International Journal of Multidisciplinary Research and Development
Online ISSN: 2349-4182, Print ISSN: 2349-5979, Impact Factor: RJIF 5.72
www.allsubjectjournal.com
Volume 3; Issue 4; April 2016; Page No. 101-105

Development of phonological processes in typically developing 3 ½ to 6 ½ years Hindi speaking children

[*1] Ravali P Mathur, [2] Dr Arun Banik

[1] Ph.D scholar, MASLP, Lecturer (Speech and Hearing), Ali Yavar Jung National Institute for the Hearing Handicapped K.C Marg, Bandra reclaimation, Mumbai, India.

[2] Ph.D, MASLP, Head of the Department, Ali Yavar Jung National Institute for the Hearing Handicapped K.C Marg, Bandra reclaimation, Mumbai, India.

Abstract
The study aimed to delineate phonological processes across 3 ½ to 6 ½ years old typically developing Hindi speaking children. A total of 180 children participated in the study who were further divided into 30 in each of the six age groups i.e. 3 ½ to 4, 4 to 4 ½, 4 ½ to 5, 5 to 5 ½, 5 ½ to 6, and 6 to 6 ½ yrs. The inclusion criteria were normal oral mechanism, native speakers of Hindi and attending Hindi medium school. To assess phonological processes a test of Phonology in Hindi was developed and administered. The results indicated a total of 24 processes to be occurring in children speech. However, processes declined as the age increased and the mean percentage of occurrences were varying in each age groups for individual processes studied. These results were partially similar to other studies which were conducted in Indian languages.

Keywords: Phonology processes, Hindi, Typical developing, Children

1. Introduction

Phonology refers to the speech sound system of a language and includes the study of how speech sounds are classified and organized and used contrastively in a given language. Phonology encompasses all aspects of the sound system both speech production and perception. the phonological structure has two components, a limited repertoire of sounds (phonemes) representing various classes (based on physiological and acoustic characteristics) and a set of phonotactic rules defining how these phonemes can be arranged in syllables (Hodson & Paden, 1991) [7].

For a child the goal of phonological development is not to learn the phonology of the target language but to learn to recognize words from the input and to produce adult like forms as output. The basic production patterns first appear in the prelinguistic period, during which the fundamental articulatory patterns emerge as CV Syllable structures and use of stop, nasal and glide consonants etc. As children begin to recognize and attempt to produce words, they must move beyond the basic repertoire and learn to produce the phonetic, phonological and prosodic features of a target language (Stoel-Gammon, 2006) [18]. Hence, the phonological acquisition involves both cognitive linguistic learning and the development of the speech motor skills needed for production.

A universal group of articulator simplifications that children learn to speak and apply to the new words they listen and normal speech errors are known as phonological processes (Bou, 2008) [3]. Phonological processes provide a means for describing the error patterns evident in young children's speech (Bailoor, Rai & Krishnan, 2014) [2]. The processes that commonly develop in normal children's speech across languages are called natural processes. The processes that never occur or occur rarely in normal child phonology are called unusual processes. Further they are also grouped into three major categories 1) Syllable structure processes- the processes that modify the syllable structure of the target word. 2) Substitution processes- processes that substitute one sound for another and 3) Assimilation processes- processes that assimilate one sound to another (Grunwell, 1985) [6].

A normative study on phonological development conducted by San (2010) [13] in 264 Malaysian English speaking Chinese children between the ages of 3 to 7years indicated that the children's speech sound accuracy is underestimated when Malaysian English dialectal features were not taken into consideration. The author, further concluded that the differences found were mainly due to the cross linguistic effects of mandarin Chinese and Malaysian which were acquired at the same time by Malaysian English speaking children.

Afrin (2015) [1] investigated phonological processes in fifty one typically developing 4 to 5 years old Bangla speaking children. The study findings indicated a total of 13 phonological processes to be occurring in children speech and these were different compared to other language speaking children.

On review of literature of Indian studies, a study was conducted by Simon and *et al.,* (2015) [16] to evaluate the phonological processes in 3 to 4 yr old typically developing Malayalam speaking children living in rural and urban areas of India. A total of 30 children i.e. 15 each were studied from both rural and urban areas. The findings indicated higher occurrence of phonological processes in rural area children compared to urban area. Hence, the authors concluded that this difference could be due to limited educational facilities and parental attention in children living in rural areas of India.

