

## **Phonological Processes in Children Having Malayalam as Mother Language**

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### **Abstract**

Phonology is the branch of linguistics that studies the sound system of languages. Phonology concerns the regularities and rules governing pronunciations of words, phrases and sentences. Phonological development implies the acquisition of a functional sound system intricately connected to the child's growth in language. It is suggested that children begin language learning process with innate limitations on phonetic capacity and natural processes to deal with those limitations is labeled as Phonological Processes. The innate universal phonological processes imply that all children are born with the capacity to use the same system of processes and must learn to eliminate or suppress those processes that are inappropriate to his/her native language. Research on normal use and suppression of phonological processes indicate that most children regardless of the language being learned to use common processes early in their development of the sound system. There are limited numbers of studies that have reported regarding the Phonological Processes in Indian languages, especially in Malayalam. Hence, the present study attempts to analyze the phonological processes of 3 to 7.11 years old normally developing Malayalam speaking children.

Three-hundred children aged between 3 to 8 years were selected for the study. They were 5 groups with an interval of one year for each group. Each group had thirty males and thirty females. Seventeen phonological processes were assessed in the study. For each phonological process, five target words and five target sentences were selected. Each of these words and sentences were pictorial. Each subject was asked to repeat the word/sentence which the examiner said. The child was asked to repeat only after seeing the corresponding picture on the computer screen. After saying each word, the examiner paused for about one second before presenting the corresponding stimulus picture and signaled the child to repeat the word. The response from each child was recorded using a microphone, which was directly connected to the computer. The results of the study revealed that, most of these phonological processes were present in 3 to 7.11-year-old male and female children. Other than ‘Metathesis’ and ‘Velar fronting’ all other phonological processes were found to be persisting in 3 years to 7.11-year-old male and female children. There was a significant difference in the occurrence of seventeen Phonological processes between male and female children except ‘Prevocalic voicing’, ‘Palatal fronting’, ‘Metathesis’ and ‘Velar fronting’. Based on the findings of the study, it suggested that as children grow older, simplification processes lessen considerably as speech production nears the adult target.

**Keywords:** Malayalam as Mother Language, Phonological Processes, Acquisition

## **Introduction**

Phonological development implies the acquisition of a functional sound system intricately connected to the child’s growth in language (Bauman-Waengler, 2000). The term ‘phonological process’ is most frequently used to describe the pattern in which the modification of the adult model by normally developing children. Hodson & Paden (1983) define phonological processes as regularly occurring deviations from standard adult speech. Lowe (1994) described phonological processes as a “systematic sound change that affects classes of sounds or sound sequences that result in simplification of speech production”. Edwards & Shriberg (1983) have defined phonological processes as referring to any systematic sound change that affects a class of sounds (velars and fricatives) or sound sequences, such as /s/ plus consonant clusters (/sw/, /sl/ etc.).

Stampe (1969) labeled the naturally occurring operations “Phonological Processes”. The natural phonological processes are those that are innate and phonetically motivated so that their occurrence is common across languages and seen as part of the normal acquisition of the sound system. Research on normal use and suppression of phonological processes indicate that most children regardless of the language being learned to use common processes early in their development of the sound system (Lowe1994).

The natural phonological processes are operating as all children attempt to use and organize their phonological systems. The acquisition of an adult phonological system consists of learning to suppress these processes. The rate at which the processes are suppressed varies between children (Lowe, 1994). Therefore, it was considered necessary to have a document regarding the persistence and suppression of phonological processes in different age groups in different languages. The studies on the phonological processes have been carried out in English and many other western languages. However, those findings cannot be adapted directly to Indian languages. Studies are required to provide the normative data in Indian languages and several such attempts have also been made to assess phonological processes in different Indian languages.

Sunil (1998), conducted a study on 3 – 4yrs normally developing Kannada speaking children and results indicated that children used several phonological processes during speech production and these processes tend to persist even after 4yrs of age.

Radhakrishnan (2001) conducted a study on normally developing 3-4yr 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 3-4yrs 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 3-4year.

It is important to note here that language specific features play an important role in determining the phonological development of the children of a given language. Final consonants are stressed syllables are not characteristic of spoken language in Tamil as well as many Dravidian languages. That is most word in Tamil end with a vowel. Hence final consonant deletion and unstressed syllable deletion ideally should not be looked for in expression in Tamil. However, these have been reported in the study done by Radhakrishnan (2001).

Pootheri (1998) used Malayalam articulation test on 30 children aged 3-4yrs Malayalam speaking children. The processes identified in them were cluster reduction, final consonant deletion, apicalization, and affrication as persisting processes and the decreasing processes identified were stopping, stridency deletion, fronting, reduplication, palatalization, medial consonant deletion, backing of fricatives, denasalization, and articulatory shifts. Pootheri (1998) also reported persistence of cluster reduction and epenthesis while some processes decreased as the age advanced. Murthy (2001) studied phonological processes between 3 and 4 yrs with native language of Hindi and reported phonological processes of denasalization, backing, cluster reduction.

Ranjan (1999) had administered Hindi articulation test on 30 normally developing Hindi speaking children aged 4-5yrs and observed that the most commonly occurring processes were cluster reduction, weak syllable deletion, aspiration, deaspiration, articulatory shift, denasalization, partial reduplication, epenthesis, devoicing, affrication, diphthong reduction, and fronting.

