



DEVELOPMENTAL TRENDS OF FEW PHONOLOGICAL SKILLS IN ORIYA SPEAKING TYPICALLY DEVELOPING CHILDREN, CHILDREN WITH LEARNING DISABILITY AND CHILDREN WITH PHONOLOGICAL ERRORS

Linguistics

Venkat Raman Prusty*

Central Hospital, South Eastern Railways, Kolkata *Corresponding Author

Dr. Arun Banik

Ali Yavar Jung National Institute of Speech and Hearing Disability

ABSTRACT

Phonological skills development is one of the basic foundations before language mastery of a child. Preston and Edwards (2010), in their study on phonological skills and phonological errors in English speaking preschoolers, suggested that poorer phonological skills are associated with lower receptive vocabularies and more atypical sound errors. This study focused further on few phonological skills development in Oriya speaking typically developing children of 3-12 years age, compared to adults, children with Learning Disability of 7 to 12 years of age and a third group of children of 7 to 12 years of age with phonological errors (without any anatomical & physiological abnormalities in oral structures). The result from this part-pilot data was used to construct a screening test to assess phonological and morphological abilities in Oriya speaking children. The results of few sub tests are described in this paper, such as syllable segmentation, syllable deletion, identification of syllable, form a word (by adding & substitution of syllable). The results were analyzed based on gender, age group, for each task.

KEYWORDS

Phonological skills development, typically developing, Learning Disability, Phonological errors, Syllable segmentation, Syllable identification, Syllable addition and substitution.

INTRODUCTION:

The basic premise of a psycholinguistic perspective is that children's speech and literacy development is the product of an intact speech processing system comprising-

- Speech input processing (eg. auditory discrimination)
- Lexical representations (eg. Components of words are stored-semantic, phonological, motor, grammar and orthographic)
- Speech output processing (eg. programming and production of speech).

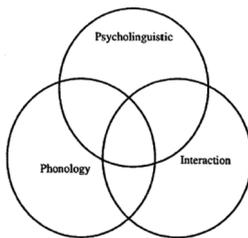


Figure-1. An integrated three-way approach to intervention for children with speech difficulties (from Pascoe, Stackhouse, & Wells, 2006).

Oriya language:

Oriya is an alphasyllabic language, one of the Indic group of the Indo-European family, branched off from Assamese-Bengali before Assamese and Bengali separated from each other (Pattanayak, 1966).

Phonology of Oriya:

Oriya language consists of 37 Consonants & 6 Vowels, 1 suprasegmental (nasalization).

The peculiar & unique nature of the language-

- A gap in the vowel system making it unique than any other language in the world.
- Special consonantal allophones
- Vowel ending system except for few borrowed or loan words and 2nd person familiar singular imperative person number suffix /phai/.
- No long vowels in the phonology, two graphemes for long vowels, but pronounced as short.
- Penultimate stress pattern of language.

Vowels-Table-1. Vowel system of Oriya.

Feature	Front	Central	Back
Close (High)	i		u
Half Close (High Mid)	e		o
Half Open (Low Mid)			ɔ
Open (Low)		a	

Nasalization:

Nasalization is the only suprasegmental phoneme found in Oriya.

Eg. /bOi~si/- flute /pe~kaLi/- trumpet /pui~ba/- to get warm form fire /mua~/ - fried rice cake /a~/ - opening mouth

Vowel Length:

Vowel length is not considered phonemic although there are a number of instances where the vowels are phonetically long and may also contrast with their short counterparts. (/pila/- child, /pi:la/- he drank as in morpheme boundaries). The length of the vowel, however, is non-constrastive and non-phonemic. Words ending in vowels are long in imperative words ([dho:] - wash). In compared to all these types of varying vowel length, there is a geminate vowel construction without any morphophonemic boundaries, purely based on phonological rules common to any language, but specifically observed in vowel ending language like Oriya. ([gote-eka]). There are two graphemes for long forms of vowels /i/ & /u/. However, the phonemic use of these graphemes is limited to academic functions such as recitation etc.

