner and place of articulation errors. Mines (1997) reported a significant relationship between phonological errors and degree of hearing loss. The most commonly occurred phonological processes were final consonant deletion and cluster reduction.

The recent advancement in rehabilitation of congenital hearing impaired children is COCHLEAR IMPLANT. Cochlear implant helps the hearing impaired children in listening by converting mechanical sound energy into a coded electric stimulus which further stimulates the auditory neural elements directly, bypassing the damaged hair cells of cochlea. Various studies reported the increase in sound repertoire and near normal perfection in articulation skills of hearing impaired children with cochlear implants done at early ages (Tobey & Hasentab, 1991). Chin & Pisoni (2000) reported that the use of cochlear implants improves the inventory of speech sounds in a two year post implant case study. The phonological processes reported by them in 5.8year old were deaspiration, fronting, cluster reduction and deaffrication. Buhler, DeThomasis, Chute and Decora (2007) concluded that cochlear implant children revealed the presence of phonological processes like stopping, cluster reduction, final consonant deletion, velar fronting and liquid simplification.

In Indian context, Ramadevi (2006) examined phonological processes among normal hearing children and hearing impaired children who are native kannada language speakers. The results indicated 54 phonological processes were observed among hearing impaired children with a total of 32 phonological processes found in normal hearing in the age range of 5 to 9 years. Among hearing impaired children, the phonological processes occurred less than 20% were Epenthesis, gliding of liquids and medial vowel deletion; Frequently occurring phonological processes (i.e.) 20 – 60% were affrication, alveolar assimilation, backing, partial cluster reduction, final vowel deletion, lateralization, monophthongization, stopping of glides and liquids, voicing, vowel backing, vowel fronting, vowel lengthening, vowel raising and vowel shortening. The most commonly occurring processes i.e. > 60% were cluster reduction, deaspiration, denasalization, devoicing of consonant, fronting of palatals and retroflexes, nasal deletion, stridency deletion and vowel lowering.

In a study by Ravali Mathur (2019), he concluded that the delay in phonological development in children with hearing impairment is found to be more in Hearing impaired children using hearing aids than with cochlear implants. The results showed that among children with cochlear implant group the phonological processes observed more were weak syllable deletion, nasal assismilation, metathesis, prevocalic voicing, diphthongization, vowel fronting, sound intrusion, total cluster reduction, reduplication and backing.

Need Of The Study

In Indian context there is a dearth in phonological processes analysis among hearing impaired children using cochlear implants. Hence the current study focuses on analysis phonological processes occurring among Tamil speaking hearing impaired children who are using cochlear implants.

Aim Of The Study

The aim of the current study is to analyze the occurrence of phonological processes among Tamil speaking hearing impaired children who underwent cochlear implant surgery and undergoing Auditory verbal therapy.

Method:-

Participants:

The participants included in the study comprised of 10 hearing impaired children (5 male children and 5 female children) in the age range of 3 to 5 years. All the participants were diagnosed as Congenital Bilateral Severe to Profound hearing loss and they underwent cochlear implant surgery at Government Rajaji Hospital, Madurai. All the subjects are undergoing Auditory verbal therapy followed by cochlear implant surgery. All the children are using MED-EL Sonata Ti 100 cochlear implants with OPUS-2 Speech Processor. The Speech Processing strategies and number of channels were not considered for the study. All the subjects present with normal oral peripheral mechanism anatomically and physiologically with no other associated problems.

Test Material:

Tamil Articulation Test developed by Usha (1986) was used for the study. The list of words used for the study are attached in APPENDIX – 1.

Procedure:

The consent for participating in the study was obtained from the parents of the participants. All the participants were seated comfortable in front of the computer in a quiet room. The task involved in the study is repetition task. The Clinician sat beside the participant. The subjects were asked to repeat the words in Tamil Articulation Test which were told by the clinician in an audible loudness. All the participants were familiarized to the Tamil Articulation Test word list before the task. The children were permitted to use both auditory and visual cues, any how children were encouraged to use Auditory cues majorly. The words repeated by the subjects were recorded with the help of PRAAT Software. The recorded samples were further analyzed perceptually by three experienced Speech Language Pathologist in regard to the occurrence of phonological processes. The occurred phonological processes were listed for all the participants and they were statistically analyzed.

Results And Discussion:-

The result of the present study depicts the occurrence of phonological processes among hearing impaired children with cochlear implants. The result shows a presence of total of 26 phonological processes among the subjects which included both typical and atypical phonological processes.