Another study has been conducted by Srilakshmi (2005) to assess the phonological processes in three to four years old Telugu speaking typically developing children using the “Telugu Test of Articulation and Phonology” (TTAP) (Vasanth & Dodd, 1991). She has identified the following phonological processes in this age group which were cluster reduction, initial consonant deletion, medial vowel deletion, diphthong reduction, palatalization, stopping, deaffrication, affrication, lateralization, labialization, denasalization, fronting, vowel unrounding, vowel rounding, vowel backing, prevocalic voicing.

There is a paucity of literature in terms of persistence and suppression of phonological processes in Malayalam. Thus, a need for the study regarding the assessment of phonological processes in Malayalam was considered necessary, as this information will be useful in assessing and treating clinical population. Hence, in this study an attempt has been made to study the phonological processes in Malayalam speaking children. In this study an attempt has been made to study the phonological processes in Malayalam speaking children.

## **Method**

The study was carried out in following four phases: 1) Development of the test material, 2) Selection of subjects, 3) Administration of the test and 4) Analysis of data

### **Phase 1: Development of the test material**

Test material was developed to assess 17 phonological processes in Malayalam. These 17 phonological processes were considered based on the studies done by Sameer (1998), Anilsam (1999) and Sachin (2010). These authors have reported the occurrence of following phonological processes in Malayalam speaking children during their language development: 1) Cluster reduction, 2) Stopping, 3) Weak syllable deletion, 4) Liquid substitution, 5) Deaspiration, 6) Initial consonant deletion, 7) Prevocalic voicing, 8) Gliding, 9) Nasal assimilation, 10) Denasalization, 11) Devoicing of stops, 12) Palatal fronting, 13) Affrication, 14) Deaffrication, 15) Coalescence, 16) Metathesis and 17) Velar fronting

### **Stimulus preparation**

Preparation of the stimuli was done based on ALPHA (Assessment Link between Phonology and Articulation) test (Lowe 1983). The ALPHA test provides two assessments using a delayed sentence imitation format. This test provides a traditional, sound-in position

assessment of consonant production. In addition, this test can also be used for the analysis of phonological processes. The ALPHA development procedure was adopted to develop the test material in Malayalam to assess 17 target phonological processes. This consisted of a total of 85 Malayalam words and sentences. The target words and sentences were developed in the following phases.

### **1: Selection of words and sentences**

A total of 6 pictorial words and six pictorial sentences were selected to assess each phonological process. Hence a total of 102 words and 102 sentences were selected from different sources which included, school text books, short stories of children and periodicals (dailies, weeklies, and monthlies).

### **2: Familiarity test**

As a part of the development of test material, familiarity test was carried out to find out the familiarity of the stimuli.

### **Phase 2: Selection of subjects:**

A group of children aged between three to five years were selected for the study. They were belonging to five different age groups with an interval of one year for each group. Each group had 30 males and 30 females.

### **Inclusion criteria:**

1. Children having Malayalam as their mother tongue
2. Children who were having average and above average academic performance as reported by the teachers were included in the study.
3. Subjects who were from middle socioeconomic group were selected for the study.

### **Exclusion criteria**

1. Children with history of language deficits, speech problems, neurological problems, emotional problems, organic deficits, hearing impairment and mental retardation were excluded from the study.
2. Children exhibiting significant difficulty in understanding instructions during testing were also excluded from the study.

### **Phase 3: Administration of the test**

#### **Task 1: Delayed sentence imitation task**

In this task each subject was asked to repeat the sentence which the examiner said. The child was asked to repeat only after seeing the corresponding picture on the computer screen. Hence this step also involved the presentation of pictures corresponding to each sentence using a

computer. The picture presentation was cue for the subject to imitate the examiner. After saying each sentence, the examiner paused for about one second before presenting the corresponding stimulus picture and signaled the child to repeat the sentence.

### **Task 2: Delayed word imitation task**

In this task each subject was asked to repeat the word which the examiner said. The child was asked to repeat only after seeing the corresponding picture on the computer screen. Hence this step also involved the presentation of pictures corresponding to each word using a computer. The picture presentation was the cue for the subject to imitate the examiner. After saying each word, the examiner paused for about one second before presenting the corresponding stimulus picture and signaled the child to repeat the word.

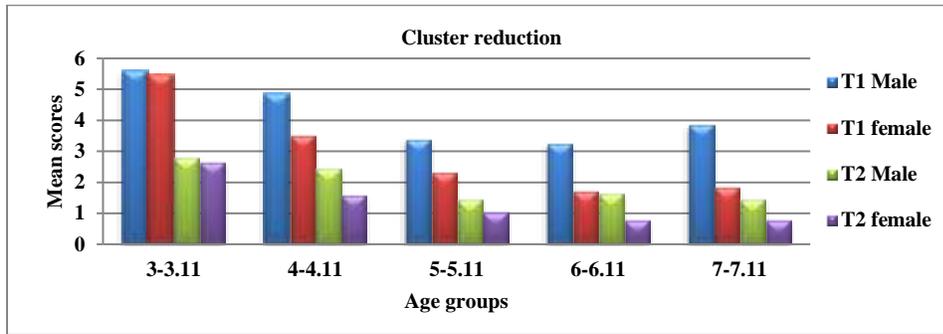
### **Phase 4: Data analysis**

Transcription of the data and analysis was carried out by examiner and by three trained Malayalam speaking speech language pathologists with a Master's degree in Speech and Hearing, in order to have a reliable data.

