

# Phonological Processes in Tamil speaking Young Children

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## Abstract

The present study aimed at identifying developmental pattern of phonological processes in 2 to 6:11 years typically developing Tamil speaking children. A total of 150 typically developing Tamil speaking children participated in the present study. They were divided into 5 groups with 30 children in each age group. Nine sentences in Tamil with increasing complexity and the pictures representing the sentences was developed. Each child was seated comfortably and pictures of sentences were randomly presented one after the other as the investigator said the sentence describing the picture. The child was instructed to repeat the sentences after the investigator and the same was audio recorded. The speech samples were transcribed and perceptually analysed by a speech language pathologist. Results revealed the occurrence of about thirty-four phonological processes in children's speech and the processes were suppressed with increase in age. Among the type of phonological process, substitution processes occurred more frequently across the age groups than other processes. The findings of the study would aid in assessment, diagnosis and intervention of children with speech sound disorder.

**Keywords:** Phonological processes, typically developing children, perceptual analysis

## Introduction

Children start to produce true speech around their first birthday and their speech intelligibility increases with age. Some of the factors that contribute to the intelligibility of the speech are rate of speech, pitch, loudness and occurrence of phonological processes. According to Kenneth, et al., (2008), phonological processes is the simplification of standard adult population which is observed during the normal developmental process of speech. Phonological processes are regularly occurring deviations from adult speech patterns; that may occur across a class of sound, a syllable shape or syllable sequence (Hodson, et al., 1983). In addition, Yuvas, (1998) stated, when children's speech is analysed, clear systematic patterns were found in their erroneous approximations to the adult target words. These error patterns that are uniform across children and languages are referred as phonological processes.

Phonological processes are classified into three major categories by Grunwell, (1985) They are (a) Syllable structure processes, (b) Substitution processes and (c) Assimilation processes. Syllable structure processes are phonological processes that affect the syllable structure, Substitution processes is when one sound is substituted by another sound in a systematic fashion, and assimilation processes is said to occur when one sound in the word becomes similar to another sound in the word. In addition, Stoel- Gammon. et al., (1985) listed the processes that disappear by the age of 3 and those that persist beyond 3 years of age. Processes

including unstressed syllable deletion, final consonant deletion, doubling, diminutization, velar fronting, consonant assimilation, reduplication and prevocalic voicing disappears by 3 years of age and processes such as cluster reduction, epenthesis, gliding, vocalization, stopping depalatalization, and final devoicing persists after 3 years of age.

There are some research works directed in determining the age, or age range, at which the various processes are present in the speech of normal developing children. Preisser, et al., (1988) studied the phonological processes in young children and reported that the processes that were frequently observed during 18- 29 months were cluster reduction and gliding. It was also reported that the percentage of occurrence of phonological processes was lower for children of 22 – 25 months compared to children in 18 – 21 months of age. The higher age group showed reduced errors in syllable reduction & postvocalic singleton omission. Bankson, et al., (1990) reported that phonological processes such as gliding of sounds, stopping, cluster reduction, vocalization and final consonant deletion persisted longer in children.

There are few investigations of phonological processes in Indian languages especially in Tamil. Bharathy (2001) studied the development of phonological processes in 3 to 4 years old normal Tamil speaking children, using the Tamil Articulation Test developed by Usha, (1986). Results indicated the occurrence of 15 phonological processes such as unstressed deletion, cluster reduction, epenthesis, gliding, stopping of liquids, stopping of fricatives, nasal assimilation, voicing assimilation, metathesis, initial consonant deletion, final consonant deletion, backing, fronting, deaffrication and affrication. It was also reported, by the end of 4 years of age most of the processes were reduced and only few processes such as epenthesis, cluster reduction and stopping of liquids were evident. Results revealed a decrease in phonological processes with increase in age.

In another Indian study (Venkatesh, Ramsankar, Nagaraja & Srinivasan, 2010), the pattern of phonological development in typically developing Tamil speaking children (monolingual), and Tamil-Telugu bilingual children in 4- 6 years children was investigated. Tokens (words) from Tamil articulation test were presented with picture cards, randomly. Participants were asked to name the picture cards. The responses were transcribed and analyzed. Results indicated that 14 phonological processes were present in both monolingual and bilingual. Initial consonant deletion, final consonant deletion, syllable reduction at initial, medial, final positions and vocalic suppression of final consonant were identified in the speech analysis of 4-5 years monolingual and 5- 6 years bilingual children. In 5- 6 years monolingual children syllable reduction at medial position was observed. Substitution errors were noticed in 4- 5 years monolingual and bilingual children are gliding of liquids, stopping, deaffrication and fronting. Also, monolingual children of 4- 5 years also showed affrication and backing and bilinguals showed gliding of liquid pattern. Five to six years monolingual children had gliding of liquids and for bilinguals of this group showed affrication, gliding of liquids, deaffrication and fronting. In Harmony / Assimilation group of phonological processes voicing and devoicing in initial positions were seen in 4-5 years & 5 -6 years bilingual and devoicing in medial position was seen in all 3 groups except 5-6 years monolingual.

