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## Comparison of PMLU in Kannada speaking Down's syndrome and Typically Developing Children

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### Abstract

Phonological Mean Length of Utterance, (PMLU) is a whole word measure for determining phonological proficiency and is one of the new tools for quantifying development of word forms in both normal and clinical population. Even though PMLU measures phonological proficiency, its utility in clinical populations like Down's syndrome is not clearly understood. Since there is a scarcity of information on PMLU measures, the present study focuses on comparing PMLU scores in Kannada speaking Down's syndrome and language age matched normal children.

Two groups of Kannada speaking children were included in the study: Group1 composed of normal children (n = 60 and chronological age of 3-4 years) matching the language age of group 2. Group 2 comprised of children with Down's syndrome (n = 35 and chronological age of 6-15 years) with mild to moderate mental retardation and expressive language age of 3-4 years. Picture naming task using Kannada Articulation test was done and 25 words were randomly selected for PMLU analysis. Samples were recorded using digital professional voice recorder and the children's utterances were calculated for PMLU measures.

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Obtained scores were analysed using SPSS 16.0 version by Independent t- test with p value kept at 0.05. The results revealed statistically significant difference in PMLU scores between Down's syndrome population and typically developing children. These reduced scores are indicative of poor whole word complexity in children with Down's syndrome. Findings of the study indicate that PMLU measure could be a benchmark in assessing the phonological skills in disordered population.

**Keywords:** *Phonology, PMLU, Down's syndrome*

## **Introduction**

The evaluation of children's phonological skills has been an area of interest for both researchers and clinicians. The area of understanding the phonological development has now shifted from describing sound inventory to detailed analysis of children's production in terms of phonological processes, error patterns.

According to Stoel-Gammon and Stone, 1991 (cited in Saaristo-Helin, 2009) a thorough phonological assessment of young children always makes use of both independent and relational analyses, since it is well known that substantial variation is present in their productions. Phonological skills can be analyzed by using both qualitative and quantitative measures. However, in clinical practice, a simple and practical method is being sought as a reliable assessment tool of a child's phonological skills. So far, the methods of analyzing children's early phonological skills have made extensive use of formal articulation tests, and the focus has been on segments and measures of correctness. Only, recently researchers have begun to believe that word is the basic unit of analysis (Ingram & Ingram, 2001) and focussed on the whole word correctness during a single production of a given word (Bankson & Bernthal, 1990).

Ingram and Ingram (2001) have introduced a new method of evaluating children's words: the Phonological Mean Length of Utterance (PMLU). This measure utilizes spontaneous speech samples and draws attention from the segments to the word as a whole. The central assessment tool of the PMLU method measures whole-word complexity for both child and target words. Words are assigned points for both segments in the word (one point per segment) and the number of correct consonants in the word (one point per correct consonant).

A few studies have been reported on word complexity measures. Ingram and Ingram (2001) proposed five stages of PMLU which range from I-V reflecting the possible level of development in English speaking children. Saaristo-Helin, Makkonen and Kunnari (2006) while studying the phonological development of 17 children acquiring Finnish, found relatively high PMLU values for the Finnish children at earlier stages of phonological development as compared to children acquiring English. They further reported that there is an immense need for more language-specific research in order to develop the PMLU method suitable for clinical use in various language environment. A recent study done by Hase, Ingram and Buntam (2010) compared two phonological assessment tools for use with 27 one-

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three year-old monolingual Spanish-speaking children on the complexity of children's production and reported difference in age.

PMLU measures have also been studied among the Indian population. The study by Radish and Jayashree (2009) in 400 Kannada speaking normal children of age 3 to 7 years revealed a developmental trend in PMLU acquisition with effect on gender. They further reported that Kannada speaking children are superior to English speaking children ascribing the fact that the phonologies of some languages are acquired earlier than others and also differences in the syllable structure and word shape of the different languages (Saaristo-Helin, et al, 2006). Similar research done in the disordered population has reported of lower PMLU scores in children with Specific Language Impairment, very-low-birth weight as well as in children with cochlear implants in comparison with age matched typically developing peers (Van Noort-Van Der Spek, Franken, Wieringa & Weisglas-Kuperus, 2010, Polite & Leonard, 2006; Schauwers, Taelman, Gillis & Govierds, 2005).