Syllable structure:

Mahapatra (1995) states that the possible syllable structures can be derived from the formula. Co-3 V Co-2, Co-3 means that maximum three consonant elements can occur in place of one syllable. Most of the Oriya syllables are open though some closed syllables are also found. Each syllable whether open or closed has peak, which is a vowel. It may or may not have an onset. In case of closed syllables a coda is found (G.N.Dash, 1982).

Table-2. Word structure in Oriya Language.

syllables – open		
With a single phoneme	V	/a/- come
With two phoneme	CV	/ja/- go
With three phonemes	CCCV	/stri/ -wife
Closed- types		
Two phonemes	VC	/as/- come
Three phonemes	CVC, VCC	/bas/- sit, /AMk/-draw
Four phonemes	CCVC, CVCC	/sTil/- steel, / batn/- button

There are more types of word structures-

CCVCC - /trunk/, CCVCCV -/spasta/- clear and other longer structures as well like CVCCVCVCV-/pustikara/

OBJECTIVES, HYPOTHESIS:

The study aims at comparing the developmental trend of few phonological skills in typically developing children, children with Learning disability, and those with phonological errors. It also aims at understanding underlying processing at different stages and possible abnormality causing errors in output.

Hypotheses:

- There is no difference in performing the tasks for phonological skills in different age groups of children which can show developmental trend.

- There is no difference in performance between the typically developing children and children with Learning Disability and children with Phonological errors.

METHODOLOGY:

Subjects:

Table-3. Subjects in each group with description.

	Typically Developing Children								Adult	Children with Learning Disability				Children with Phonological Errors			
	Gr I-A	Gr I-B	Gr I-C	Gr I-D	Gr I-E	Gr I-F	Gr I-G	Gr I-H		Gr III-E	Gr III-F	Gr III-G	Gr III-H	Gr IV-E	Gr IV-F	Gr IV-G	Gr IV-H
Age range	3-3;11	4-4;11	5-5;11	6-6;11	7-7;11	8-8;11	9-10;6	10;6-12	25-35	7-7;11	8-8;11	9-10;6	10;6-12	7-7;11	8-8;11	9-10;6	10;6-12
N	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

All participants met the following inclusionary criteria- Oriya as their primary language (Limited Exposure to other languages) No prior enrollment in speech or language intervention (Group III & IV-only diagnosed)

were required to form a new word by adding a given phoneme in the initial position.

Normal hearing status

No history of neurological or psychological disorder
No oromotor problems as per an informal oral motor examination.
For Group I & II only- typical development of speech and language.
For Group I & IV- Satisfactory academic performance on the basis of teachers' reports.

Demonstration for adding a syllable- bATA- way, add 'ka' and say it again- kabATA

Demonstration for phoneme substitution- bATA- way. Now say it again but instead of /a/say /i/- bATi- marble.

Screening:

All participants were screened for typical language development, appropriate cognitive skills and intelligence. A screening questionnaire for speech, language and listening skills consisting of 'yes/ no', close ended questions was given to teachers and caretakers to confirm the absence of any deficits in speech, language and listening skills among children.

Stimuli:

Initially, a word list was prepared by selecting words from standard textbooks of Oriya, (Chhabila abhidhaana, Sarala oriya abhidhaan, Taruna shabda kosha, Grantha Mandir, Word book-Direct approach series, Books for children published). The frequency of occurrence of phonemes and syllables were taken into consideration (from, Phonemic and morphophonemic frequency count in Oriya by Ahsok R. Kelkar). The initial word list was checked for familiarity by Speech Language Pathologists, Teachers, Linguists and other adults to make a final list for the main study. Few of the words from the list was used for this pilot study.

Sub-tests for assessing phonological skills:

Syllable segmentation: (Dodd, Holm, Oerlemans, & McCormick, 1996; Robertson, & Salter, 2007) – It is the person's ability to segment the word into its constituent syllables.

Stimuli were different for each task. There was one or two demonstration item for each task, for the children to understand the task specific instructions.

Demonstration items: bATA- way, Topi- cap

Syllable deletion: (Rosner, 1999; Robertson, & Salter, 2007) – This task requires deletion of specific syllable from the word.

Demonstration item: dokAna- shop, now say it without /do/
Identification of syllable: Two types of tasks were included.

Procedure:

The children and adults were instructed and tested individually, for each task. Demonstration items were presented, preceding the target stimuli.

