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Radish Kumar. B.
Jayashree S. Bhat, Ph.D.

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Abstract

Phonological mean length of utterance (PMLU) is a whole word measure for measuring phonological proficiency. It measures the length of a child's word and the number of correct consonants. The present study investigated the phonological length of utterance in native Kannada speaking children of 3 to 7 years age. A total of 400 subjects in the age range of 3-7 years participated in the study. Spontaneous speech samples were elicited from each child and analyzed for PMLU as per the rules suggested by Ingram. Mann-Whitney U test and Kruskal Wallis test were employed to compare the differences between the means of PMLU scores across the gender and the age respectively. The result revealed increase in PMLU score as the age increased suggesting a developmental trend in PMLU acquisition. No statistically significant differences were observed between the means of PMLU scores across the gender.

Introduction

The field of phonological acquisition has made extensive efforts to measure its development through normative studies (Templin, 1957; Olmstead, 1971) and articulation tests (Hodsen & Paden, 1991). Earlier studies have focused on correctness of consonants as well as the analysis of segments in general. Recent studies have focused on the whole word complexity (Masterson &

Kamhi, 1992, Ingram, 2002). One such measure is the Phonological mean length of utterance (PMLU). It is a whole word measure for measuring phonological proficiency (Ingram,2002). It measures the length of a child's words and the number of correct consonants. The PMLU for a speech sample is calculated by: (1) counting the number of segments (consonants and vowels) in each word as produced by the child; (2) counting the number of consonants produced in each word that the child produced accurately; (3) summing these two numbers; (4) totaling these sums; and (5) dividing this total by the total number of words in the sample. PMLU quantifies development of phonology and focuses on the children's whole-word productions instead of specific segments. Ingram demonstrates the value of the PMLU measure by applying it in a wide range of contexts. These include a comparison of monolingual children, a comparison across languages, and the diagnosis of impairment or delay.

Very few studies have addressed the PMLU in different languages. One such study is by Ingram (2002) who proposed preliminary PMLU stages, reflecting the possible level of development in English speaking children which are as follows.

Table 1: PMLU stages in English speaking children

Stages	Range	Mid point
I	2.5-3.5	3
II	3.5-4.5	4
III	4.5-5.5	5

IV	5.5-6.5	6
V	6.5-7.5	7

Helin, Makkonen & Kunnari (2006) reported that PMLU was much higher in Finnish speaking children than those reported for children acquiring English. Other studies have focused PMLU on the disordered population. Polite & Leonard (2006) reported lower PMLU scores in children with Specific Language Impairment than age matched typically developing peers. Another study by Schauwers, Taelman, Gillis & Govierts (2005) reported lower PMLU scores in children with cochlear implant than age matched typically developing peers and they also concluded that the earlier implanted children were more proficient than the later implanted children.

Need for the Study

From the review it is clear that there is very little understanding of PMLU in typically developing children in different languages. A few years ago, PMLU, a whole word measure was proposed to measure complexity of word attempted by children of different ages (Ingram & Ingram, 2000) which forms the basis of a developmental scale in phonology. Although studies have addressed the phonological mean length of utterance in English and Finnish languages, none have focused on the Indian languages. Hence the present study was carried out to determine the PMLU in native Kannada speaking children between 3 and 7 years.

Aims of the Study

- To examine the PMLU in typically developing Kannada speaking children.
- To compare phonological mean length of utterance (PMLU) across the gender

Method

Subjects: Subjects consisted of four hundred typically developing normal children in the age range of 3-7 years. An informal consent was obtained from the parents for all the subjects. They were divided into eight groups. Each group consisted of 25 males and 25 females in six month interval. They are as follows:

Table 2: Distribution of subjects across age groups

Groups	Age range (in years)	Males	Females
1	3-3.6	25	25
2	3.6-4	25	25
3	4-4.6	25	25
4	4.6-5	25	25
5	5-5.6	25	25
6	5.6-6	25	25
7	6-6.6	25	25
8	6.6-7	25	25

The subject's exclusion criteria will be history of speech, language, neurological and hearing problems. The inclusion criteria would be native kannada speakers with an exposure to either tulu and /or Konkani , middle socio economic status and formal education in kannada.