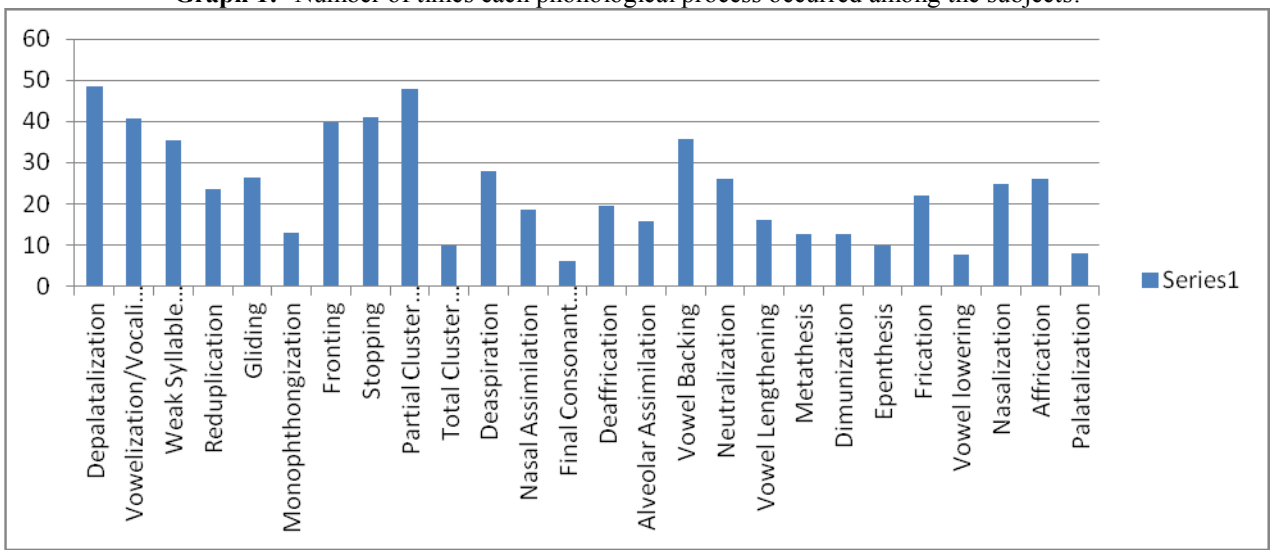
Table 1:- Phonological processes occurrence among the 10 subjects.

S.No	Phonological Processes	Sub 1	Sub 2	Sub 3	Sub 4	Sub 5	Sub 6	Sub 7	Sub 8	Sub 9	Sub 10	Mean
1.	Depalatalization	54	48	56	49	53	38	44	39	52	51	48.4
2.	Vowelization/ Vocalization	48	49	42	44	36	40	39	32	46	32	40.8
3.	Weak Syllable Deletion	42	38	21	39	40	32	28	44	29	40	35.3
4.	Reduplication	24	32	20	23	18	17	26	24	22	30	23.6
5.	Gliding	36	29	21	24	26	32	26	21	28	20	26.3
6.	Monophthongization	27	14	12	10	12	10	8	14	10	11	12.8
7.	Fronting	42	44	36	29	42	44	38	40	43	39	39.7
8.	Stopping	50	38	42	39	42	38	46	33	42	40	41
9.	Partial Cluster Reduction	60	52	48	54	52	34	46	38	44	52	48
10.	Total Cluster Reduction	12	8	10	10	6	11	7	5	16	12	9.7
11.	Deaspiration	33	24	27	28	31	25	28	31	27	26	28
12.	Nasal Assimilation	24	11	15	18	21	24	16	12	23	21	18.5
13.	Final Consonant Deletion	10	0	4	12	5	11	7	3	8	2	6.2

14.	Deaffrication	26	14	18	21	19	24	18	22	16	18	19.6
15.	Alveolar Assimilation	28	22	10	14	16	21	10	11	16	8	15.6
16.	Vowel Backing	40	43	38	32	28	34	29	44	32	36	35.6
17.	Neutralization	36	18	28	28	24	32	30	19	26	20	26.1
18.	Vowel Lengthening	20	12	16	18	21	24	16	14	10	11	16.2
19.	Metathesis	18	8	12	11	9	13	21	14	11	9	12.6
20.	Dimunization	18	6	14	12	14	25	8	10	12	6	12.5
21.	Epenthesis	14	12	8	8	14	8	13	6	4	12	9.9
22.	Frication	27	28	23	22	18	21	22	18	19	22	22
23.	Vowel lowering	10	4	3	11	6	3	9	11	12	6	7.5
24.	Nasalization	28	22	26	26	24	21	26	23	28	25	24.9
25.	Affrication	30	24	26	23	28	31	24	28	22	26	26.2
26.	Palatalization	12	6	8	11	5	7	12	6	8	6	8.1

From the above table it can be inferred that the phonological process Depalatalization occurred maximally followed by Partial cluster reduction, Stopping, Vowelization/Vocalization, Fronting, Vowel backing and Weak syllable deletion. Whereas the Phonological processes Final Consonant deletion, Vowel Lowering and Palatalization occurred minimally.