### **Results and Discussion**

The SPSS software (V.17) was used to compute the statistical scores. Statistical analysis was carried out to compare the significant difference of the mean percentage of occurrence of each phonological process between different age groups, the genders and Task 1 and Task 2. Scores were tabulated separately for each age group. Mean percentage of occurrence and standard deviation of each phonological process was computed. The descriptive statistics was carried out, on the scores of each phonological process, on 'Delayed sentence imitation task' and 'Delayed word imitation task'. Mean and standard deviation values were obtained. Univariate Analysis of Variance (ANOVA) was carried out to find out the significance of difference of each of the phonological process between the age groups and genders. The phonological process was taken as dependent variable and the age and gender were taken as independent variables. Scheffe's post hoc test was carried out to find out the significant difference between the age groups for each phonological process for both Task1 and Task 2. The paired sample t test was administered to find out the significant difference between the scores obtained in 'Delayed sentence imitation task' and 'Delayed word imitation task'. Each of the 17 phonological processes are analyzed and discussed separately.

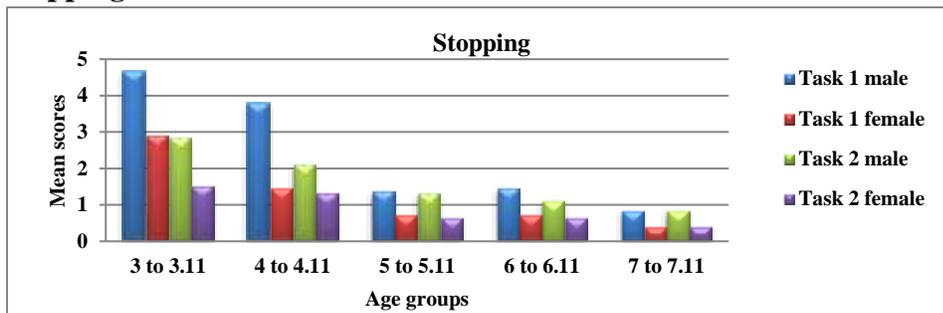
## Cluster reduction



**Figure1: The mean values of ‘Cluster reduction’ in male and female of different age groups for Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there were significant differences in mean values of ‘Cluster reduction’ under both tasks for all the five age groups irrespective of gender. F values were found to be significant at 0.05 level across all the age groups. The Scheffe’s post hoc test results suggested that, for both Task 1 and Task 2, the age groups 3 to 3.11 years and 4 to 4.11-year-old children had significantly higher occurrence than older age groups.

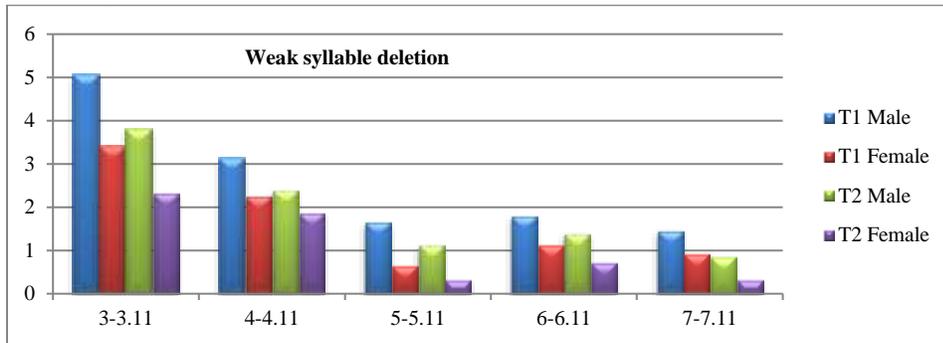
## Stopping



**Figure 2: The mean values of ‘Stopping’ in male and female of different age groups on Task 1 and Task 2**

The results of ANOVA revealed that there were significant differences in mean values of ‘Stopping’ in five age groups, irrespective of gender difference under both the tasks. The result of the Scheffe’s post hoc test suggested that, in both the tasks, 3 to 3.11 year old children had significantly higher occurrence of stopping among all other groups.

