Role of Language in Multilingual Children with Suspected Dyslexia: A Pilot Study

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Abstract

Objective: To evaluate language profiles, Limited English Proficiency (LEP) and Primary Language Disorders (PLD) in multilingual suspected dyslexics.

Methods: A cross-sectional was conducted in a tertiary care hospital at Mumbai. The sample consisted of 46 participants aged 8-13 years. Performances of children were compared using the Linguistic Profile Test (LPT) and Dyslexia Assessment for Languages of India (DALI). Non-parametric statistics were carried out to assess the data.

Results: It was found that the dyslexics had affection in semantics and literacy domain, but LEP (Group 2) cases had poor phonological awareness and PLD (Group 3) group closely mimicked the SLD (Group 1) group in overall test performance. In linguistic profile test, delayed language was found in Group 3. This study highlights the fact that in order to characterize SLD in multilingual societies it is important to assess the child in all languages familiar to them.

Keywords: Language • Specific learning disorder • Multilingualism

Introduction

Children with Primary Language Disorders (PLD) such as receptive, expressive or both struggle with the form, content, or function of language [1], and their childhood prevalence is estimated at 4-13% [2,3]. They have a core deficit in areas of listening or speaking and have associated problems such as in reading, writing and social skills [4].

In multilingual countries like India with a complex language environment, assessment of language disorders is a formidable task. In a typical language developmental profile, children acquire Language Proficiency (LP) in their Native Language (L1=NL) first and later acquire skills in instructional languages such as english (L2=IL). Typically second language acquisition in English Language Learners (ELL) can take 5-7 years to develop proficiency [5]. The process for understanding whether a child's learning difficulties are due to the developmental pattern of english language acquisition, limited school opportunity rather than a Specific Learning Disorder (SLD) is not well understood by teachers. Children acquiring english often display similar characteristics to those with an SLD [6]. Therefore multilingual children with a suspicion of language disorders should be assessed for both languages, L1=NL and L2=IL. It is observed that first generation English Language Learners (ELL) often have poor proficiencies on L2 or Limited English Proficiency (LEP) [7].

Specific Learning Disorders (SLD) refers to a deficit in neural-processing of basic processes involved in understanding or using spoken or writing languages that manifests in in the skills of reading, writing, mathematical concepts, organization, long and short term memory [8]. Prevalence of SLD is 5-10% among children in India [8]. SLD encompasses dyslexia, dysgraphia and dyscalculia, with dyslexia (inability to skilled reading) being the most common prototype with a prevalence of 3% to 10% among Indian children. Inclusion of SLD in the RPWD Act 2016 has created awareness among parents, a felt need among teachers for the need of early identification of children at risk for SLD [9]. However in India, there is lack of standardized tests in regional languages to assess linguistic proficiency, language disorders and specific learning disorders.

Recent bilingual and bi-literacy research has shown the presence of a common neural circuitry in individuals speaking and reading two languages [10]. With this background a bi-literate child when assessed for dyslexia should be done in both L1 and L2 languages to gain critical information and for a comprehensive evaluation. The screening and assessment tests currently available are primarily curriculum based tools and in few regional languages. The National Brain Research Centre (NBRC) has developed a screening and assessment test DALI to identify reading issues among school children in English, Hindi, Kannada and Marathi languages [11]. The Dyslexia Assessment in Indian Languages (DALI) contains:

1. Screening tools for school teachers:
   a. Junior Screening Tool (JST)
   b. Middle Screening Tool (MST)
2. Assessment tests for psychologists and speech-language pathologists:
   a. Indian Language Assessment Battery (i-LAB)

A pilot study was undertaken to evaluate language profiles, associated co-morbidities in multilingual children with suspected dyslexia. The study aimed to examine specifically the role of co- morbidities such as limited English proficiency and language disorders in them.

Methods

Location of study

The study was conducted at the LD clinic in an academic tertiary hospital in Mumbai. The clinic is a certifying agency for children with specific learning disorders from multilingual backgrounds. The study was approved by the Institutional Ethics Committee (IEC) and informed consent, assent of participants was taken.

Participants

n=46 (41 cases and 5 controls) consecutive children aged 8 to 13 years studying in grades IV, V, VI, VII and VIII were enrolled in the study. All participants had Devanagari (Hindi/Marathi) as their native language, 24/46 and 22/46 had Hindi and Marathi as their native languages respectively (L=HL/ML). The instructional language of all 46 children was English (L2=IL). All participants were age, socioeconomic strata and language profiles matched.

Testing tools

The psychological, language and educational profiling for each participant was done by the use of following tests:

i. Malin's Intelligence Scale for Indian Children (MISIC) test was done on all participants to assess their intelligence quotient [12].

ii. Woodcock Johnson III Tests of Academic Achievement (WJACH-III) for assessment of Specific Learning Disorders (SLD). The WJACH-III

uses the discrepancy model for diagnosis i.e. discrepancy between intellectual potential and academic achievement of the child, standard scores<77+/-5 is significant, SD<-1.5 in broad clusters of reading, writing and maths areas is suggestive of SLD [13].

iii. Curriculum based educational assessments for individualized qualitative analysis-assessment for spoken language at home, school, social setting, listening comprehension, reading skills, handwriting legibility, usage of words, sentence construction, spelling, and organizational skills among others.

