

## Phonological Processes in Typically Developing Kannada Speaking Children

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### Abstract

*The present study investigated the various phonological processes occurring in 2.6- 3 year old typically developing Kannada speaking children. 8 children, i.e., 4 boys & 4 girls served as subjects. 50 simple Kannada words, which commonly occur in the utterances of normal young children, were selected for the study. These target words were picturized and were used to elicit the target response from the subjects. The responses were audio recorded and the data obtained were transcribed using IPA transcription. Sound by sound analysis was carried out to identify various phonological processes. The results indicated that out of the 12 processes observed, none of the phonological processes qualified as a significant one in the speech of children in the age group of 2.6 to 3 years. However, the most commonly seen processes were final vowel deletion, retroflex fronting, /h/ deletion etc. This study indicates that most of the phonemes in Kannada including fricatives and trills are achieved by 3 years of age and this warrants revision of our existing norms on articulation development. The results also expand our understanding of child phonology in the critical early language learning period.*

**Key words:** *Phonological process, Kannada, Retroflex fronting, Typically developing children.*

Children are not haphazard in their mispronunciations of words, but they are in fact quite systematic in their production (Ingram, 1976). The concept of phonological process was first introduced by Stampe (1973) and according to him learning of sound system requires suppression of a number of innate simplifying processes and simultaneously increasing number of contrast sounds. Hodson and Paden (1983) defined phonological process as regularly occurring deviation from standard adult speech patterns that may occur across a class of sounds, a syllable shape or syllable sequence. According to Lowe (1996) phonological processes are systematic simplified adult production of children. In short, processes are description of regularly occurring patterns observed in child's speech, which operate to simplify adult targets.

Study of phonological processes provide a more comprehensive and adequate descriptive framework for error analysis because they describe the structural as well as the systemic

simplifications in the speech patterns and where ever necessary take account of contextual factors influencing production of sounds. It also provides a parsimonious basis for selecting those classes of phonemes which need immediate attention and intervention. The phonological development of children learning English as their first language has been well described. However, as Ingram (1981) points out, despite numerous studies on languages other than English, we know relatively little about phonological development in other languages. This necessitates the need for phonological process analysis in Indian languages as well.

Literature reports that there are more than forty such different processes operating during children's phonological development (Hodson, 1980). Stoel-Gammon and Dunn (1985) reviewed the studies of occurrences of phonological processes and identified the processes which disappeared by three years of age as unstressed syllable deletion, final consonant deletion,

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consonant assimilation, reduplication, velar fronting, diminutization and prevocalic voicing. And the processes, which persist after three years, were identified as cluster reduction, epenthesis, gliding, vocalization, stopping, de-palatalization and final devoicing. Haelsig and Madison (1986) studied 50 children in the age group of 3-5 years in Native American English and reported that gliding of liquids, cluster reduction and weak syllable reduction to be the most frequently occurring processes in this age range. However, the percentage of occurrence of each of these processes declined with age. They also reported that the greatest reduction in the use of phonological processes occurred between 3 and 4 years of age. Roberts, Burchinal and Footo (1990) found that liquid gliding, fronting and de-affrication were dropping between 2.6 and 3 years and cluster reduction between 3.6 and 4 years based on their analysis of the speech sample of 145 children. The age at which a process occurred in less than 10% of the sample was interpreted as the age at which the process had dropped out for the group.

There are sparse reports of phonological process analysis in languages other than English also. Becker (1982) studied 10 monolingual Spanish children aged four years and found that de-affrication, /r/ deficiencies, cluster reduction, epenthesis, weak syllable deletion and alveolar assimilation to be the most used processes in these children. Later Martinez (1986) reported Tap/Trill deficiencies, consonant sequence reduction, de-affrication, stopping, affrication, fronting, assimilation and sibilant distortion in 3-year-old Spanish children. Topbas (1997) studied the phonological acquisition in Turkish children and reported that from a cross linguistic perspective, the phonological patterns exhibited coincide broadly with universal tendencies, although some language specific patterns were also evident. In Turkish children /r/ was substituted by /l/, i.e.

liquid realization of another liquid where as in English, the /r/ is usually replaced by /w/ or /j/ a gliding process. The same finding is reported in Italian also (Bonoleni and Leonard, 1991). This is explained on the basis that some phonemes are more common where as some are rare in some languages. For example /w/ and /j/ are rare in Turkish and Italian where as they are more frequent in English. On similar lines, in the Indian context, Rahul (2006) reports that usage of /l/ for /r/ is a frequent finding in children in the age group of 2-3 years with Hindi as their native language. He reasons that both /l/ and /r/ are liquids and /l/ is easier among the two and is more preferred.

Paulson (1991) studied 30 normal developing children of Mexican descent in the age range of 2-5 years. She found that the 2 year olds used phonological processes most frequently and the 4-year olds least often. Her subjects used syllable reduction, consonant sequence reduction, prevocalic singleton omission, strident deficiencies, and /r/ deficiencies. And miscellaneous error patterns were stopping, gliding, vowel deviation, epenthesis, substitution of /l/ for /r/ and sibilant distortions. Hua and Dodd (2000) studied the phonological acquisition in Putonghua language (Modern Standard Chinese) and suggested that vowels and final consonants were mastered earlier than initial consonants.