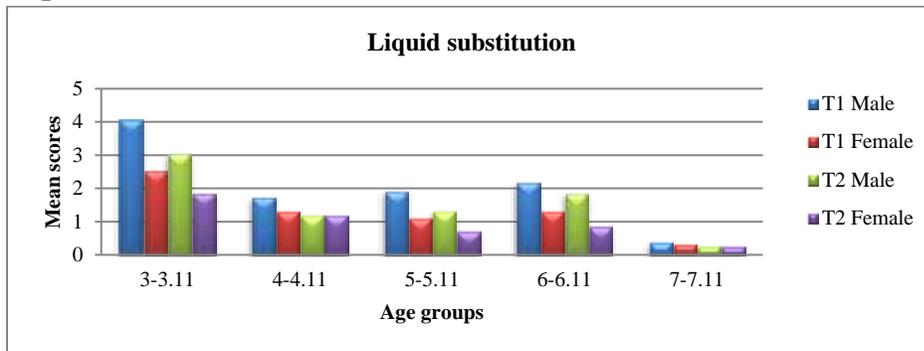
### Weak syllable deletion



**Figure 3: The mean values of ‘Weak syllable deletion’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there were significant differences in mean values of ‘Weak syllable deletion’ under both the tasks. It also revealed that there were significant differences in the mean values of male and female children (significant at 0.05 level) irrespective of age groups. Among all the five groups, the children aged 3 to 3.11 years old had significantly higher occurrence than all other groups and there was no significant difference in the mean values of 5 to 5.11 year and 7 to 7.11 year old children according to the results of Scheffe’s post hoc test.

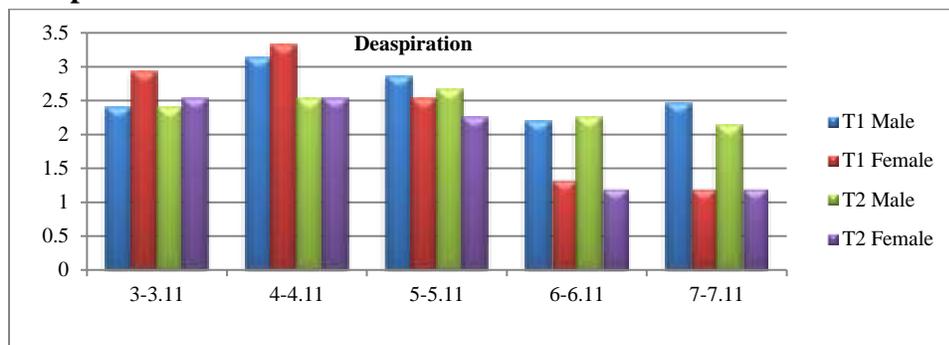
### Liquid substitution



**Figure 4: The mean values of ‘Liquid substitution’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there was significant difference in mean values of ‘Liquid substitution’ under both the tasks and were found to be significant at 0.05 level across age groups irrespective of gender differences. For both the tasks, it was observed that, The 3 to 3.11 year old children showed higher occurrence of the phonological process liquid substitution and 7 to 7.11 year old children showed lower occurrence among the five age groups.

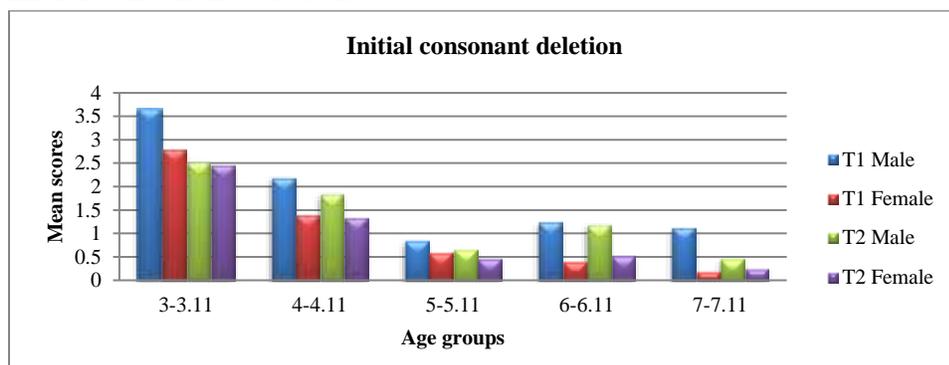
## Deaspiration



**Figure 5: The mean values of ‘Deaspiration’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there was a significant difference in mean values of ‘Deaspiration’ under both the tasks. Results also revealed that there were significant differences in the values of male and female children (significant at 0.05 level) in all the age groups. The results of Scheffe’s test suggested that there was a similar performance by children aged 6 to 6.11 years and 7 to 7.11 years on both Task 1 and Task 2. 3 to 3.11-year old children had higher occurrence among the five age groups studied on Task 1. In Task2, although there were differences in the mean values of 3 to 3.11 years, 4 to 4.11 years, and 5 to 5.11 years old children, these values were found to be not significant, suggesting a similar performance by the subjects of these age groups.

## Initial consonant deletion

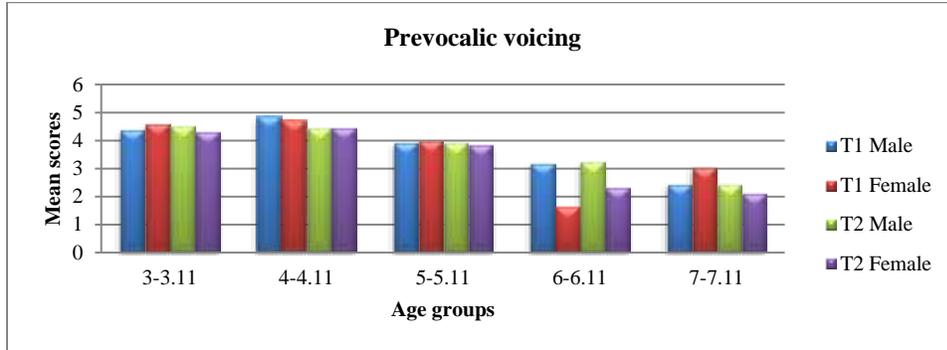


**Figure 6: The mean values of ‘Initial consonant deletion’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there were significant differences in mean values of ‘Initial consonant deletion’, across the age groups and between the genders for both the tasks. For both the tasks, the results of Scheffe’s test suggested that it was observed that, the age groups

3 to 3.11 year and 4 to 4.11 years showed higher occurrence of initial consonant deletion than other age groups.