Even though PMLU, a whole word measure proposed to measure the complexity of word attempted by children of different ages has been studied in typically developing, limited research has focused on clinical population like Down's syndrome. Down's syndrome (DS) is a genetic disorder in which there is a trisomy of 21st chromosome, which occurs in 1 in 800 births. There is considerable variability in cognitive skills in this population from close to normal intelligence to severely retarded.

The speech of children with Down's syndrome is often difficult to understand. Speech errors are common among children with Down's syndrome, with characteristic delay compared to other typically developing normal children. Down's syndrome exhibits a large number of phonological processes compared to any other phonological disordered population. Since there is a scarcity of information on PMLU measures, the present study focused on comparing PMLU scores in Kannada speaking Down's syndrome and language age matched normal children, on the premise that this information can serve as a baseline for assessment of phonological development in clinical populations and form the basis of a developmental scale in phonology.

The present study, thus aimed at comparing the PMLU scores in Kannada speaking Down's syndrome and language age matched normal children. The objectives of the study were to explore the PMLU in typically developing Kannada speaking normal children as well as Down's syndrome children and to compare the phonological mean length of utterance (PMLU) scores across these two groups.

## **Material and Methods**

Two groups of Kannada speaking children were included in the study: Group 1 composed of normal children (n = 60), who passed the checklist for normal hearing, speech, language, social and cognitive development (chronological age 3-4 year) which matched the language age of Group 2. Group 2 comprised of children with Down's syndrome (n = 35), of chronological age 6-15 years with mild to moderate mental retardation and Expressive

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Language Age of 3-4 year (as per Assessment of Language Development by Lakkhana, Venkatesh & Bhat, 2008) were selected for the study. Children exhibiting associated problems (co- morbid disorder & sensory problems) were excluded from the study.

Kannada Articulation Test (Babu, Ratna & Betagiri, 1972) was administered. Picture naming task was considered for eliciting the response and the samples were recorded using a digital professional voice recorder (Sony Digital Editor 2.4, ID-P series). This data was collected as a part of the Master's dissertation (Archana, 2010) on phonological development in children with Down's syndrome, wherein, children were administered picture naming task of 108 stimulus words. From the 108 words, 25 words were selected randomly from each sample for the PMLU analysis.

### **Analysis**

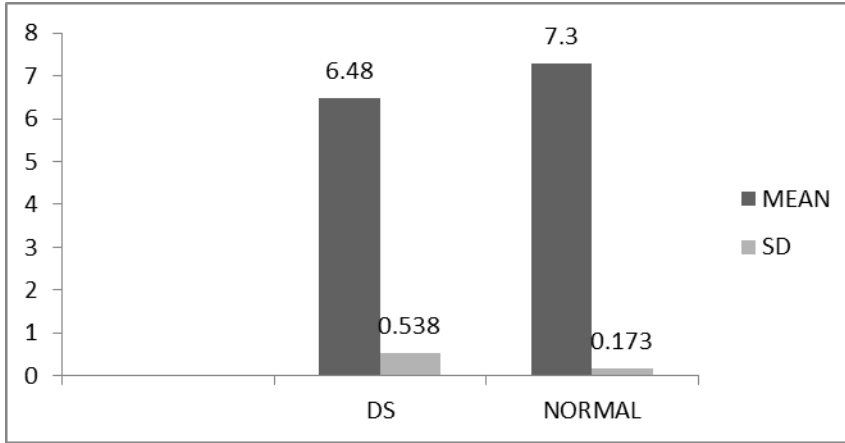
Children's production of utterance was narrow transcribed and the PMLU calculated (as per Ingram's rules, 2001) for each child. For each word, the number of segments (consonant and vowel) as produced by the child was counted and summed with the number of correct consonants in a word. The sum of each word in all the utterances of a single subject was summed and divided by the number of words produced by the child to obtain the PMLU. Obtained scores were analysed using SPSS 16.0 version and Independent t- test was applied on the data with p value kept at 0.05.

