



Original Article:

Traces of Sub-Lexical Dyslexia in a Semisyllabic Orthography

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Abstract: Dyslexia refers to the impairment of reading ability. Different forms of dyslexia have been reported in the literature. A classic type of dyslexia in which children exhibit poor reading of non-words compared to true words is known as phonological dyslexia. From the perspectives of the prevailing models of reading aloud, this deficit is attributed to an impaired 'sub-lexical' route. However, phonological dyslexia is presumed to be rare in semisyllabic scripts (e.g., Indian scripts) due to the inherent transparency of the written symbols of this orthography. However, the existence of this type of dyslexia has not been empirically tested in this orthography till date. In this context, we aimed to investigate the existence of the equivalent of phonological dyslexia (i.e., sub-lexical dyslexia) in Kannada language. We administered a battery of word and non-word reading tests in a group of children studying in Kannada medium schools from I to VII Grades. Our results are suggestive of the existence of sub-lexical dyslexia in semisyllabic orthography.

Key Words: Phonological skills, Sub-lexical dyslexia, Non-words, Kannada, Semisyllabic orthography..

Introduction:

Dyslexia refers to the impaired reading ability. It may be observed in children in their developmental years of learning.(1) The term dyslexia stems from the Greek root that broadly suggests 'language problems'. Dyslexia encompasses persistent and specific failure to master reading skills efficiently in spite of adequate intelligence, conventional instruction and sufficient socio-cultural opportunity.(2,3) The characteristic of this impairment is difficulty converting letters (graphemes) to sounds (phonemes). This difficulty marks reading errors that include addition, omission, substitution, reversal of sounds in words (e.g. reading 'gril' as 'girl'), as well as whole or partial substitutions of words (e.g. reading 'constitution' as 'construction'). The prevalence of dyslexia in the west has been reported to range from 3 to 10% (4) or as high as 20% (5) of the general population. In India the prevalence of dyslexia is reported to be 11.2% (6) to as much as 21.6%.(7)

In the light of dual route model of reading aloud,(8) it is possible to identify two clear subgroups(9) of children with

dyslexia. One group shows poor reading of 'irregular' words (e.g. 'pint') due to the damaged 'lexical route' termed as 'surface dyslexia'. The other group is poor at reading 'non-words' (readable letter combinations without any meaning e.g. 'nisdly') relative to 'true words' (i.e., real and meaningful letter combinations that include both regular and irregular words) owing to an impaired 'sub-lexical' route, known as phonological dyslexia. This may not be readily obvious in a transparent, semisyllabary such as Kannada because of the orthographic characteristics. The Kannada writing system, like many other Indian languages, employs a transparent/regular, semisyllabic orthography and majority of the primary graphic units of Kannada are syllables. English, on the other hand, is an alphabetic script that has distinct subunits corresponding to individual phonemes. Nag and Snowling(10) claim that the core deficit associated with reading difficulty in Kannada is in the phonological domain. Nevertheless, it appears to be more logical to label the equivalents of phonological dyslexia in Kannada as 'sub-lexical dyslexia' as the latter term aptly represents the underlying impaired processing route that converts written symbols to their corresponding sounds.

Although phonological dyslexia has received considerable attention in English, attempts to investigate the existence of this disorder (or its equivalent) in non-alphabetic scripts has been a gray area of research. Ideally, in regular writing systems like Kannada, children who have mastered akshara knowledge (e.g., intact letter identification and naming) should not have difficulty in reading non-words.(11) Yet, there are a couple of reports of phonological dyslexia in the transparent writing systems such as Japanese-Kana, Spanish and Danish. Unless children are specifically tested with non-words, which may not often happen in routine academic/clinical endeavors, the presence of phonological/sub-lexical dyslexia does not become apparent. This may be yet another reason for the relative paucity of reports on phonological dyslexia(11) especially in transparent orthographies. This warrants an investigation for the possibility of sub-lexical dyslexia in transparent, semisyllabic orthography of Kannada.

Aim and Objectives

The present study aimed at investigating the existence of sub-lexical dyslexia in Kannada, a semisyllabic orthography. The specific objective was to assess Kannada word and non-word reading skills of children from Grades I to VII.

Methods

Ethical approval and Consent

The study was carried out after receiving approval from the Institutional Ethics Committee. Subject information sheet was first presented to the head of each school and a written consent to carry-out the study was obtained. Assent from each child was also sought in written form before the commencement of testing.

