

Original Research Article

Comparison of Phonological Processing Abilities in Children with Learning Disability in Hindi and English Language: A Pilot Study

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ABSTRACT

Phonological processing skills play a key role in the acquisition of reading and spelling in alphabetic languages. Phonological processing refers to activities that require sensitivity to, or manipulation of, the sounds in words. Prior research has identified three interrelated clusters of phonological processing abilities; phonological awareness, phonological access to lexical store, and phonological memory (Wagner & Torgesen, 1987). These three phonological processes are related strongly to subsequent word decoding abilities, and, in the absence of intervention, they are highly stable individual differences from the late preschool period forward (Lonigan, Burgess & Anthony, 2000). Result indicates that there is significant difference in the mean score obtained by typically developing children and children with learning disability in Hindi specially Rhyming Production, Manipulation Phoneme Deletion, Manipulation Phoneme Substitution, Manipulation Phoneme Addition, Blending, Segmenting, Forward Digit Recall, Backward Digit Recall, Forward word Recall and Backward Word Recall. Further, it has also be reflected that there is significance difference in English in Rhyming Production, Alliteration Production, Manipulation Final sound Identification, Manipulation Phoneme Deletion, Manipulation Phoneme Substitution, Manipulation Phoneme Addition, Blending, Segmenting, Words Vs Orthographically correct Non-words, Words Vs Homophonous Non words, Backward Digit Recall and Forward word Recall.

Key words: Phonological Processing, Phonological Awareness, Phonological recoding, Phonological Memory, Learning Disability.

INTRODUCTION

Phonological awareness refers to the ability to detect or manipulate the sound structure of oral language. Research with a variety of populations and using diverse methods has converged on the finding that phonological awareness plays a key role in the normal acquisition of reading (Adams, 1990; Byrne & Fielding-Barnsley, 1991; Stanovich, 1992; Wagner & Torgesen, 1987). Children who are better at detecting and manipulating syllables, rhymes, or phonemes are quicker to learn to read, and

this relation is present even after variability in reading skills due to factors such as IQ, receptive vocabulary, memory skills, and social class in partialled out (Bryant, MacLean, Bradley, & Crossland, 1990; Wagner & Torgesen, 1987; Wagner et al., 1994).

Phonological access to lexical store ("lexical access") refers to the efficiency of retrieval of phonological codes from permanent memory (Wagner & Torgesen, 1987). In other children, lexical access typically is measured as the rate at which an

array of letters, digits, or colors can be named. Lexical access measures are significant predictors of growth in decoding skills in school-age children (Wagner et al., 1997) and appear to have an independent effect on growth in decoding above that of phonological sensitivity and phonological memory, consistent with the double-deficit hypothesis (Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004). As a phonological skill, efficiency in lexical access might influence the ease with which a child can retrieve the phonological information associated with letters, word segments, and whole words and increase the likelihood and he or she can use phonological information in decoding.

Phonological memory refers to the coding of information in a sound-based representation system for temporary storage (Baddeley, 1986) and is typically measured by immediate recall of verbally presented material (repetition of non words or digits). Efficient phonological memory might enable children to maintain an accurate representation of the phonemes associated with the letters of a word while decoding and, therefore, devote more cognitive resources to decoding and comprehension processes. Results from studies by Wagner et al., (1997) indicate that phonological memory is a significant correlate of growth in decoding skills but that it does not provide unique predictive variance to growth in decoding beyond that provided by phonological awareness for school-age children.

It is now well established that phonological skills have an important connection with reading and spelling development. Phonological tasks such as recognizing rhyme and alliteration in spoken words, orally deleting phonemes, judging whether two words begin or end with the same sound, and tapping out the number of sounds in the spoken words, all show a significant relationship to reading (Treiman & Zukowski, 1991).