### **Results**

The objectives of the present study were to obtain phonological mean length of utterance scores in Down's syndrome and language age matched normal and to compare the PMLU scores between these two groups.

Samples of 35 children with Down's syndrome were considered, out of whom 5 samples were discarded due to them being highly unintelligible. The remaining 30 samples were considered for further analysis. In the normal group, all 60 samples were analyzed.

Graph 1: Showing mean and SD scores for Down's syndrome and normal children



MEASURE (PMLU)	DOWN'S SYNDROME	NORMAL
MEAN	6.48	7.3
SD	0.538	0.173

**Table 1:** Mean & SD of PMLU scores in Group1 (DS children) & Group2 (normal children).

PMLU stages	No. of normal children	No. of Down's syndrome
I	0	0
II	0	0
III	0	1
IV	0	10
V	55	17
Above V	5	2

**Table 2:** Number of normal and Down's syndrome children corresponding to each PLMU stages

As shown in Table 1 and Graph 1 the mean values of PMLU were 6.48 and 7.3 (Confidence interval=0.67 -0.97) respectively in children with Down's syndrome and normals whereas their respective SD values were 0.534 and 0.173. There was a significant difference between Down's syndrome and normal children with respect to PMLU measures ( $p < 0.05$ )

As shown in Table 2 the number of normal children in PMLU stage V and above V were 55 and 5 respectively. As shown in Table 2, the number of Down's syndrome children in PMLU stage III, IV, V and Above V were 1, 10, 17 and 2 respectively.

## **Discussion**

The present study aimed at comparing PMLU scores between normal and Down's syndrome children and found statistically significant differences between the groups. It was also found that children with Down's syndrome scored consistently low compared to language age matched normal children. This can be attributed to factors such as cognition and intelligence along with defective anatomical profile (Miller & Leddy, 1998) which includes small oral cavity, hypotonia of oral muscles, fusion of lip muscles, extra lip musculature. Standard deviation values in Down syndrome are higher than in normals indicating greater variability in them.

PMLU scores obtained in the present study when compared with Ingram's (2001) PMLU revealed that normal children were found to be in the V and above stage whereas Down's syndrome came to levels of III, IV, V and above V. This again indicates higher variability in the Down's syndrome group and could be hypothesized that word correctness is indicative of a disordered rather than delayed. Radish et al (2009) reported PMLU scores of 7 to 9 for the 3-4 year normal Kannada speaking children group. Their scores were slightly different from that of the present study where PMLU scores of normal children were 7 to 8 with a mean of 7.3. This slight difference in scores can be attributed to variations in task, sample size and listener bias.

## **Conclusion**

From the present study, it can be concluded that there is a significant difference in PMLU stages & mean PMLU scores between normal and children with Down syndrome. Down's syndrome children had poorer PMLU scores compared to age matched normal children. Poorer scores in Down's syndrome group indicate that whole word complexity and correctness are reduced in Down's syndrome group than language age matched normal children. This significant difference between the groups indicates that PMLU could be a suitable method for assessment of phonology.

This further endorses that assessment of phonology not only should include the segmental analysis but also the analysis of whole word complexity. Henceforth, in addition to segmental measures, whole word measures should also be seen to provide better information on phonological development in both disordered and typically developing children population.

Focusing on both the aspects in intervention could improve the child's overall language ability with better speech intelligibility. However, further research is warranted to understand its usefulness in clinical use.

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