Participants and setting

Ten children each from Grade I till VII were randomly recruited from a normal, Kannada medium school in Manipal (Udupi Taluk). Children with any obvious sensory, motor, intellectual deficits as observed by the first author or reported by the teachers were excluded from the study. Each child was individually tested in a quiet area within the school premises.

Materials

Children were tested for their accuracy of reading 30 words and 70 non-words in Kannada that were graded in difficulty based on the syllable lengths. Ten words each with two, three and four syllables were included to test word reading skills. Non-words were created by jumbling up Kannada akshara such that they formed novel combinations which are readable but do not possess meaning. There were 25 bi-syllabic non-words, 25 tri-syllabic non-words and 20 non-words with four syllables.

Stimulus Presentation

Stimuli were displayed on a laptop computer using Microsoft office power point 2007 presentation software for Windows 7. For the first five participants from each grade, words were presented initially followed by non-words and order was reversed for remaining five participants of the same grade (i.e. testing non-words first and then true words). Stimulus items were displayed one at a time in black colour on a white background, in the centre of a 14" HP colour screen of the laptop computer. Stimulus items were displayed in BRH Kannada font downloaded with Baraha - Indian Language Software(12) and the font size was 28. Participants were seated comfortably at around 50 cm away from the computer monitor.

Procedure

The participants were instructed to read each stimulus item aloud as accurately as possible. The stimulus remained on the screen until the participant responded or indicated that he/she "does not know" to read it. The responses were audio-recorded for later analysis.

Results and Discussion

Of the 70 children tested for the true word and non-word reading accuracy in Kannada, 18 children (25.71%) exhibited intact true word reading compared to non-word reading (see Table 1). Their non-word reading encompassed an obvious struggle compared to reading true words. Their non-word reading was largely characterized by deletion and substitution errors in deciphering vowel diacritics as well as akshara (the written orthographic units in semisyllabic orthography) clusters. Eight children read non-word as a true word (e.g., /a:mpa/ as /appa/). Such lexicalization errors are indicative of a deficient sub-lexical processing, leading to the sub-lexical dyslexia in Kannada. These errors were further obvious when length of the non-word was relatively longer. For example, more difficulty with reading non-word with four syllables (/nɛ:puseju/) compared to two (/ɖa:dʒɛ/), demonstrating a length effect for the graded stimulus.(13) Non-word reading of such children was characterized by the prolongation of reading and response times.

Further, six children in Grade I and five in Grade II also demonstrated considerable difficulty to read non-words and appeared to have sub-lexical dyslexia. However, they exhibited difficulty in reading true words and were found to have difficulties at the level of akshara identification. They could identify only a few familiar, frequent akshara in only in their inherent forms (E.g. able to read ಕೆ /Ka/ but not ಕೊ/Ko/).

They were quite naive to identify complex akshara with secondary markers and clusters constituting non-words and/or even true words. Therefore, these children could not be considered as having considerable difficulty to read only non-words compared to true words and hence the 'sub-lexical dyslexia'. This finding, in turn, advocates the importance of testing akshara knowledge while diagnosing sub-lexical dyslexia in children to ensure exclusive difficulty in reading non-words and with spared reading of true words.

Grade	No. of children with Sub-lexical dyslexia
III	5
IV	4
V	4
VI	4
VII	1
Total	18

As compared with the developmental pace documented in English, mastery of akshara knowledge and phoneme awareness in Kannada would emerge slowly.(14) It is critical that the reading performance of children in a specific grade be vetted against the reading skills of the majority of children from the same grade. On this note the current study calls for caution while extrapolating the findings as word and non-word reading analysis lacked such grade-wise measure. We further learnt that the formal assessment of akshara knowledge adds valuable information in labeling sub-lexical dyslexia and hence also acknowledge this limitation. Nevertheless, these children constitute a pilot evidence for the possible evidence of sub-lexical dyslexia in a semisyllabic orthography (i.e., Kannada), which has not been documented so far. Findings of the study also add that even a good reader of Kannada (as evidenced by adequate true word reading skills) can have phonological dyslexia unless tested directly using formal tests or at least gauged through their non-word reading skills as is the case in current study. In light of these evidences, it is imperative to track the phonological skills (syllabic awareness) of children learning to read Kannada.

Conclusion

This study provided evidence for the possible existence of sub-lexical dyslexia, a rare entity in semisyllabic orthography employed in most Indian languages. Future investigations shall focus on the existence of this disorder among children who have mastered complete akshara knowledge but yet exhibit relative difficulty in reading non-words compared to true words taking into consideration the grade-specific reading performance.

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