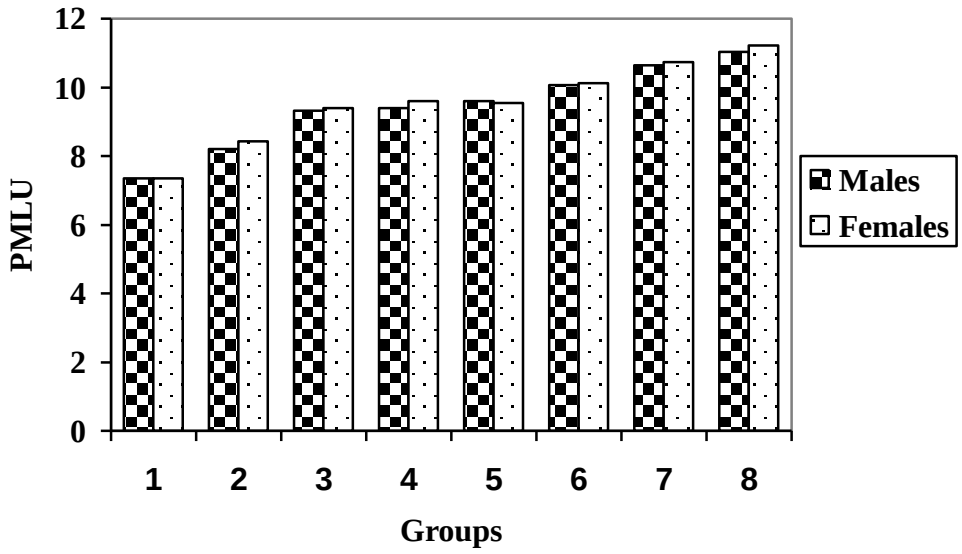
Procedure

In order to assess the phonological mean length of utterance, spontaneous speech utterances were elicited from each child for duration of 30 to 40 minutes. Samples consisted of minimum of 50 utterances. The experimenter served as a conversational partner and introduced the child to age appropriate toys and questions. The samples were obtained in an informal setting within the school premises and audio recording was done using a portable Sony Recorder in a relatively quite environment. The words were accepted for analysis according to the rules suggested by Ingram and Ingram as shown in Appendix I. The children's production of utterances was narrow transcribed and PMLU was calculated for each child. For each word, the number of segments (consonants and vowels) as produced by the child was counted and summed with the number of correct consonants in a word. The sum of each words in all the utterances of a single subject were totaled and divided by the number of words produced by the child to obtain the PMLU scores. Obtained scores were analyzed statistically using Mann-Whitney U test and Kruskal Wallis test.

Results

The PMLU was analyzed in native kannada speaking children. Mean of the PMLU scores were computed across the age and gender and they are shown in graph 1.

Graph 1: PMLU Scores in different age groups



The results in graph 1 reveal that there is a developmental trend across 3-7 years and females showed higher PMLU score than male children.

Mann-Whitney U test was employed to compare the differences between the mean PMLU scores of all the groups across the gender. The results revealed that there was no statistically significant difference between the means of PMLU scores across the gender though PMLU scores were higher in female children in comparison with male children.

Kruskal Wallis test was administered to compare the differences between the mean PMLU scores across the successive age groups to observe for the developmental trend. The results are shown in the table 3.

Table 3: Mean PMLU scores across the successive age groups

S.No	Groups	p value
1	1 (3.0 – 3.6 yrs) vs 2 (3.6-4.0 yrs)	p<0.001
2	2 (3.6-4.0 yrs) vs 3 (4.0 – 4.6 yrs)	p<0.001
3	3 (4.0 – 4.6 yrs) vs 4 (4.6 -5.0 yrs)	p>0.05
4	4 (4.6 -5.0 yrs) vs 5 (5.0 -5.6 yrs)	p>0.05
5	5 (5.0 -5.6 yrs) vs 6 (5.6 -6.0 yrs)	p<0.05
6	6 (5.6 -6.0 yrs) vs 7 (6.0 -6.6 yrs)	p<0.01
7	7 (6.0 -6.6 yrs) vs 8 (6.6 – 7.0 yrs).	p>0.05

The results revealed that there was a significant difference observed between groups 1 & 2, 2 & 3, 5 & 6, 6 & 7 and 7 & 8 at $p<0.05$. There was no significant difference observed between groups 3 & 4, and 4 & 5.