Bailoor, Rai & Krishnan (2014) [2] studied the development of phonological processes in ten typically developing 3 to 4 years old Kannada English speaking bilingual children and then compared the results with monolingual Kannada speaking children's reports. The spontaneous speech samples both in L1 and L2 were analyzed for various phonological processes

frequency of occurrence. The results indicated a total of 14 phonological processes to be occurring. The most commonly occurring were fronting, cluster reduction, epenthesis, initial consonant deletion, affrication, metathesis and final consonant deletion. The least occurring processes were medial consonant deletion, backing of fricatives and vowel unrounding. These results were compared with findings of Tulu Kannada bilinguals (Mala, 2001) [9] and Kannada monolingual speaking children (Sunil, 1995) [19] of same age group. The comparison of phonological processes fronting, cluster reduction, affrication, medial consonant deletion and epenthesis was done. The findings indicated significant differences in fronting, cluster reduction and final consonant deletion.

Ranjan (2009) [12] attempted to study phonological processes in sixty 3 to 5 yr old typically developing English speaking Indian children. A total of 14 phonological processes were identified to be occurring between 3 to 4 yrs of age and 13 to be occurring between 4 to 5 yrs of age. The author concluded that phonological processes decrease in occurrence as the age progresses and this could be due to acquisition of new phonemes. The phonological processes which decreased as age advanced from 3 to 5 yrs were diphthong reduction, vowel change, initial consonant deletion, backing of vowel, deaffrication, assimilation, fronting and gliding.

A phonological disorder is characterized by a static speech sound system, variability without gradual improvement, persisting phonological processes, chronological mismatch, idiosyncratic rules, restricted use of contrast (Bowen, 2011) [4]. Epidemiological studies indicate that about 3 % of pre-school children and 2% of 6 to 7 year old children to be having phonological disorders (Shipley & McAfee, 2004) [17]. Available literature indicates that occurrence of phonological processes is a universal phenomenon of all languages but however variations are reported in terms of phonological processes used in various languages, dialectal variations, knowledge of number of languages etc. (Bailoor & *et al*, 2014) [2]. A couple of studies have also indicated that phonological processes frequency to be less often in bilingual children than in monolingual children (Bailoor & *et al*, 2014 [2], Campbell & Sias, 1995) [5].

Phonological disorder is amongst the most prevalent speech disorders, affecting approximately 10% of the preschool and school age population. Phonological disorders are related to hearing loss, cleft lip or palate, cerebral palsy (CP) and others (Shipley and McAfee, 2004) [17]. To serve these large numbers of children speech language therapists need knowledge about the development of phonological processes in typically developing children. Hence, the present study was aimed to identify the phonological processes in typically developing 3 ½ to 6 ½ yrs Hindi speaking children.

2. Aim of the Study

To delineate phonological processes used by typically developing Hindi speaking children in the age range of 3 ½ to 6 ½ years.

3 Methodology

3.1 The participants

A total number of 180 typically developing children in the age range of 3 ½ yrs to 6 ½ yrs were selected for the study. The target number of participants were 30 in each of the six age groups i.e. 3 ½ to 4, 4 to 4 ½, 4 ½ to 5, 5 to 5 ½, 5 ½ to 6, and 6 to 6 ½ yrs. The children who met the inclusion criteria as following were selected.

1) In the age range of 3 ½ to 6 ½ yrs.
2) Typically developing children with no delay in developmental milestones.
3) Normal oral peripheral mechanism.
4) Hindi mother tongue and attending Hindi medium school.
5) Children with no associated problems.

3.2 Test material

The authors had developed a Hindi test of phonology for assessing the phonological processes. The test tool consisted of 100 regular used Hindi words and a few English loan words (spoken in Mumbai region), which most commonly occur in the utterances of young children. All the target words were mostly bisyllabic, trisyllabic and few multisyllabic in structure. The target word list had consonants, vowels, diphthongs, & consonant clusters which were reported by Ohala (1991) [10] to be having higher incidence of occurrence in Hindi language. The Hindi test of phonology material was prepared by collecting around 216 meaningful Hindi words. This list of words were checked for familiarity by 20 parents of young Hindi speaking children and 5 Hindi medium teachers. The most familiar words which had a rating of 90% and above were selected and scrutinized for picturability and unambiguity. Further, these words were evaluated for content validity by two Linguists and three Speech language pathologists. This had resulted finally in the accumulation of 100 target words further pictures of which were prepared as a Power point presentation (PPT).