The term 'learning difficulty' has been applied to those children who have

significantly greater difficulty in learning than the majority of their age. They are unable to make use of the education facilities available in schools. Person with learning difficulties can have problems with many every day learning activities. Reading, spelling and numeracy skills are basic to school achievement. Children with specific learning difficulties may show problems in all three areas or only one or two. Reading and spelling are closely associated skills and it is rare to find reading-disabled children who are not at all handicapped in spelling. Most children are likely to be behind in all three areas, although there are occasional reports of subgroups showing rather more of one or the other deficit.

There is unanimous agreement among educationist today, that the quality of primary education in almost all parts in India is poor. Even though children progress in primary grades due to the non-detention policy, in practice, little learning is taking place. Children are pushed from one grade to the next, irrespective of how much they are learning. Also due to varied education systems adapted by different schools in our country there is no uniformity in the classroom instructions and the protocols for assessment. Findings from a number of studies reveal that class III to IV children are not able to read and write even simple sentences. Thus something is surely wrong with the learning outcomes of children (Ramachandran, Jandhyala, & Saihjee, 2003).

Also there is no definitive answer to the question of when a child qualifies for a diagnosis of learning difficulties. But it is obviously better to step in with intervention strategies during the early grades rather than wait until the child is almost on the point of completing primary school with a non-functional level of academic skills, before deciding that there is a real problem. Unfortunately this latter scenario is a common one; many children in schools can be left to struggle for years with their learning difficulties neglected. But one could wait until the child has settled at

school, has completed two or three years of instruction and then assess and treat specific difficulties identified in children who are falling behind the rest of the class. Much of the evidence at this stage leans towards the etiological importance of early behavioral problems in the development of learning difficulties. As it is in the early years, up to class IV, that efforts at diagnosing learning difficulties and addressing remedial work in language and mathematics must be directed. A variety of methods may be used including oral & written tests and observations.

The study of learning disabilities in India has been steadily gaining momentum in the last 1 or 2 decades largely due to the efforts of parents and concerned professionals. However over the last decade or so, there has been an increase in identification of the individuals and children with LD and a consequent demand for services. So far this process is mainly confined to children enrolled in urban schools (Karanth, 2003).

Children, who come from diverse linguistic and socioeconomic background, enrol in English medium schools with varying degree of exposure to English in preschool years and with different degrees of literacy support at home, ranging from zero (illiterate parents) to fairly high degree of preschool exposure and family literacy support. The child without exposure and/or support not only has to cope with both the new language and literacy acquisition, but also to compete with his peers. The conditions in classrooms in even the best schools are far from ideal. More often than not, single teacher inadequately trained and equipped, has to handle between 50 and 100 students in a single classroom. Under these conditions, it would be surprising for the teachers to be able to identify and cater children with learning difficulties. With special education and rehabilitation, having gained recognition from the Government of India in the last decade of 20th century, the availability of professional services are nowhere near that required by a country of such dimensions. The plans for future ought

to include different levels of intervention. Primary prevention, which aims to reduce the number of new cases, is required to lessen the presence and influence of numerous risk factors known to contribute to LD. Measures of secondary prevention concern with reducing the number of identified cases by focusing more attention on children at higher risk of developing reading deficits but before they manifest serious long term deficits, should be initiated at primary school level. Tertiary management aims to ameliorate the complications associated with identifiable problems or conditions and calls for effort of skilled professional. More crucial however, is the medium of instruction. A perusal of Indian literature on this topic clearly indicates that any discussion of LD in this country is largely based on findings and observation of children studying in English medium schools. Diagnosis and remedial procedure seldom take into account the fact that the majority of children learn English as their second language and most of them come from non-English speaking background (Karanth, 2003).

NEED OF THE STUDY

Reading is a complex skill that the majority of us have learnt quite easily. Nevertheless, approximately 7-8% of the schools going children have LD of different types whose poor academic performance is mostly and traditionally has been attributed to their inattentiveness and lack of interest in studies. English (alphabetic) and any Indian language (semi syllabic) are distinct languages which are processed differently and hence same principles of understanding language processing and acquisition cannot account for both the languages. Therefore reading acquisition in alphabetic language systems is equivalent with the acquisition of the phoneme-grapheme correspondence (Landerl et al., 1994). Present understanding of the manifestation of LD is attributed to two major factors firstly a inherent weakness in the linguistic, especially the metalinguistic domain and the influence of the regularity of written language system.