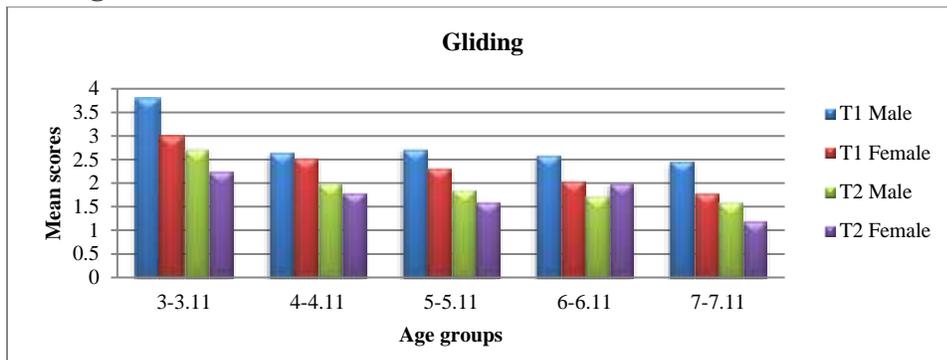
### Prevocalic voicing



**Figure 7: The mean values of ‘Prevocalic voicing’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

There was significant difference (significant at 0.05 level) in mean values of ‘Prevocalic voicing’ across the age groups irrespective of gender differences for both the tasks as shown in the results of ANOVA. For both the tasks, there were no significant differences in the performance of age groups 6 to 6.11 years & 7 to 7.11 years and 3 to 3.11 years & 4 to 4.11 years as per the results of Scheffe’s test.

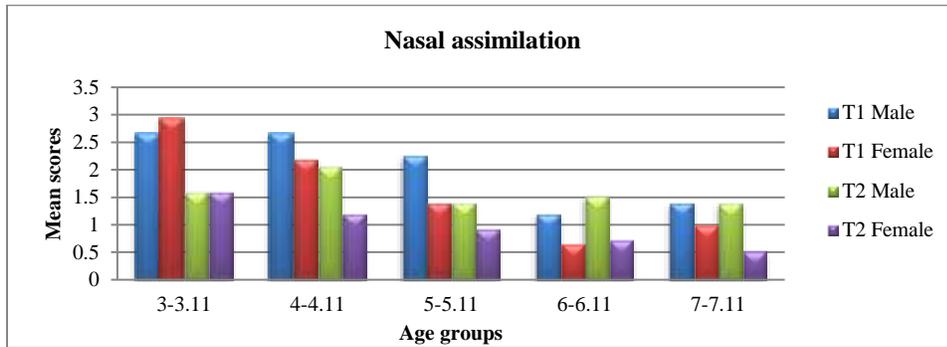
### Gliding



**Figure 8: The mean values of ‘Gliding’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there was significant difference in mean values of ‘Gliding’ across the age groups and between the genders for both the tasks. The result of Scheffe’s post hoc test was also shown that the children aged between 3 to 3.11 years had higher occurrence of gliding than older age groups among the five age groups studied, for both Task 1 and Task 2.

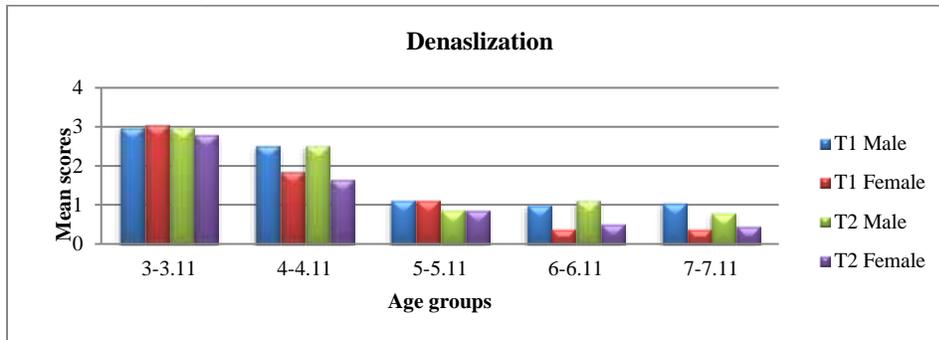
## Nasal assimilation



**Figure 9: The mean values of ‘Nasal assimilation’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there was a significant difference in mean values of ‘Nasal assimilation’ for both Task 1 and Task 2 across the age groups irrespective of gender differences. The result of Scheffe’s post hoc test for both Task 1 and Task 2, it was observed that, the occurrence of nasal assimilation in 3 to 3.11 years & 4 to 4.11 years and 6 to 6.11 years & 7 to 7.11 years were not significant, suggesting a similar performance by the subjects of these age groups. Children aged 5 to 5.11 years had higher occurrence of nasal assimilation than older age groups in both the tasks.