3.3 Recording environment and procedure

After seeking the consent from the parents of the participants the participants were seated comfortably and rapport was formed prior to the testing. The Hindi test of phonology was administrated through the PPT presentation on laptop in a quiet, well lit room. Participants were asked to name the pictures presented through PPT and responses were recorded using Sony digital recorder, occasionally cues were provided if the child couldn't name the picture. The duration of the testing ranged from 15 to 20 minutes for each child.

3.4 Measurements and analysis

All the speech data obtained were transcribed in broad IPA using earphones and analyzed for percentage of occurrence of phonological processes.

3.5 Reliability measures

In order to establish inter judge reliability, 10% of the speech samples were randomly transcribed by an experienced speech language pathologist. The inter judge agreement was found to be 85.33% for the selected samples.

3.6 Data analysis

The percentage of occurrence of each phonological process was calculated separately for each participant by analyzing each target word as a whole. The percentage of subjects exhibiting the phonological process were further classified into three categories as described by Ramadevi (2006) [11] i.e. occasionally occurring (less than 20%), frequently occurring (20 to 60%) and most commonly occurring (more than 60%).

4 Results & Discussion

On the observation of overall results a total of 24 phonological processes were found to be occurring across 3 ½ to 6 ½ yrs of age group children's speech. Among these the phonological processes used by the youngest group i.e. 3 ½ to 4 yrs were 23 processes and 6 to 6 ½ years were 18 processes. Further, the mean percentage of occurrence of phonological processes were found to be far less in 6 to 6 ½ yrs old children which indicates a decline in phonological processes as the age increases. These findings are displayed in Table 1.

Table 1: The percentage of occurrence of phonological processes across 3 ½ to 6 ½ yrs old children.

S. No.	Phonological processes	3 ½ to 4yrs	4 to 4 ½ yrs	4 ½ to 5 yrs	5 to 5 ½ yrs	5 ½ to 6 yrs	6 to 6 ½ yrs
01	Epenthesis	70%	70%	60%	60%	50%	30%
02	Stopping	70%	50%	30%	30%	30%	20%
03	Fronting	30%	20%	20%	20%	10%	10%
04	Cluster reduction	70%	70%	50%	50%	40%	40%
05	Final consonant deletion	50%	30%	30%	40%	10%	10%
06	Deaspiration	30%	20%	20%	-	20%	10%
07	Vowel substitution	30%	20%	20%	20%	30%	20%
08	Depalatalization	70%	70%	50%	50%	40%	40%
09	Palatalization	40%	30%	30%	30%	10%	10%
10	Gliding	40%	40%	20%	20%	-	10%
11	Demunitization	30%	30%	20%	20%	-	10%
12	Nasal Assimilation	20%	-	-	-	-	10%
13	Frication	40%	40%	20%	30%	20%	10%
14	Prevocalic devoicing	20%	20%	10%	20%	10%	10%
15	Monophthongization	20%	20%	20%	30%	20%	20%
16	Substitution of l/r	70%	60%	50%	40%	30%	30%
17	Affrication	20%	10%	20%	10%	20%	10%
18	Vowel shortening	40%	-	-	-	20%	-
19	Initial consonant deletion	20%	-	10%	-	10%	-
20	Velar assimilation	20%	-	-	-	10%	-
21	Alveolar assimilation	20%	-	-	20%	10%	-
22	Postvocalic voicing	-	10%	-	-	10%	-
23	Reduplication	20%	-	-	-	-	-
24	Backing	20%	-	20%	-	-	-

Further on qualitative analysis of percentage of occurrences of phonological processes according to Ramadevi (2006) [11] the findings are described as following.