Discussion

The present study was taken up to investigate the phonological mean length of utterance in Kannada speaking children between 3 & 7 years. The results revealed developmental trend and that there is a high significant difference between the groups 1 & 2 and 2 & 3 suggesting rapid growth in the phonological development in 3-4 year old typically developing children in comparison to other age groups taken up for the study. The results reveal that although a temporary plateau seems to be reached between age 4 and 5, there is still an increase in pMLU around age 6. This is an interesting finding but the question to be explored further is whether this

increase is due to a phonological advancement, or to an advancement in the domain of vocabulary (the children know more long words), or morphosyntactic proficiency (they apply morphosyntactic operations that lengthen their words).

There was no significant difference observed between the mean PMLU scores across the gender though PMLU scores were higher in female children in comparison to male children. The higher PMLU scores in females could be attributed to maturational factors as female children are phonologically more proficient than male children (Anderson & Shames, 2006).

The PMLU scores reported in the present study are higher in comparison with English speaking children as reported by Ingram (2002). This may suggests that Kannada speaking children are superior in the acquisition of segments as well as in their whole-word phonological proficiency than English speaking children. This is supported by the fact that the analysis of specific languages indicated that the phonologies of some languages are acquired earlier than others (Bedore,1999). But there is an evidence to suggest that PMLUs are longer in languages with longer words suggesting that children adjust their PMLUs according to the target language. This may be because of the differences in the syllable structure and word shape of the different languages. This may be the reason that Kannada speaking children had obtained higher PMLU scores compared to English speaking children.

The higher PMLU scores may also be due to the phonologically complex words usually exhibited by bilingual children, as the children studied were exposed to Tulu and/or Konkani language apart from Kannada language. Gildersleev et al (1996) has observed that there will be

potential differences between the phonology of monolingual and bilingual children. So, there is a need to further study PMLU across monolinguals and bilinguals.

The higher PMLU scores may also be due to the differences across the language exposure to children across the socioeconomic status (Hoff & Tian, 2004). There is a general tendency that children in the middle and higher socioeconomic status get exposed to wide varieties of vocabulary when compared to poor socioeconomic status as they are exposed to television. These vocabularies may vary in their length as well as the phonological complexity and hence the higher PMLU scores in the present study. These results suggest the apparent need for further research across the socio economic status in order to develop the PMLU method suitable for different language environment.

Conclusions

The present study attempted to investigate the Phonological mean length of utterance (PMLU) in native Kannada speaking children of 3-7 years age. The results revealed a developmental trend in typically developing Kannada speaking children. Hence, this measure could be regarded as a yardstick for phonological development, and forms the basis of a developmental scale in Kannada speaking children. The PMLU scores reported in the present study are higher in comparison with English speaking children. This suggests that Kannada speaking children are superior in the acquisition of segments as well as in their whole-word phonological proficiency than English speaking children. This suggests the need for language specific research in order to develop the PMLU method suitable for different language environment.

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APPENDIX I

Rules for the calculation of Phonological mean length of utterance (PMLU):

Rules	Description
Sample size	Select at least 25 random words
Lexical class rule	Count words (e.g., common nouns, verbs, adjectives, prepositions and adverbs) that are used in normal conversation between adults. This excludes chills words (e.g., mommy, daddy, etc.)
Compound rule	Do not count compounds as a single word unless they are spelled as a single word

	(e.g., cowboy but not teddy bear; i.e., teddy bear would be excluded from the count)
Variability rule	Only count a single production for each word
Production rule	Count one point for each consonant and vowel that occurs in the child's production. Syllabic consonant receive one point (e.g., syllabic "l", "r" and "n")
Consonant correct rule	Assign one additional point for each correct consonant

Radish Kumar. B
Department of Audiology and Speech Language Pathology
KMC, Mangalore
Mangalore – 1
Karnataka, India
radheesh_b@yahoo.co.in

Jayashree. S. Bhat, Ph.D.
Department of Audiology and Speech Language Pathology
KMC, Mangalore
Mangalore – 1
Karnataka, India
bhatjs@yahoo.co.in