- a) Syllable oddity: In this task, children were presented with four words, among which three words began with the same syllable (initial) and one word differed in the initial syllable. Children were required to identify the word with the odd initial syllable.

For all sub tests, the productions of the participants were recorded using a tape recorder. Each correct response was given score '1 point', error response or no response were given 'zero'.

Demonstration item: In the given set of words *gapa- story, gacha- tree, gadha- donkey* and *bAla- hair*, three words began with the syllable /ga/. The word *bAla* was the odd word as it began with the syllable /bA/. Child was required to identify the word *bAla*.

Statistical Analysis:

The data from Group II (adults) was taken to see when the typically developing children –Group I, achieve adult like skills. Performance by Group I (age matched) is compared to performance of Group III & IV. Means of the scores for different tasks were compared across the sub groups of Group I and that of adult group using post hoc analysis, which would suggest age group which scored similar to the adult group. ANOVA, post-hoc analysis and descriptive statistics were used to analyze the findings.

- b) In this task, children were asked to identify the syllables in initial, medial or final position of a given word. The words were presented verbally by the experimenter. No distractor was used.

Demonstration items: Initial (e.g., *dAnta- tooth* - /dA/), medial (e.g., *kodALa- spade*) and final (e.g., *gaDA- mace*).

RESULTS & DISCUSSION:

Form a word (by adding & substituting a syllable)- Phoneme addition task was developed based on the task by Robertson and Salter (2007).

In this task; the experimenter presented a word verbally and children

Syllable segmentation:

It involved segmenting words of various lengths into its constituent syllables. Participants were required to clap once for each syllable of the word. The words were presented randomly but scored according to sub groups carrying words of varying difficulty level.

Table-4. Performance of children in all sub groups of Group I, Group II (Adults), Means and SDs, for Syllable segmentation.

Syl. Seg.	I-A	I-B	I-C	I-D	I-E	I-F	I-G	I-H	Gr II
Bisyllabic	9.5 (0.707)	9.8 (0.421)	10 (0)	10 (0)	10 (0)	10 (0)	10 (0)	10 (0)	10 (0)
Tri-syllabic	4 (0.816)	4.1 (0.56)	4.8 (0.42)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)
Bisyllabic cluster	3.5 (0.707)	3.6 (0.699)	4.6 (0.699)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)
Trisyllabic cluster	3.2 (0.788)	3.3 (0.674)	3.5 (0.527)	3.9 (0.316)	4.4 (0.516)	5 (0)	5 (0)	5 (0)	5 (0)

4-syllabic	2.4 (0.843)	2.7 (0.674)	3.4 (0.516)	4.4 (0.516)	4.6 (0.516)	5 (0)	5 (0)	5 (0)	5 (0)
4-syllabic cluster	2 (0.666)	2.2 (0.699)	2.4 (0.516)	3.5 (0.527)	4.2 (0.632)	4.5 (0.527)	4.8 (0.421)	5 (0)	5 (0)

Kruskal-Wallis One-way ANOVA & Post hoc comparisons among the groups and that of adults with Mann-Whitney rank sum test showed that the performance of children in younger groups were differed significantly from the performance of children in older groups. The difference among the groups also varied with difficulty levels. Children achieved adult like scores at different ages for different difficulties. For bisyllabic words, children of 4 years could score as much as adults, and for the 4 syllable clusters, it was only when they

were at least 9 years 6 months old.

When compared with the scores obtained from the children with Learning disability (Group III) and that of children with phonological errors (Group IV), it was seen that for difficult stimuli, children in both the groups scored significantly poorer than typically developing children. However, for simple bisyllabic and trisyllabic scores were same for the older group, and similar for younger group with varying standard deviation for Group III & IV.

Table-5. Means & SDs of typically developing children, children with Learning disability and phonological errors, for syllable segmentation task.