The first important finding was that the most commonly occurring Phonological processes (70%) were only found in the age range of 3 ½ to 4 ½ yrs were Epenthesis, Cluster reduction, Depalatalization, Substitution of l/r and Stopping (70%) observed. These Phonological processes frequency of occurrence reduced to frequently occurring between 4 ½ to 6 ½ years (60-30%) except for stopping which was least occurring by the age of 6 ½ yrs i.e. 20%. The finding of cluster reduction, epenthesis and stopping are correlating with some studies done in Indian languages i.e. Kannada & English (Bailoor, Rai & Krishnan, 2014) [2], Kannada (Jayashree, 1999) [8] & Malayalam speaking children (Sameer, 1991) [14]. Further it is also noted that Phonological processes Epenthesis, Cluster reduction, Depalatalization, Substitution of l/r are frequently occurring in the speech of children of 6 ½ yrs indicating the possibility of its existence post 6 ½ yrs of age in the present study. These results are presented in Figure 1.

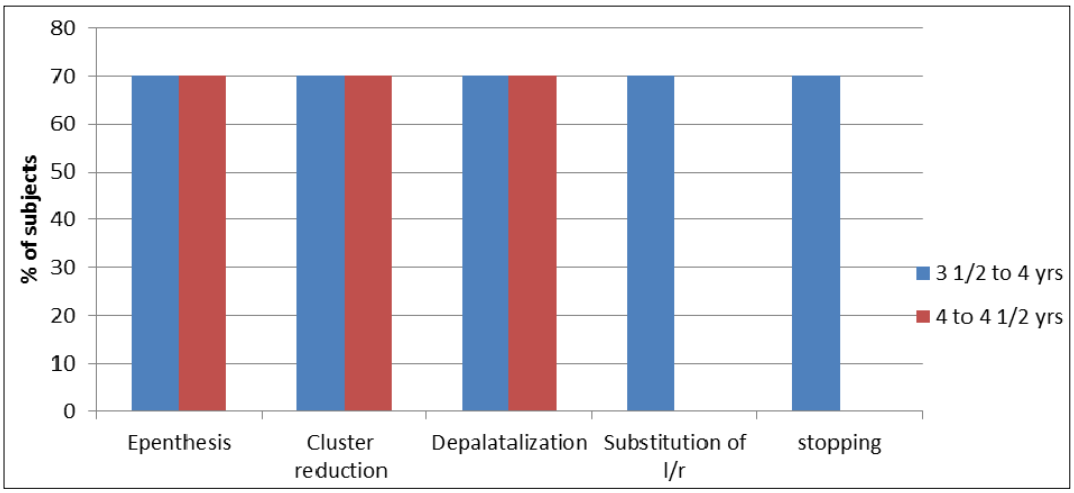

Fig 1: The percentage of subjects who exhibited Most commonly occurring phonological processes across 3 ½ to 4 ½ yrs of age.

The second major finding of the study indicated phonological processes Final consonant deletion & Palatalization to be frequently occurring in the age groups of 3 ½ to 5 ½ yrs (50 to 30%) and Gliding, Demunitization and Frication to be frequently occurring processes between the age groups of 3 ½ to 4 ½ yrs (40 to 30 %). These findings are partially correlating with the study of Santosh (2001) [15] who has studied phonological processes in 3 to 4 yr old Hindi speaking children. On further analysis it was also observed that Fronting, Deaspiration, Vowel substitution and Vowel shortening to be frequently occurring only in 3 ½ to 4 yrs of age children speech. All these processes were found to be suppressed by the age of 5 ½ to 6 ½ yrs i.e. least occurring (20 to 10%). Similar findings of occurrence of phonological processes is reported by Afrin (2015) [1] in her study of fifty one typically developing 4 to 5 years Bangla speaking children. The results are presented in Figure 2.