These two areas need elaborate research especially in Indian languages and scripts. Identifying the weakness in metalinguistic aspects would promote focused intervention towards gearing up the language domain which would in turn aid acquisition of reading skill. Identifying the cognitive load put forth by English and Hindi (semi syllabic) would help in focusing therapeutic efforts to promote acquisition of specific skills in the two languages and in selecting a more appropriate script (when ever a choice of exemption has to be made like in children with LDs, cerebral palsy, hearing impaired) which provides minimal hindrance (is easy to process) towards acquiring literacy. It's important to recognize and capitalize on inherent strength of our script. Ironically when the child has a choice to make parents select English in place of an Indian language which is the mother tongue and could have been acquired with relative ease.

Aim:

The present study is cross linguistic study which specifically probes into the relative ease of processing phonology of two languages, Hindi and English by two groups of children, a group having LD and their age matched peers aged 8- 11 years.

Objectives of the study

1. To study phonological abilities in children with LD and their grade matched peers, for Hindi and English.
2. To identify the differences, if any in the phonological processing abilities in the two languages across the two group of participants.

METHODOLOGY

Participants

A total number of ten children in the age range of 8-11 years, Hindi as mother tongue and studying English since standard one were considered for the study. The participants were classified in two groups; Group 1-Five children diagnosed as Learning disabled and, Group 2-Five age match peers. Inclusion criteria:

Children aged 8-11 years attending standard 3-5 in regular school. Children who have been diagnosed as having learning disability by a Psychologist or a Neurologist or a Psychiatrist.

Children who have Hindi as mother tongue and studying English since standard I.

Children with no history of delayed motor milestone, neurological impairment, Mental retardation, epilepsy and no other primary diagnosis of Attention Deficit Hyperactive Disorders (ADHD), autism spectrum disorders or hearing impairment. Informed consent from the parents.

Tools:

1. Case history proforma was designed for the purpose of the study
2. Checklist in Hindi and English were developed for evaluation of phonological processing capabilities in consultation with Linguists.
3. Otoacoustic emission for hearing screening
4. Philips AQ6345 recorder for audio recording.

Tools and instruments

The study was carried out in following stages:

Stage1: Collections of guidelines to assess phonological processing skills in children aged 8-11 years were done.

A demographic data sheet was developed for this study and was used to collect demographic details of the children. Phonological processing skill consisted of: a) Phonological awareness b) phonological recoding in lexical access and c) short term verbal memory (Wagner and Torgesen, 1987). Phonological awareness skills comprised of: segmenting, blending, rhyming, alliteration, repetition and manipulation. Phonological recoding in lexical access consisted of discrimination of words and non words, orthographically correct nonword-word, homophonous nonword-word and automatized naming. And short term verbal memory consisted of series of words/digit recall.

Stage2: Preparation and validation of checklist in Hindi and English to assess phonological processing skills in children aged 8-11 years.

The tool was developed for the purpose of the study. Real words and pseudo words in this list was prepared from standard II National Council of Educational Research and Training (NCERT) text books.

Clinical Linguist verified the items based on the familiarity rating and phonotactic rule of constructing pseudo words. The items which were finally chosen were given for rating by three SLPs for validation. The final checklist was administered on 30 typically developing children and on 30 children with learning disabilities.

Stage3: Collection; scoring; tabulation and statistical analysis of the data were done.

Parental teachers consent was obtained before taking the data. Both the checklists were administered on the children in a quiet room with minimum amount of interfering noise. Two prior examples were given for each skill before eliciting the responses. It was ensured that each student has understood the task. A break of 10 minutes was provided after every 45 minutes whenever felt by the participant or the examiner. The entire test was audio recorded. Instructions for administering each part of the test were included on the record form. Testing duration was 10-15 minutes for each checklist.