Syl. Seg.	I-E	III-E	IV-E	I-F	III-F	IV-F	I-G	III-G	IV-G	I-H	III-H	IV-H
Bisyllabic	10 (0)	10 (0)	10 (0)	10 (0)								
Tri-syllabic	5 (0)	4.8 (0.421)	4.7 (0.483)	5 (0)	4.9 (0.316)	4.9 (0.316)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)
Bisyllabic cluster	5 (0)	4.1 (0.737)	4 (0.816)	5 (0)	4.3 (0.483)	4.4 (0.699)	5 (0)	4.5 (0.527)	4.6 (0.516)	5 (0)	5 (0)	5 (0)
Trisyllabic cluster	4.4 (0.516)	4 (0.666)	4 (0.816)	5 (0)	4.1 (0.567)	4.2 (0.918)	5 (0)	4.4 (0.516)	4.5 (0.527)	5 (0)	4.9 (0.316)	4.9 (0.316)
4-syllabic	4.6 (0.516)	3.4 (0.699)	3.2 (0.788)	5 (0)	3.6 (0.516)	3.5 (0.707)	5 (0)	4 (0.666)	3.8 (0.632)	5 (0)	4.2 (0.632)	4 (0.666)
4-syllabic cluster	4.2 (0.632)	3.4 (0.699)	3.3 (0.674)	4.5 (0.527)	3.4 (0.516)	3.5 (0.707)	4.8 (0.421)	4 (0.816)	3.7 (0.674)	5 (0)	4.2 (0.632)	4 (0.666)

The few errors made by children in very young groups might be due to occasional failure to clap for syllables in a word. When asked to say it orally, they could say number of claps intended. Therefore, the classic method of clapping for each syllable should be modified into some new method.

Syllable deletion:

Table-6. The performance of children in all sub groups of Group I and Group II (Adults), Means and SDs, on syllable deletion.

	I-A	I-B	I-C	I-D	I-E	I-F	I-G	I-H	Gr II
Mean	3.3	4.4	4.9	5	5	5	5	5	5
SD	0.483	0.699	0.316	0	0	0	0	0	0

Table-7. Means & SDs of typically developing children, children with Learning Disability, and children with phonological errors, Means and SDs, on syllable deletion.

	I-E	III-E	IV-E	I-F	III-F	IV-F	I-G	III-G	IV-G	I-H	III-H	IV-H
Mean	5	4.4	4.8	5	4.4	4.9	5	4.5	4.9	5	4.6	4.9
SD	0	0.516	0.421	0	0.516	0.316	0	0.527	0.316	0	0.516	0.316

One way ANOVA on ranks resulted in significant difference in performance of children among the sub groups of Group I and that of adults in syllable deletion task ($p = .000$). Post hoc comparisons showed that the performance of children reached adult form at 6 years of age. The performance of Group III children varied and was lower than scores of children with Phonological errors, Group IV scores were not different statistically than Group I scores. The findings may suggest children with phonological errors in this study had an intact

Table-11. Means & SDs of typically developing children, children with Learning Disability, and children with phonological errors, on Syllable Identification at three positions.

	I-E	III-E	IV-E	I-F	III-F	IV-F	I-G	III-G	IV-G	I-H	III-H	IV-H
Initial	5 (0)	3.9 (0.737)	4.2 (0.788)	5 (0)	4.2 (0.632)	4.5 (0.707)	5 (0)	4.5 (0.527)	4.7 (0.483)	5 (0)	4.6 (0.516)	4.8 (0.421)
Medial	4.9 (0.316)	3.4 (0.516)	4 (0.527)	5 (0)	3.8 (0.788)	4.1 (0.737)	5 (0)	4.1 (0.737)	4.4 (0.516)	5 (0)	4.5 (0.527)	4.6 (0.516)
Final	5 (0)	3.8 (0.788)	4.2 (0.918)	5 (0)	4.1 (0.875)	4.4 (0.699)	5 (0)	4.3 (0.674)	4.7 (0.483)	5 (0)	4.6 (0.516)	4.7 (0.483)

From two-way ANOVA, comparing all the tasks in phoneme Identification, it was clearly seen that scores for all the tasks differed significantly, the difference in task also differed for different groups. It could be observed that the syllable oddity task was easier for all the children in all groups when compared to identification of position of syllables. In identification of position, it was clearly seen that children regardless of typically developing or with Learning disability or with phonological errors, it was better scores for syllable identification

processing at this level.

Identification of syllable:

a) Syllable oddity:

Table-8. The performance of children in all sub groups of Group I and Group II (Adults), Means and SDs on syllable Odity.