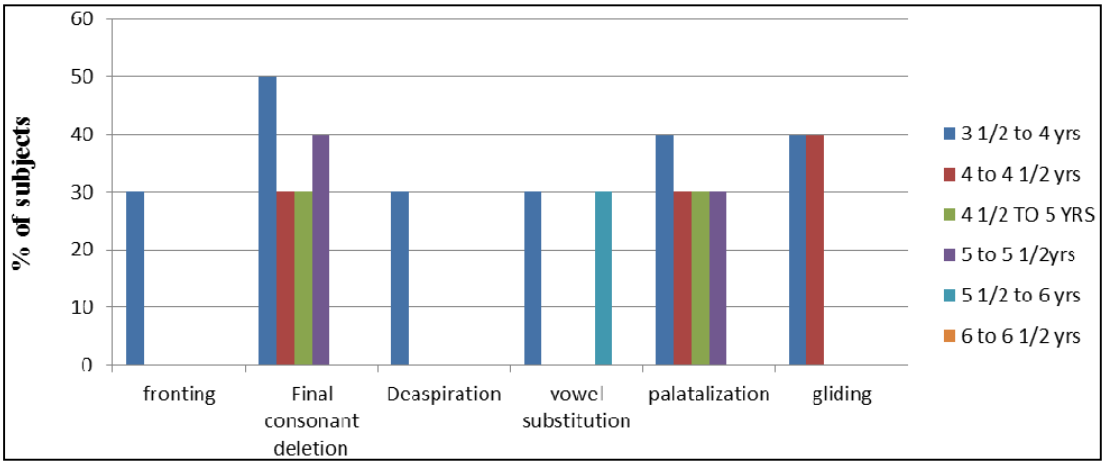

Fig 2: The percentage of subjects who exhibited frequently occurring phonological processes across 3 ½ to 6 ½ yrs of age.

the third important finding was the phonological processes Nasal assimilation, Prevocalic devoicing, Monophthongization, Affrication, Initial consonant deletion, Velar assimilation, Alveolar assimilation, Postvocalic voicing, Reduplication and Backing to be least frequently occurring in 3 ½ to 6 ½ yrs age children (20 to 10%) and with a decline in the percentage of occurrence with increasing age. The phonological processes Initial consonant deletion, Velar assimilation, Alveolar assimilation, Postvocalic voicing, Reduplication and Backing were found to be disappearing in the speech of children of 6 to 6 ½ years indicating suppression. These results are partially similar to the study of Santosh (2001) [15] especially with assimilatory processes and Initial consonant deletion. The results are presented in Figure 3.

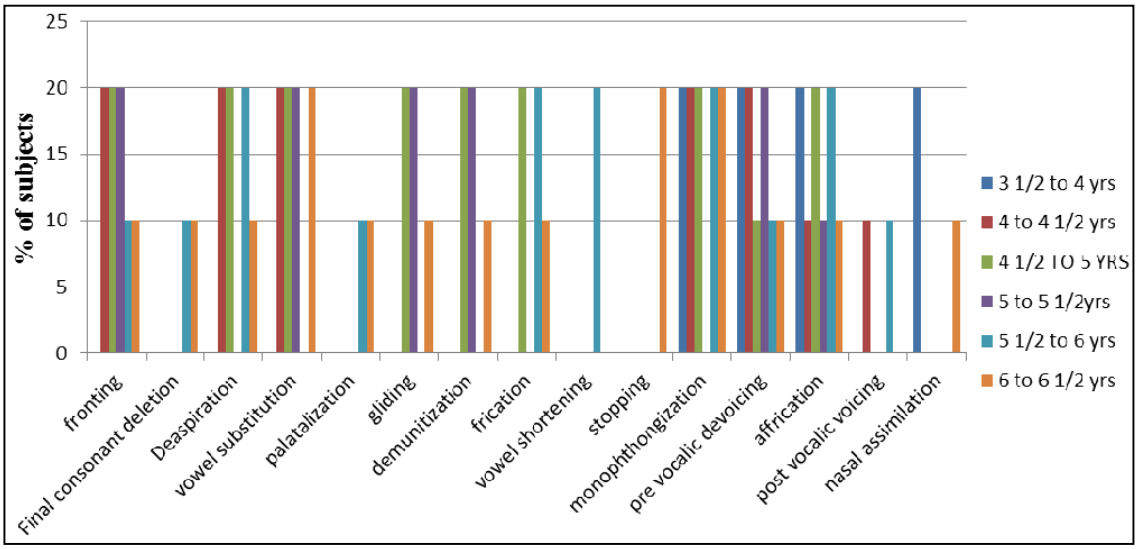

Fig 3: The percentage of subjects who exhibited occasionally occurring phonological processes across 3 ½ to 6 ½ yrs of age.