Scoring was done after administration of the test. Each correct response was scored as 1 and incorrect response was scored as 0. The scores obtained by the participants were tabulated numerically. Both the checklists were administered sequentially. The scoring was done after the test was over and the results were tabulated. After scoring the audio record was heard by first Speech Language Pathologist (SLP) and then by another SLP and the scoring was rechecked for accuracy.

Under the phonological processing skills the maximum obtained score in English was compared to the maximum score in Hindi in both the groups and both the languages. Statistical analysis using SSPS (Statistical package for Social Science) version 18 software was carried out for the data. Descriptive statistical analysis was done which included mean and standard deviation of the scores obtained for both the groups and for both the languages. Independent sample t-test and paired sample t-test were carried out to obtain the results based on the performance on the phonics skills tasks for both the groups and both the languages.

RESULT

The mean score, standard deviation and level of significance of eighteen parameters of phonological processing abilities in English and Hindi in Children with Learning Disability and typically developing children have been detailed in Table-1.

Result indicates that there is significant difference in the mean score obtained by typically developing children and children with learning disability in Hindi specially Rhyming Production, Manipulation, Phoneme Deletion, Manipulation Phoneme Substitution, Manipulation Phoneme Addition, Blending, Segmenting, Forward Digit Recall, Backward Digit Recall, Forward word Recall and Backward Word Recall. Further, it has also been reflected that there is significant difference in English in Rhyming Production, Alliteration Production, Manipulation Final sound Identification, Manipulation Phoneme Deletion, Manipulation Phoneme Substitution, Manipulation Phoneme Addition, Blending, Segmenting, Words Vs Orthographically correct Non-words, Words Vs Homophonous Non words, Backward Digit Recall and Forward word Recall. Others parameters have not shown any significant difference.

Table 1: Mean, Standard Deviation and Level of Significance

S. N.	Parameters	Hindi				Level of Significance	English				Level of Significance
		TDC		CLD			TDC		CLD		
		Mean	SD	Mean	SD		Mean	SD	Mean	SD	
1	Repetition	10.00	.00	10.00	.00	1.00	10.00	.00	9.80	.44	.317
2	Rhyming Production	9.8	.44	7.20	1.09	.006	10.00	.00	8.00	1.58	.019
3	Rhyming Identification	9.8	.44	9.40	.89	.439	9.00	1.00	7.40	1.14	.055
4	Alliteration Production	10.00	.00	9.20	1.09	.134	10.00	.00	8.80	1.09	.017
5	Alliteration Identification	10.00	.00	9.20	1.09	.134	10.00	.00	8.40	2.07	.054
6	Manipulation Final sound Identification	10.00	.00	9.40	.54	.050	9.80	.44	7.80	.83	.009
7	Manipulation Phoneme Deletion	10.00	.00	7.80	1.64	.005	10.00	.00	8.00	1.00	.005
8	Manipulation Phoneme Substitution	10.00	.00	8.00	1.00	.005	10.00	.00	7.40	1.81	.005
9	Manipulation Phoneme Addition	10.00	.00	8.20	1.30	.005	10.00	.00	8.00	1.22	.005
10	Blending	10.00	.00	7.80	2.16	.005	9.60	.54	7.60	1.67	.022
11	Segmenting	9.8	.44	7.60	1.14	.009	9.80	.44	7.20	1.09	.006
12	Words Vs Orthographically correct Non-words	5.0	.00	4.40	.89	.136	5.00	.00	3.00	.00	.003
13	Words Vs Homophonous Non words	5.0	.00	4.60	.89	.317	4.60	.54	3.20	.44	.011
14	Random Automatized Naming	5.0	.00	5.00	.00	1.00	5.00	.00	5.00	.00	1.00
15	Forward Digit Recall	4.8	.44	3.00	.00	.014	5.00	.00	4.20	.83	.053
16	Backward Digit Recall	4.0	.70	2.20	1.09	.016	4.00	.00	2.40	.54	.005
17	Forward word Recall	4.6	.54	3.40	.54	.020	4.40	.54	3.00	1.00	.033
18	Backward Word Recall	3.8	.44	2.60	.54	.014	3.00	.00	2.40	.54	.050