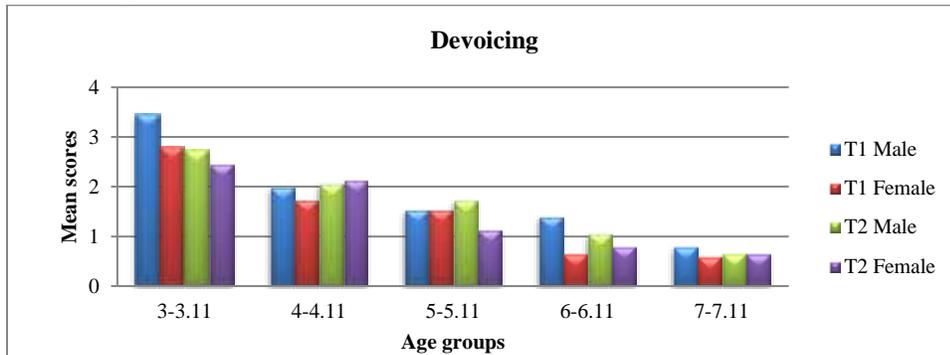
## Denasalization



**Figure 10: The mean values of ‘Denasalization’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there were significant differences in mean values of ‘Denasalization’ under both the tasks. The results also revealed that there were significant differences (significant at 0.05 level) in the mean values of male and female children irrespective of the age groups. For both Task 1 and Task 2, it was observed that the age groups 3 to 3.11 year and 4 to 4.11 years had higher occurrence of denasalization than older age groups according to the results of post hoc test.

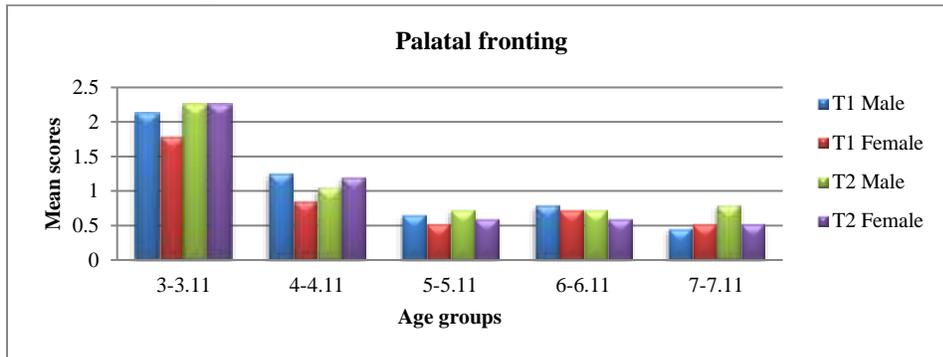
## Devoicing



**Figure 11: The mean values of ‘Devoicing’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there was significant difference in mean values of ‘Devoicing’ under both the tasks across the age groups irrespective of gender differences. The result of Scheffe’s post hoc test suggested that 3 to 3.11-year old children had higher occurrence of devoicing than older age groups for both the tasks.

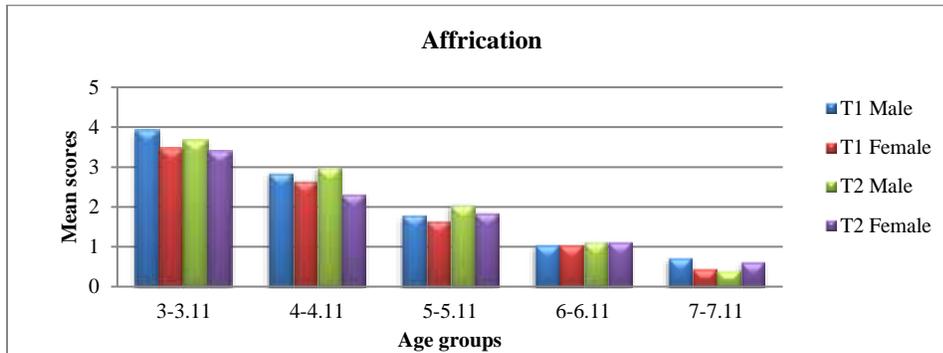
## Palatal fronting



**Figure 12: The mean values of ‘Palatal fronting’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

There was significant difference in mean values of ‘Palatal fronting’ under both the tasks across the age groups irrespective of gender differences as shown in the results of ANOVA. It was observed from the post hoc test result that, in both tasks the age groups 3 to 3.11 years and 4 to 4.11 years had higher occurrence of palatal fronting than older age groups.