	I-A	I-B	I-C	I-D	I-E	I-F	I-G	I-H	Gr II
Mean	3.3	4.3	4.8	5	5	5	5	5	5
SD	0.483	0.674	0.421	0	0	0	0	0	0

Table-9. Means & SDs of typically developing children, children with Learning Disability, and children with phonological errors, on Syllable oddity.

	I-E	III-E	IV-E	I-F	III-F	IV-F	I-G	III-G	IV-G	I-H	III-H	IV-H
Mean	5	4.7	4.8	5	4.7	4.8	5	4.8	4.8	5	4.8	4.8
SD	0	0.674	0.421	0	0.674	0.421	0	0.421	0.421	0	0.421	0.421

b) Syllable Identification: (Initial, medial & Final)

Table-10. The performance of children in all sub groups of Group I and Group II (Adults), on Syllable Identification at three positions.

	I-A	I-B	I-C	I-D	I-E	I-F	I-G	I-H	Gr II
Initial	3.2 (0.421)	4.2 (0.632)	4.6 (0.516)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)
Medial	3 (0.666)	3.6 (0.699)	4.4 (0.843)	4.9 (0.316)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)
Final	3.1 (0.567)	3.9 (0.737)	4.6 (0.699)	4.8 (0.421)	5 (0)	5 (0)	5 (0)	5 (0)	5 (0)

when syllable occurred at initial and final position, than in medial position.

On comparison among the groups, the Learning disability groups scored the lowest in each sub group, however, there was significant difference in scores of children with phonological errors and typically developing children. Children at even 12 years of age could not score as that of typically developing children.

Form a word (by adding a syllable and Syllable substitution)**Table-12. The performance of children in all sub groups of Group I and Group II (Adults), Means and SDs, on Form a word task including both addition and substitution of syllable.**

	I-A	I-B	I-C	I-D	I-E	I-F	I-G	I-H	Gr II
Addition	0.9 (0.567)	1.3 (0.483)	1.8 (0.632)	3.4 (0.843)	3.8 (0.788)	4.9 (0.316)	4.9 (0.316)	5 (0)	5 (0)
Substitution	0.7 (0.483)	1.2 (0.421)	1.7 (0.674)	3 (0.942)	3.5 (0.849)	4.8 (0.421)	4.9 (0.361)	5 (0)	5 (0)

Table-13. Means & SDs of typically developing children, children with Learning Disability, and children with phonological errors, on Form a word task including both addition and substitution of syllable.

	I-E	III-E	IV-E	I-F	III-F	IV-F	I-G	III-G	IV-G	I-H	III-H	IV-H
Addition	3.8 (0.788)	2.1 (0.567)	3.1 (0.875)	4.9 (0.316)	2.2 (0.632)	3.7 (0.674)	4.9 (0.316)	2.4 (0.516)	3.7 (0.674)	5 (0)	2.9 (0.737)	3.7 (0.823)
Substitution	3.5 (0.849)	1.8 (0.632)	2.8 (0.918)	4.8 (0.421)	2 (0.666)	3.4 (0.843)	4.9 (0.316)	2.2 (0.632)	3.6 (0.966)	5 (0)	2.7 (0.674)	3.8 (0.788)

From two-way ANOVA, comparing all the tasks in 'forming a word', it was clearly seen that scores for all the tasks differed significantly, the difference in task also differed for different groups. The typically developing children though showed a drastic increase in score at the age of 6 years, they reached adult type responses after the age of 9 years. There was no significant difference in scores for any tasks. However, means of the scores for each age group was higher for deletion, followed by addition and then substitution task. Children at the age of 8 years score almost equally on all the sub tasks, indicating different time line for developing the skills. When compared the mean scores of typically developing children with other two children groups, it was evident that the mean scores were significantly higher in typically developing children in all age matched sub groups. There was a significant difference in scores for children with phonological errors when compared to learning disability. In both the groups, children could not score better even at the age of 12 years. The children with Learning disability, with very low score clearly proved their deficiency in the higher phonological skills.

Summary:

Speech & Language intervention is subject based, dependent on language exposure and requires standard testing system in the same language. This study gives a base to formulate a standard screening test to assess phonological and morphological skills in Oriya speaking individuals.

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