5. Summary and Conclusion

The study was aimed to delineate phonological processes occurring in Hindi speaking typically developing children across a wide age range i.e. from 3 ½ to 6 ½ yrs. The results indicated a total of 24 processes occurring in the speech of children studied. The results were only partially similar to other studies done in Indian languages this could be due to methodological, language and regional or dialectal differences. This study was a preliminary attempt to establish normative data however, further in depth studies are to be carried out

among different age groups, languages and larger samples etc which will further help the speech language pathologists in dealing with language disordered populations.

6. Acknowledgment

We the authors are thankful to the children who participated in the study with lots of patience & motivation, their parents and the school principals for the permissions provided.

7. References

1. Afrin S. Phonological process of 4-5 years old typically developing Bangla speaking children. Thesis submitted as part fulfillment of Bachelors in science in speech and language therapy to University of Dhaka 2015.
2. Bailoor P, Rai M, Krishnan L. Development of phonological processes in typically developing 3 to 4 year old Indian bilingual speaking children. European Journal of educational & development psychology. 2014; 2(2):1-9.
3. Bou N. Spanish Phonological Patterns Identification and Analysis [power point slides]. Online available at http://www.sedl.org/pubs/sedl-letter/v14n03/3.html 2008.
4. Bowen C. Phonological Processes in Typical Development. Online available at http://www.speech-language-therapy.com/table3.htm 2011.
5. Campbell R, Sais E. Accelerated Metalinguistic (Phonological) awareness in bilingual children. British Journal of Developmental Psychology. 1995; 13:61-68.
6. Grunwell P. Phonological development in phonological disability. Topics in Language Disorders, 1985; 3:62-76.
7. Cited in Simon A, Shruthi L, Rajelakshmi S, D'Souza JM, Kumaraswamy S. Phonological processes in Malyalam speaing 3-4 year old urban and rural children. Langauage in India 2015; 15(5):1-10.
8. Hodson BW, Paden EP. In Articulation and Phonological disorders. N.J. Englewood cliffs. Printice Hall, 2004.
9. Jayashree S. Development of phonological processes in normal 4 -5 age group Kannada speaking children. Unpublished dissertation submitted to university of Mangalore, 1999.
10. Mala. Development of phonological processes in 3-4 years old Tulu-Kannada speaking Normal Bilingual Children. Unpublished Master's Dissertation, Mangalore University, Mangalore, 2001.
11. Ohala M. cited in Rahul. Study of phonological processes of 2-3 years old Hindi speaking normal children. Unpublished dissertation submitted in part fulfillment of masters degree to University of Mysore, 2006.
12. Ramadevi KJS. Phonological profile in kannada: A study on hearing impaired. unpublished thesis submitted in part fulfillment of Doctor of philosophy. University of Mysore, 2006.
13. Ranjan R. Phonological Processes in English Speaking Indian Children. Language in India, 2009; (7):16-24.
14. San PH. The Phonological development of Malaysian English speaking Chinese children: A normative study. Unpublished thesis submitted in part fulfillment of Doctor of Philosophy to University of Canterbury, New Zealand, 2010.
15. Sameer P. Development of phonological process in normal Malayalam speaking children in the 3-4 years age group. Unpublished dissertation. Submitted to university of Mangalore, 1998.
16. Santosh M. Development of phonological processes in normal Hindi speaking children in 3 – 4 yrs age group. Unpublished thesis submitted in part fulfillment of Masters degree to University of Maharashtra health sciences, Nashik, 2001.
17. Simon A, Shruthi L, Rajelakshmi S, D'Souza JM, Kumaraswamy S. Phonological processes in Malyalam speaing 3-4 year old urban and rural children. Langauage in India, 2015; 15(5):1-10.
18. Shipley KG, Mc Afee JG. Assessment in Speech-Language Pathology: A Research Manual (3rd e.d.). Australia: Delmar Learning, 2004.
19. Stoel-Gammon C. Infancy: phonological development. University of Washington, Seatle, 2006, 642-648.
20. Sunil. Development of Phonological Processes in 3-4 year old Kannada speaking Normal Children. Unpublished Master's Dissertation, Mangalore University, 1995.