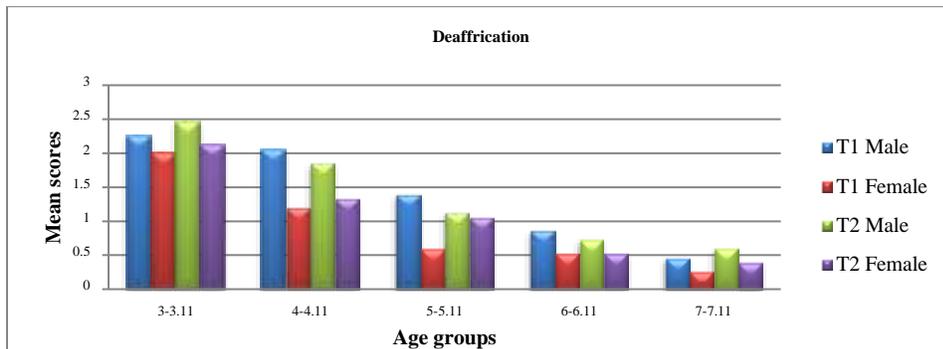
## Affrication



**Figure 13: The mean values of ‘Affrication’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there was significant difference (significant at 0.05 level) in mean values of ‘Affrication’ across the age groups irrespective of gender differences under both the tasks. The results of post hoc test suggested that, there was a significant difference in the occurrence of each age group on Task 1 and Task 2. The age groups 3 to 3.11 years and 4 to 4.11 years had higher occurrence than older age groups for both the tasks.

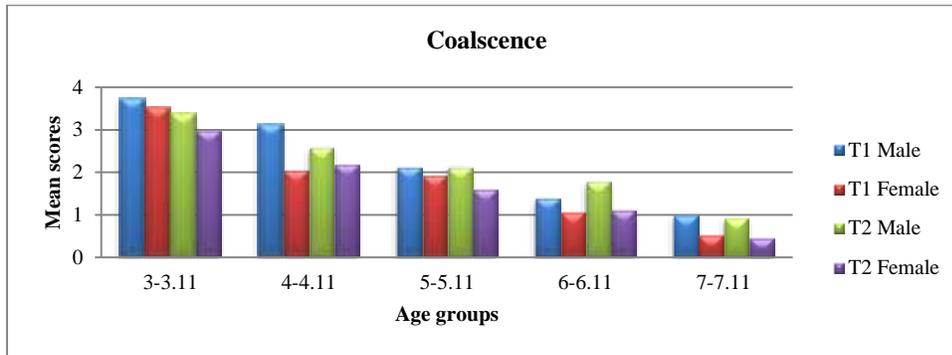
## Deaffrication



**Figure 14: The mean values of ‘Deaffrication’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of univariate ANOVA revealed that there was significant difference in mean values of ‘Deaffrication’ across the age groups irrespective of gender differences under both the tasks. In Task 1 and 2, the age group 3 to 3.11 years had significantly higher occurrence of deaffrication than in older age groups according to the result of Scheffe’s post hoc test.

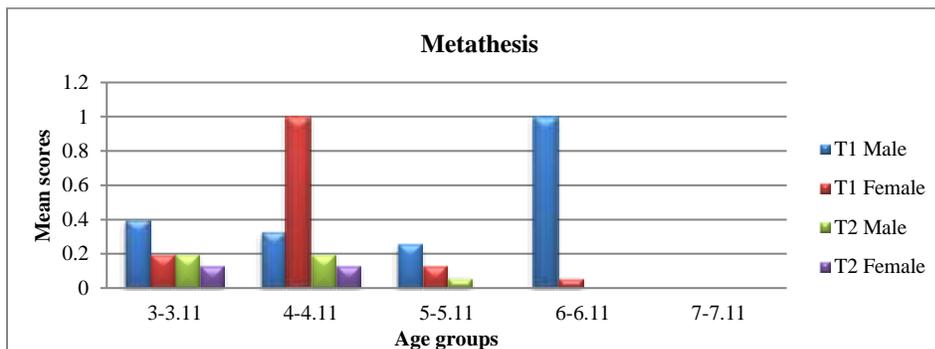
## Coalescence



**Figure 15: The mean values of ‘Coalescence’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there were significant differences in mean values of ‘Coalescence’ across the age groups and between the genders irrespective of each other for both the tasks. It was observed from the results of Scheffe’s post hoc test, the age groups 3 to 3.11 years and 4 to 4.11 years showed higher occurrence of coalescence than older age groups.

## Metathesis

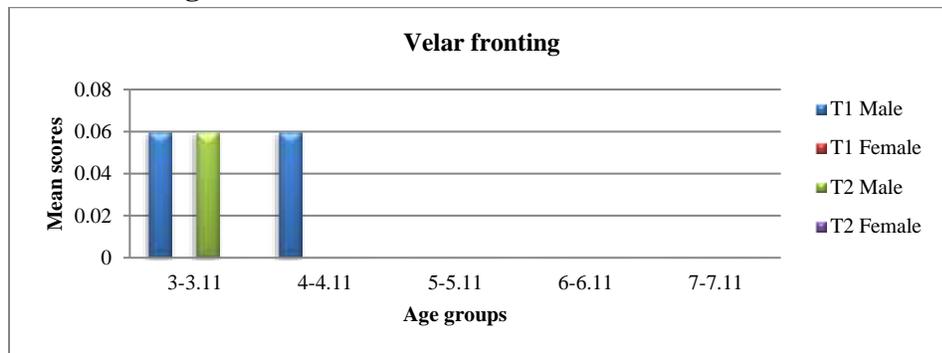


**Figure 16: The mean values of ‘Metathesis’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there was significant difference (significant at 0.05 level) in mean values of ‘Metathesis’ across age groups irrespective of gender differences on both the tasks. Based on post hoc test results, in Task 1, the mean values of the age groups 4 to 4.11 years and 6 to 6.11 years were shown higher than all other groups. But the differences in these values were not found to be significant, suggesting a similar performance in these age groups. The children aged 7 to 7.11 years did not show ‘Metathesis’ in their speech. In Task 2, the age groups 3 to 3.11 year and 4 to 4.11 had higher occurrence of ‘metathesis’ when compared to other age groups. The scores obtained by children of these two groups were found

to be same, suggesting a similar performance. The phonological process ‘metathesis’ was not present in children aged 6 to 6.11 years and 7 to 7.11 years.