Dhanavendan and Raja (2015) investigated phonological processes in thirty 2.6 years to 6 years typically developing Tamil speaking children. They were divided into 3 groups with 10 children in each group. Di-syllabic and tri-syllabic 160 meaningful words were used to assess. They found that 37 phonological

processes in children. Of them substitution processes had the highest occurrence than other processes and also the occurrence the processes were found to decrease with age.

A recent study by Perumal, (2017) profiled the consonant acquisition in 450 typically developing Tamil children in the age range between 2 to 4:11 years. Spontaneous picture naming and sentence repetition tasks were carried out. The responses of children were transcribed and analyzed for the occurrence of the processes. Score of one was assigned for the occurrence of process and zero for non-occurrence of process across the age groups for both spontaneous picture naming and sentence repetition task. Frequency of occurrence / Percentage of children with occurrence of different types of phonological processes for each age group was found. Results indicated reduction in the phonological process with age. Most frequently occurring processes includes cluster reduction, velar assimilation and in substitution process, deaffrication followed by fronting, stopping of fricatives and liquids.

### Need for the study

The knowledge of phonological development has significant value in the clinical population to determine whether a child is phonologically disordered and requires intervention. Only few published studies (Dhanavendan and Raja, 2015; Perumal, 2017) are available in typically developing children in Tamil speaking environment and they also differ in their methodology. Given this limited understanding of phonological development and scarcity of research might lead to a risk in misdiagnosis. Henceforth, development of a normative data will aid in the assessment and pre-post intervention analysis of phonological processes in children with communication disorders. The aim of this study is to investigate the phonological processes in typically developing (TD) Tamil speaking children in the age range of 2 to 6.11 years.

### Method

**Participants:** A total of 150 TD native Tamil speaking children between the age range of 2 and 6.11 years participated in the study. These children were further divided into 5 groups. Group I included children in the age range of 2 – 2:11 years; group II were children in the age range of 3 – 3:11 years; group III were children in the age range of 4 – 4:11 years; group IV were children in the age range of 5 – 5:11 years and group V were children in the age range of 6 – 6:11 years. Each group consisted of 30 children. Children were randomly taken from kinder garden and primary classes in four different schools in Chennai. Inclusion criteria for the children to participate in the study includes:-1) Child should pass informal speech, language and hearing screening, 2) He/ She should not have any oro- facial abnormalities. 3) He/ She should not have any neurological deficits and, 4) Teachers should report that the child has good learning and academic skills. Children who did not fit in the inclusion criteria were excluded from the study.

**Material:** Nine sentences in Tamil with increasing complexity were initially developed for the study. Picture cards were prepared for the sentences. Three pictures were developed for each stimuli by the investigators and was given to 7 judges to rate the appropriateness of the picture with the corresponding sentence. The judges were native Tamil speakers in the age range of 30 to 40 years. Picture that was mostly opted by judges among three options was used in the study.

**Procedure:** Formal written consent to collect children's speech samples was taken from the school head or principal prior to data collection. Data was collected from each child individually in a quiet room in the school. The child was seated comfortably and pictures of the sentences were randomly presented one after

the other. The investigator said the sentence or named the word as respective picture was shown, and the child was instructed to repeat the sentences after the investigator. The responses of the children were audio recorded using wavesufer software through laptop. Microphone (i ball distortion free mic, Model No: M27) was placed 10cm from the child’s mouth. In case if the child had not listened or understood any stimuli, the investigator repeated it again. Recorded speech samples were then, transcribed and perceptually analyzed by the principle investigator. Recorded samples were presented through headphones in a quiet room. The occurrence of phonological processes was calculated and tabulated across each age group.

**Results**

Phonological process analysis was carried out for incorrectly produced phonemes in the sentences. Type and frequency of occurrence of phonological processes in children across all groups were noted during the analysis. Phonological processes were classified as syllable structure process, assimilation process, substitution process and other processes. Of the 30 children in group1 (2-2.11yrs), only 20 of them attempted to repeat the sentences. However, most of the children who attempted to repeat couldn’t complete the sentence repetitions. They omitted words, substituted words with vocalizations and their productions could not be transcribed. The analysis involved only few samples of this youngest group and that’s the reason only few phonological processes were identified in this group compared to 3 to 3.11 years. The results are presented with respect to the frequency and type of phonological processes.

**Frequency of Phonological Processes:** Phonological processes were classified as syllable structure processes, assimilation processes and substitution process. The frequency of occurrences of each of these processes are as follows.