As noted earlier, the literature on phonological processes is relatively fewer in Indian languages. However, in the recent past a number of such studies have been attempted in several Indian languages focusing on the normal phonological process usage and these have been briefly reviewed in Table 1.

The present study intended to analyze the speech sample of typically developing Kannada speaking children (2.6 to 3 years) to identify the type of phonological processes present in their utterances.

	Author	Language	Age Group	Common processes seen
1	Sunil, T J (1998)	Kannada	3-4 years	Fronting, Cluster reduction, Initial consonant deletion and Affrication
2	Jayashree, U P (1999)	Kannada	4-5 years	Fronting, Cluster reduction and Stopping
3	Ramadevi et al (2002)	Kannada	5-6 years	Stridency deletion, De-aspiration and Retroflex fronting
4	Sreedevi et al (2005)	Kannada	2-2.6 years	Retroflex fronting, Trill deletion, Depalatalization, Affrication, Stopping, Cluster reduction etc
5	Sreedevi, N (2008)	Kannada	1.6-2 years	Retroflex fronting, Initial Consonant deletion, Vowel lowering, Trill deletion, Cluster reduction etc
6	Sameer, P. (1998)	Malayalam	3-4 years	Cluster reduction, Final consonant deletion, Epenthesis and De-affrication
7	Bharathy, R (2001)	Tamil	3-4 years	Epenthesis, Cluster reduction, Gliding, Nasal assimilation, Voicing De-affrication & Fronting.
8	Santhosh, M (2001)	Hindi	3-4 years	Cluster reduction. Epenthesis, Fronting, Gliding, Metathesis Nasalization etc
9	Rajeev Ranjan (1999)	Hindi	4-5 years	Cluster reduction, partial reduplication and aspiration
10	Rahul Banjariya (2006)	Hindi	2-2.6 years 2.6-3 years	Retroflex fronting, Deaspiration, /h/ deletion, Gliding, Initial consonant deletion Affrication, Denasalization, Monothongisation, Devoicing etc

**Table 1:** Review of Phonological Processes in various Indian Languages.

### Method

**Subjects:** Eight typically developing children, 4 boys and 4 girls in the age range of 2.6 to 3 years were considered for the study. All the children had the Mysore dialect of Kannada as their native language. They were screened for normal speech and language skills, hearing acuity and normal cognitive and motor development. Subjects were pooled from daycare centers and individual homes.

**Test Material:** 50 simple Kannada words, which commonly occur in the utterances of typically developing young children, were selected for the study. Most of the test words used was bisyllabic, except for a few trisyllabic ones. The word list had the vowels of Kannada in the initial position and the consonants were in the initial and medial position of the target words. The target words were picturized on white cards of 4 x 6” size in color. The picture cards were arranged in order as per the sequence of Kannada alphabets. The target words included a few clusters also. The list of target words is given in Appendix 1.

**Procedure:** Each individual subject was brought into a small noise free room and seated opposite to the examiner. Once the rapport was established, the examiner presented the target pictures one after another. The subjects were encouraged to name the

item in the picture card. The response obtained were audio recorded using a high fidelity portable digital Sony tape recorder. If any of the subjects failed to identify a target word, additional cues were presented by the examiner. In spite of additional cues, if the child failed to name the target picture, the child was asked to repeat after the examiner.

**Data Analysis:** The data obtained from all the 8 subjects were transcribed by two speech language pathologists using broad and narrow IPA transcription. The inter judge reliability was approximately 86%. Following this a qualitative analysis was carried out for each subject separately. Each word utterance of the subjects was analyzed sound-by-sound. Based on the sound changes occurring, the phonological process operating was identified. Further, frequency of occurrence of the various processes was determined. The qualitative analysis of each child’s speech sample was carried out using the following format:

Target word	Phonemic structure of target	Response of the subject	Phonemic Structure of the response	Phonological process used
/bAs/	CVC	/bAt/	CVC	Stopping

## Results and Discussion

Twelve various phonological processes were identified in typically developing children aged 2.6 to 3 years speaking Kannada as their native language. Each subject's utterances were analyzed separately for the type of the process used and the number of times it occurred. The overall percentage of occurrence of each process was obtained by computed by the following formula (Newman & Creaghead, 1988).

$$\frac{\text{Number of times a process occurred}}{\text{Total number of words spoken}} \times 100$$

i.e.

$$\frac{\text{Total number of the same type of processes exhibited by all the subjects}}{\text{Total number of target words spoken by all the subjects}} \times 100$$

Percentage of occurrence of 5% or more was considered high, following Newman & Creaghead, 1988. The processes identified are listed in descending order of occurrence based on the percentage of occurrence in the 8 subjects studied in Table 2.