### Velar fronting



**Figure 17: The mean values of ‘Velar fronting’ in male and female of different age groups on Task 1 (T1) and Task 2 (T2)**

The results of ANOVA revealed that there was no significant difference in mean values of ‘Velar fronting’ under both the tasks across age groups, it also revealed that there was significant difference in the mean values of male and female children under delayed sentence imitation task, F values were found to be significant at 0.05 level, whereas there was no significant difference across gender was seen on delayed word imitation task. Since the phonological process ‘Velar fronting’ was found to be not significant based on F value and level of significance, it was not possible to perform a post hoc test.

The results of the paired sample T-test show that, there is a significant difference in the occurrence of phonological processes on ‘Delayed word imitation task and ‘Delayed sentence imitation task’. The occurrences of phonological processes were found to be more for ‘Delayed sentence imitation task’.

The results of the present study revealed that, most of the phonological processes considered for the study were present in 3 to 8-year old male and female children who were participated in the study. The processes show a decreasing pattern of occurrence from 3 years to 7.11 years old. The declining use of phonological processes with increasing age has been reported across languages including English (Grunwell, 1982; Hodson& Paden, 1983; Haelsig& Madison, 1986; Preisser et al, 1988; Roberts et al, 1990), Malayalam (Sameer, 1998; Anilsam, 1999), Kannada (Sunil, 1998; Jayashree, 1999).

In this investigation, a phonological process was said to be persisting even if present in a single child. Additionally, a phonological process was defined as persisting if it occurred even once in the speech of the child. Lowe (1994) suggested the presence of a single occurrence of a

process qualifies its presence. By this definition, ‘Fronting’, ‘Cluster reduction’, ‘Gliding’, ‘Weak syllable deletion’, were persisting phonological processes. Although the aforementioned processes continued to be exhibited in the older children, the frequency of occurrence of the process was found to be diminished. This is again in keeping with the notion of declination of phonological process use with age.

According to the data, there appeared to be some children who persist in their usage of phonological process while others have eliminated these processes from their phonological repertoire. The varying usage of the phonological process and the differential degree of persistence, therefore, underscores the importance of considering individual differences when examining the phonological development.

Amongst 17 phonological processes considered for the present study, ‘Cluster reduction’ was one of the most common phonological process exhibited by the children of all age groups from 3 to 8 years. This is supported by Haelsig & Madison (1986) and Bernthal & Bankson (1990) in English, who reported that ‘Cluster reduction’ is a persisting process. It is also reported to be common in Spanish (Goldstein & Iglesias, 1996) and in Indian languages such as Malayalam (Sameer, 1998) & Anilsam, 1999) and Kannada (Sunil, 1998 & Jayashree, 1999). Preisser et al. (1988) also found that ‘Cluster reduction’ and ‘palatal fronting’ are the most frequently occurring processes. Similar results were reported by Stoel – Gammmon & Dunn (1985), they reported that the cluster development goes on till 8 years and are matured only by then. The results of the present study are in complete agreement with these studies.

The partial agreements and disagreements in the results of the present study with those of the previous studies may be because of several reasons. The difference in the methodology used for the study can be considered as the first reason. Most of the studies done in Indian languages are chosen stimuli as words, which are selected from the articulatory tests of the respective languages (Anilsam, 1999; Sameer, 1998; Nisthar, 2005).

The second reason for the discrepancy in the results of the present study and other studies may be the language chosen for the analysis. It may be considered that the language specific features may play an important role in determining the phonological development in children of a given language (Radhakrishnan, 2001).

Cultural diversity may consider as other factor for the discrepancy in the results of the present study and other studies. Cultural diversity is a major variable which is very difficult to control when it comes to research in Indian population. Based on the findings of the study other than Metathesis (disappeared by 6.11years) and velar fronting (disappeared by 4.11years) all other phonological processes were found to be persisting till 7.11 years.

Hence, it can be noted from the study results that the phonological processes take more than 6 to 7 years to disappear and articulatory skills continue to improve beyond 6 to 7 years. Thus, the present study provides detailed information about the phonological processes exhibited by the Malayalam speaking children aged between 3 to 8 years. It allows the speech clinician to choose more appropriate techniques, better focusing towards the child's speech and language problem.

## Conclusion

It can be said that as the children grow older, simplification processes that are operational during their developmental stages lessen considerably as speech production nears the adult target. The present study also reveals that phonological processes seen in Indian languages may be different compared to the western literature. This warrants establishment of phonological norms in our language which are useful in assessment and management of children with speech and language disorders.

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