**1. Syllable structure processes:** For children in the age range of 2- 2:11 years of age, the most commonly occurring phonological processes is weak syllable deletion (27). Children in the age range of 3- 3:11 years frequently exhibited weak syllable deletion (51), final consonant deletion (45), followed by cluster reduction (29), and weak consonant deletion (23). Children in the age range of 4-4:11 years, often had weak syllable deletion (29) and then cluster reduction (17). In 5-5:11 years old children, the most predominant process was cluster reduction (14), and the higher group population 6- 6:11 years had more syllable substitution (16) was seen often. Over all, the frequency reduced as age increased. However, at the older age of 6 -6.11years too, syllable structure phonological processes were observed in children. Table 1 shows the syllable structure processes across age groups.

**Table 1: Frequency of occurrence of syllable structure phonological processes across age**

Syllable structure Processes	2- 2:11 yrs	3-3:11 yrs	4-4:11 yrs	5-5:11 yrs	6-6:11 yrs
Cluster reduction	9	29	17	14	1
Syllable substitution	0	19	3	10	16
Initial syllable deletion	2	1	0	0	0
Weak syllable deletion	27	51	29	6	12
Final syllable deletion	5	16	5	4	0
Initial consonant deletion	-	1	1	10	0
Final consonant deletion	10	45	7	7	9
Reduplication	7	2	0	0	1

Weak consonant deletion	0	23	5	0	0
Total	60	187	67	51	39

**2. Assimilation processes:** The occurrence of assimilation process reduced with increase in age. It was found that in 2- 2:11 years, 3- 3:11 years children, the frequently occurring assimilation processes were devoicing processes and alveolarization. From 4-4.11 years, children rarely exhibited assimilation processes. Of the assimilation processes, highest occurrence of devoicing was found. Table 2 shows the different assimilation processes occurring in all age groups.

**Table 2: Frequency of occurrence of assimilation processes across age**

Assimilation Processes	2- 2:11 yrs	3-3:11 yrs	4-4:11 yrs	5-5:11 yrs	6-6:11 yrs
Alveolarization	12	12	6	0	1
Labialization	3	2	0	0	0
Devoicing	47	33	6	3	1
Nasal assimilation	1	0	0	0	0
Diminutization	0	1	1	0	0
Total	63	48	13	3	2

**3. Substitution processes:** Frequency of occurrence of substitution processes also reduced with increase in age. Table 3 shows substitution processes occurring in all age groups. In children of 2- 2:11 years of age, the most commonly occurring phonological processes were fronting (21), vocalization (14) and palatalization (10). In 3- 3.11 years old children frequency of occurrence of vocalization (96) was extremely high. For children in the age range of 4-4.11 years, vocalization (55) and epenthesis (15) were commonly observed. In children in the age ranges of 5-5:11 years, and 6- 6:11 years, vocalizations occurrences were 53 and 28, respectively. Overall, highest occurrences of vocalization process are observed in children.

**Table 3: Frequency of occurrence of Substitution Phonological processes across age**

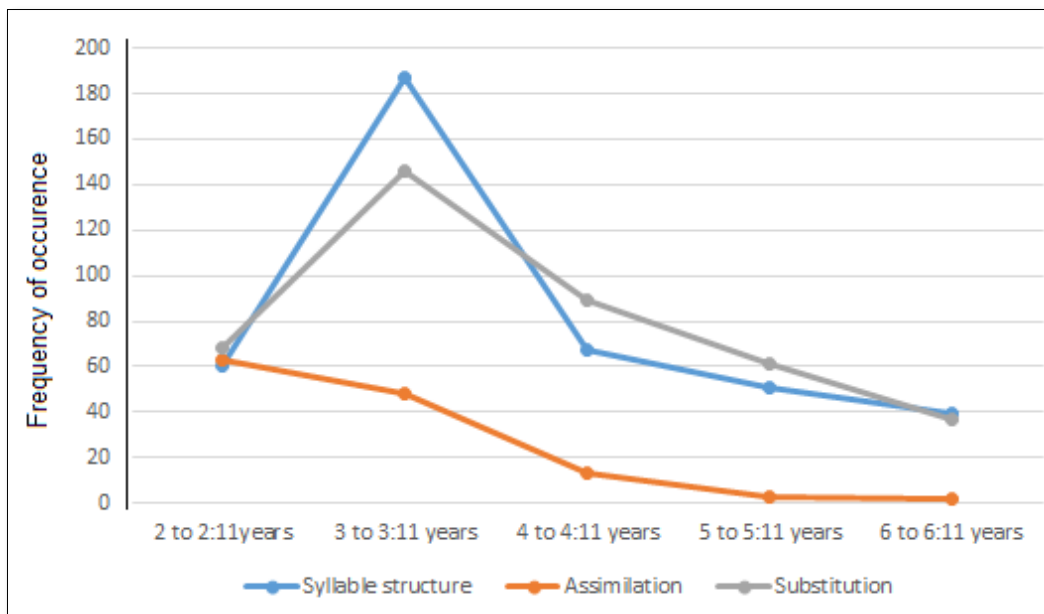
Substitution Process	2- 2:11 yrs	3-3:11 yrs	4-4:11 yrs	5-5:11 yrs	6-6:11 yrs
Affrication	1	1	1	1	0
Fronting	21	10	8	0	2
Backing	6	9	1	2	0
Vocalization	14	96	55	53	28
Stopping	6	1	0	0	0
De affrication	3	1	0	0	0
Denasalization	2	7	1	0	0
Palatalization	10	4	4	5	0
Gliding	5	9	4	0	4
Metathesis	0	2	0	0	1
Epenthesis	0	6	15	0	2
Total	68	146	89	61	37