TDD- Typically Developing Children, LD-Children with Learning Disability

DISCUSSION

Children with and without specific learning difficulties performed equivocally on the repetition tasks. In this task the participant had to repeat the words spoken by children. The nature of the task permitted the students to have an immediate access to the phonology of the word as it was given as a stimulus.

I am going to produce few words (E.g., "wonderful"). Listen to them carefully. Then repeat the words said by me. E.g., Say the word '.....' (stimulus word).

Ramus & Szenkovits (2008) observed that the phonological representation of children with dyslexia may be intact, and the phonological deficits surface only as a function of certain task requirement, notably short-term memory, conscious awareness and time constrains. Similar findings were reported by (Catts, 1989 and Snowling, 1996). Bishop (1997) reported that these deficits are restricted to memory of verbal material sparing the processing of nonverbal stimuli or environmental sounds. The involvement and effect of the short term verbal memory is

well reflected in the significantly poor scores of children with learning disabilities in items like forward digit recall, backward digit recall, forward word recall, backward word recall.

The subtest on rhyming (identification) and alliteration also had equivocal scores in both the languages for both the groups. This is owing to the lower perceptual demands placed upon the child. Hearing oral rhymes and alliteration is the first basic auditory perceptual skill that emerges by 4-5 years of age, demanding minimal processing requisite followed by hearing words in spoken sentences, hearing syllables in spoken words, skill to identify onset rhymes in words, and indentifying individual phonemes in words respectively (Applebee, 1978). However there was a significant difference between the scores of rhyming production, blending and segmenting the words between the two groups in both the languages. The three skills involve higher working memory demands. To produce a rhyme the child has to access the phonological units from the semantic long term memory deploy the

working memory to connect the onsets with the rhymes and then co-ordinate it with the oral articulators for production (Ronnberg et al, 2013). Similarly the children with LD scored significantly poorer in the subtests involving Words Vs Orthographically correct Non-words and Words Vs Homophonous Non words where the children had to Read the words or segments aloud. The process involves the metaphonological representations and exerts higher demands upon the working memory which are known to be poor in children with LD hence the scores are poorer. Manipulation Final sound Identification was equally scored by both the groups for Hindi because of the nature of basic grapheme units which represent syllables (sound units) for Hindi as compared to English which represents phonemes (sound units) in script. Identifying phonemes require a much higher auditory perceptual skill as compared to identifying syllables. Furthermore the English alphabets are opaque in nature and correspond to more than one phoneme. This puts forth a higher demand on the working memory leading to higher chances of errors and slower processing of the input.

All the other tasks involving operation at the level of phonemes like Manipulation Phoneme Deletion, Manipulation Phoneme Substitution, Manipulation, Phoneme Addition were scored significantly poor by the children with LD. The poor scores can be ascribed to the higher and fine grain auditory perceptual demand of the task along with the poor psycholinguistic processing skills in children having LD (Wolf, 2001; Smythe & Everatt, 2002; Trieman, 2006).

The semantic representations of children with LD are relatively intact (Boets, 2014) hence tasks of random automatized naming with the instructions

I am going name you a "lexical category (E.g., "Vehicle"). Take 30 seconds to think about it and then name as many items as possible within a minute. (E.g., car, taxi, bus, truck, cycle, etc). Now think about the names of '.....'(stimulus category)

could be successfully accomplish.

CONCLUSION

The present study provides an overview of Phonological Processing Abilities in Children with Learning Disability in Hindi and English Language. It may serve as a basis for developing assessment tool and intervention measures for children with learning disability.

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