Graph 1:- Number of times each phonological process occurred among the subjects.



The above graph also depicts the occurrence of Phonological processes among the hearing impaired children with cochlear implants, which shows a maximum occurrence of Depalatalization. The findings of the present study are similar to the results of Lee (2010), Day et al (2010) and Ravali P Mathur (2019).

Summary and Conclusion:-

The present study was an attempt of analyze the phonological processes in Tamil speaking children with congenital hearing impairment who underwent cochlear implant during their younger age. It was noticed that 26 phonological processes occurred among the subjects. The overall results of the study reflect delayed phonological development among hearing impaired children with cochlear implants. The knowledge about the occurrence and pattern of phonological processes among hearing impaired children with cochlear implant will help the speech language pathologist to design a better management techniques which will help in improving the speech intelligibility of the cochlear implant children. Further studies are recommended with more number of subjects and the occurrence of phonological processes can be compared with typically developing Tamil speaking children.

References:-

1. Barathy R. (2001), "Development of Phonological Processes of 3 – 4 year old normal speaking children", Unpublished Masters Dissertation, University of Mysore, Mysore.
2. Bernthal J.E. & Bankson N.W. (2017), " Articulation and Phological Disorders" (Eighth Edition), Pearson Education Inc.
3. Buhler, H.C., DeThomasis, B., Chutte, P., & DeCora, A. (2007), "An analysis of phonological process used in young children with cochlear implants", *The Volta Review*, 107(1), 55 – 74.
4. Jenita Caren Rajakumari et al. (2018), "Phonological Process in Tamil Speaking Monolingual and Bilingual Children – A comparative Study", *Language in India*, ISSN 1930-2940, Vol. 18:5, May, 2018.
5. Kala Samayan (2015), "A Comparative Study of Phonological Processes in Tamil Speaking Typically Developing Vs ADHD Children", *Journal of International Academic Research For Multidisciplinary*, ISSN: 2320-5083, Volume 3, Issue 9, October 2015.
6. Lee H.I. (2010) "Vowel production by Cantonese speaking children with cochlear implant". A dissertation submitted in partial fulfillment of the requirements for the Bachelor of science (Speech and Hearing Sciences), The university of Hong Kong, Available at http://hub.hku.hk/bitstream/10722/173715/1/Full text.pdf University of Hongkong.
7. Ramadevi, K.J.S. (2006), "Phonological Profile in Kannada: A study on Hearing Impaired". Doctoral thesis submitted for degree of Doctor of Philosophy in Linguistics. University of Mysore, Mysore, available online at: 203.129.86:8080/digital library/Author Title.do? J Author = Ramadevi%20 Sreenivas,%20K.J.
8. Ravali P. Mathur (2019), "Phonological Processes in Children with Hearing Impairment Using Hearing Aids and Cochlear Implant", *Language in India*, ISSN 1930-2940, Vol. 19:6, June, 2019.
9. Smith.C.R. (1975), "Residual hearing and speech production in deaf children", *Journal of Speech and Hearing Research,* 18, 795 – 811.
10. Tobey, E.A., & Hasenstab. S (1991), " Effects of nucleus multichannel cochlear implant upon speech production of children", *Ear & Hearing, 12 (Suppl.),* 48S – 54S.

Appendix-1:-

List of words selected from Tamil Articulation Test (Usha, 1986).

1.	adupu	24.	sa:vi	47.	u:nj^l
2.	k^n	25.	pu:cci	48.	m^l^i
3.	a:r^nju	26.	j^nn^l	49.	va:l^ipp^l^m
4.	ka:l	27.	m^nj^l	50.	simil
5.	ro:ja	28.	pu:ttu	51.	erumbu
6.	itli	29.	d^ppa	52.	m^r^m
7.	ko:li	30.	sad^i	53.	v^l^iy^l
8.	i	31.	ta:tta	54.	ţe:l
9.	vi:du	32.	pa:ttu	55.	la:ri
10.	ţi	33.	puli	56.	p^lli
11.	uţ^du	34.	pa:ppa	57.	pa:l
12.	mudi	35.	bomm^i	58.	rotti
13.	u:si	36.	k^rumbu	59.	k^rumbu
14.	nu:l	37.	s^rt	60.	ka:r
15.	eli	38.	si:ppu	61.	n^ri
16.	e:lu	39.	ka:su	62.	v^l^i
17.	ţenga:i	40.	m^ng^i	63.	ţ^v^l^i
18.	ott^g^m	41.	v^ndi	64.	ya:n^i
19.	o:du	42.	pen	65.	muy^l
20.	k^i	43.	na:i	66.	va:i
21.	k^ţţrika:i	44.	j^nn^l		
22.	kur^ngu	45.	ţe:n		
23.	puţ^g^m	46.	p^ndu		