**Types of Phonological processes:** Most common type of processes was determined by comparing the total occurrences of different types of phonological processes across age. Table 4 and figure 1 shows, total frequency of occurrences of syllable structure, assimilation and substitution processes across the age groups. Syllable structure processes and substitution processes were exhibited most frequently in the age range of 3 to 3.11 years, following which decline in the presence of the processes was observed with age. Least number of processes occurrences were observed in the oldest group (6-6.11yrs) studied. In 3 to 3.11 years and 6 to 6.11years, highest occurrence of syllable structure processes was found, whereas in age groups 2 to 2.11years, 4 to 4.11 years and 5 to 5.11 years, substitution processes were observed more. Figure 1 shows, peak frequency of occurrence of syllable structure and substitution processes at 3 to 3:11 years followed by a sharp drop at 4 to 4.11 years and then a gradual decline for the in 5 to 5.11 years and 6 to 6.11 years. Whereas, assimilation processes show fewer occurrence compared to other processes and a shallow decline in the frequency of occurrence with age.

**Table 4: Frequency of occurrences of types of phonological processes across the age groups.**

Phonological processes	2 to 2:11yrs	3 to 3:11 yrs	4 to 4:11 yrs	5 to 5:11 yrs	6 to 6:11 yrs
Syllable structure	60	187	67	51	39
Assimilation	63	48	13	3	2
Substitution	68	146	89	61	37
Total	191	381	169	115	78

**Figure 1: Developmental trend of phonological processes across the age groups.**



### Discussion

Results revealed interesting findings. First, the occurrence of the processes was found to decrease with increase in age. As children grow in age, due to physiological, anatomical, perceptual differences and mature phonological representations, their speech clarity improves and phonological processes declines.



This finding is reported in by Haelsig and Madison (1986) and Stoel- Gammon. et al., (1985) in English, and Barathy (2001), Venkatesh, et al., (2010), Dhanavendan & Raja (2015), Perumal et.al (2017) in Tamil. Second, the investigation revealed the presence of 25 phonological processes in Tamil speaking children. Of them, substitution is the frequently occurring processes in 2 to 2:11 years, 4 to 4:11years, and 5 to 5:11years, and syllable structure processes occurred maximally at 3 to 3:11years. Higher occurrences of substitution process were also seen in Dhanavendan & Raja (2015) study. The finding that syllable structure processes were predominately observed during 3 to 3:11years may be due to the aspects of language development. children in this age are in the transition period, they move from expression of phrases to sentences. In this process of transition, they may have affect the syllable level of the language. Therefore, syllable structure is frequently observed during the 3 to 3:11years.

Third, assimilation processes were found to occur less than other types. This finding is in consonance with Barathy (2001), Venkatesh, et al., (2010), Dhanavendan & Raja (2015), Perumal et.al (2017). They also reported lesser frequency of occurrence of assimilatory processes in children between 3 and 6 years. Forth, the frequency of occurrences of specific phonological processes are not in consonance with other studies (Dhanavendan & Raja, 2015), Perumal et.al, 2017) in Tamil. The reason for this finding could be attributed to the methodological differences among the studies with respect to the stimuli used, processes studied and individual variation analysis of the data.

## Conclusion

The results of current investigation have provided the data on the development of phonological processes in typically developing Tamil speaking children. These sentences and pictures developed in the study will be a useful tool in the assessment of children with speech sound disorder. The speech samples in the present study were judged by one listener. Future studies can consider using more listeners to examine the inter judge reliability and to obtain test-retest reliability. Repetition task was used to study the phonological processes. It is recommended to use word level and spontaneous speech/ descriptive task to study the phonological pattern of development to comprehensively investigate the phonological processes. Longitudinal studies in monolingual and multilingual Tamil speaking environment are warranted to obtain a clear picture of phonological development in children.

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