	Phonological process observed	Total %
1.	Final vowel deletion	3.00 %
2.	Retroflex fronting	2.50 %
3.	/h/ Deletion	1.75%
4.	Cluster Reduction	1.25%
5.	Velar fronting	1.25%
6.	Affrication	1.00 %
7.	Vowel raising	1.00 %
8.	Stopping	0.75 %
9.	Diphthongization	0.75 %
10.	/r/ deletion	0.50 %
11.	Non geminate to geminate cluster	0.50%
12.	Palatalization	0.50 %

**Table 2:** Phonological processes seen in 2.6 – 3 years.

The results reveal that out of the 12 processes observed, none of them qualified as a significant phonological process in the speech of children in the age group of 2.6 to 3 years in Kannada. This is because none among the 12 processes crossed the critical value of 5% (Newman & Creaghead, 1988). However, the most commonly seen process among all the 8 children was final vowel deletion (3%). Final vowel deletion was mainly observed for borrowed words from English like /bus/, /ka:r/, /ræil/ etc. which end with the vowel /u/ in

colloquial Kannada. The next commonly seen process was retroflex fronting (2.5%). Sreedevi (2008) has reported that retroflex fronting was the most dominant (18%) phonological process operating in children aged 1.6 to 2 years in Kannada. This can be attributed to the complexity in its production, which involves curling the tongue to contact the palate. Therefore most often, a retroflex sound was substituted by an easier dental sound, which is more frontally placed with better visibility and which also requires relatively lesser exertion of the tongue. It is interesting to note that in the present age group of 2.6 -3 years, retroflex fronting had reduced substantially to a scanty 2.5%. As per the earlier literature reports, retroflex sounds are mastered after 3 years (4.6 years - Templin, 1956 (English); 3.6 years – Babu, Bettagiri & Rathna, 1972 (Kannada). However, the present study indicates that retroflex sounds are produced correctly by 3 years of age in Kannada.

Retroflex fronting was followed by /h/ deletion (1.75 %). This is again a common feature in colloquial Kannada. This was followed by cluster reduction and velar fronting. Cluster reduction was fewer in occurrence as the test sample contained only two clusters. Clusters were not included in more numbers in the test sample as the earlier literature reports suggested that clusters are mastered by 7 years or so and this study targeted a much younger age group. The finding of velar fronting, although negligible, is quite surprising. This can be explained on the basis that, though velar is an early sound, as per the developmental norms, velars are consistently produced by 4 years or so (Fundala & Reynolds, 1986).

The remaining seven processes seen namely, affrication, vowel raising, stopping, diphthongization, /r/ deletion, non-geminate to geminate cluster and palatalization were all operating at one or less than 1% level and can be considered as an incidental finding. It is appealing to find that processes which are most commonly reported in Western literature like stopping or substitution of a stop for a fricative and /r/ deletion are almost negligent in this group of 2.6-3 years. This indicates that fricatives and trills are achieved almost consistently by 3 years of age in Kannada. Stopping and /r/ deletions are frequently reported in the Western studies even in children of older age groups (Stoel-Gammon & Dunn, 1985).

The overall results indicate that none of the 12 phonological processes observed qualified as a significantly operating process in the age group of 2.6 to 3 years in Kannada. Most of the processes sparingly occurred and perhaps with a few more repetitions, probably the child would have self corrected the errors. This observation certainly indicates that we need to revise our articulation test norms which were standardized in the sixties and early seventies. Also the processes seen were not similar to the ones reported frequently in Western languages. This is because of structural differences across the languages.

### Conclusions

It can be said that understanding the pattern of reduction of phonological processes during the course of phonological development form the basis for dealing with the clinical population. The present study indicates that most of the processes are suppressed considerably by three years of age in typically developing children. Hence based on the results obtained it can be predicted that today's children acquire speech sounds much sooner as compared to their earlier counterparts. However, further standardization of the data on a larger population with more complex words is warranted for generalization. The findings of this investigation also augment in screening the appropriateness of a child's phonological skills especially in the clinical population.

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### Appendix 1

VOWELS	INITIAL POSITION	MEDIAL POSITION
/amma/	/kivi/	/bekku/
/a:ne/	/gombe/	/mu:gu/
/ili/	/ʃamaʃa/	/va:ʃu/
/i:rulli/	/ʃo:pi/	/gedʒdʒe/
/uŋgura/	/dabbi/	/a:ʃa/
/u:ʃa/	/tale/	/karaɖi/
/ele/	/duɖɖu/	/kaŋŋu/
/e:ni/	/na:ʃi/	/cutu/
/ole/	/paʃa/	/haddu/
/o:le/	/baʃe/	/a:ne/
	/mara/	/pa:pu/
	/jama/	/kabbu/
	/railu/	/uiJJale/
	/la:ɖu/	/ka:ru/
	/vi:ne/	/ka:lu/
	/ʃaraʃu/	/ha:vʊ/
	/sara/	/gaŋe:ʃa/
	/hasu/	/pakʃi/
	/dʒaɖe/	/bassu/