iv. Linguistic Profile Test (LPT) for profiling syntax, semantic and combined language ages in Hindi/Marathi. The LPT (Karanth, 1980) tests the child's receptive and expressive skills under 3 components- i) phonology ii) syntax iii) semantics. The interpretation is done as age-equivalent scores in receptive language, expressive language and combined language ages. A lag of 6-8 months between the chronological and language ages of child is considered as a significant delay in language skills typical of language disorders [14].

v. Extended-Receptive and Expressive Emergent Language Scales (E-REELS) for profiling receptive and expressive language ages. The E-REELS is a criterion referenced checklist which provides skills expected at each age range. The performance of the child's language skills are compared with age-equivalent norms and the receptive and expressive language ages obtained.

vi. Dyslexia Assessments in Languages of India (DALI) for screening and assessment of dyslexia.

vii. Dyslexia Assessment in Languages of India contains 4 domains of basic psychological processes

viii. Phonological Awareness (PA), Fluency (F), Rapid Naming (RN) and Literacy (L). It contains 9 sub-tests that assess reading skills for:

a) Classes I and II: (i) picture naming (ii) rhyme (iii) phoneme/syllable replacement (iv) semantic fluency (v) verbal fluency (vi) letter and word reading (vii) letter writing (viii) word spelling and (ix) listening comprehension.

b) Classes III, IV, V: All tests similar to classes I and II except for 2 subtests-letter and word reading changed to word reading and letter writing changed to non-word reading.

Each child was assessed in L1=NL and L2=IL, Standard Scores (SS) obtained, SS<2SD were diagnostic for 'at risk' for dyslexia. All the enrolled participants' demographic, socio-economic and emotional details were recorded in a predesigned proforma.

Statistics

The inferential statistical tests used for data analysis were parametric tests. One-way ANOVA was used on Woodcock Johnson III and on Dyslexia Assessment in Languages of India (DALI). Pearson correlation was used to determine whether there are any associations between the sub-tests/groups.

Results

The study participants had a mean age of 10.87 years SD 2.1 and M:F ratio of 3.5:1 and all participants belonged to lower middle socioeconomic class. All had Devanagari (Hindi/Marathi) as their native language, 24/46 and 22/46 had Hindi and Marathi as their native languages respectively (L1=HL/ML). The instructional language of all 46 children was English (L2=IL). The demographic details are represented in Table 1.

On MISIC the mean FSIQ in the study population was 96.9 and SD 6.57. While the mean and SD of VIQ of was 95.6 and 5.50 respectively. The mean and SD of PIQ was 98.8 and 9.26. These results depict Inter-group differences in their performance.

The WJACH-III SS clusters of BR, BWL were representative of the linguistic and BM the non-linguistic component. Based on clinical interview, CBA, WJ, E-REELS suspected dyslexics were stratified into 3 groups: Group1 (SLD)=12(26%), Group 2 (LEP)=22 (47.8%), Group 3 (PLD)=7(15%), Group 4 (C)=05(10.9%).

One-way ANOVA was not significant for all the subtests. In Group 1 BR, BWL and BM had a high statistical correlation ($p<0.05$) whereas in Group 2, BR correlated significantly with BWL ($p<0.05$) but not with BM and lastly in Group 3, BR correlated significantly with BM ($p<0.05$) but had no correlation with BWL. The correlations are represented in Table 2.

DALI was administered in English and Hindi/ Marathi on all suspected dyslexics enrolled in study. Based on test scores across 3 domains-phonological awareness, Semantic and Literacy; participants were classified into 4 groups: Group 1 (SLD)=12 (26%), Group 2 (LEP)=22(47.8%),

Group 3(PLD)=7(15%), Group 4 (C)=05(10.9%).

The 9 subtests on 4 domains in DALI in both L1 and L2 showed that the PA domain mean was lowest in Group 2(L1=81.02, L2=76.5) as compared to controls. In the Semantic domain Group 1 was lowest (L1=76.3, L2=77.2). In literacy domain, Group 1 had lowest mean as compared to the controls (L1=76.5, L2=76.3) except for reading comprehension. Comprehension was lowest in Group 2 when compared to the controls (L1=69, L2=69). The means and standard deviations in L1 and L2 across domains are represented in Table 3.

Qualitative inter-group sub domain comparisons revealed Group 1 cases had IL>NL, reading deficits in both languages suggested learning disorder with limited exposure to NL. Group 2 cases had IL<NL, deficits in IL was due to limited english language proficiency. Group 3 cases had IL=NL, poor scores in all academic and language domains was suggestive of language disorders.

The LPT was administered in Hindi/ Marathi on all enrolled study participants to confirm the diagnosis of primary language disorders. Group 3 all cases (n=7) had poor receptive and expressive language scores indicative of language disorder whereas all others i.e. n=39 participants had age-appropriate language skills. The LPT results are represented in Table 4.

Table 1: Demographic details of participants in the study (N=46).

Compounds	Group I specific learning disorders (n=12)	Group II specific learning disorders with limited english proficiency (n=22)	Group III specific learning disorders with language disorders (n=7)	Group IV non-dyslexic controls (n=5)
No. of Participants	12	22	7	5
Gender (Male)	12	13	4	3
Mean Age (yrs)	11.2	10.6	10.4	10.6
SES Status (Kuppuswamy scale)	Lower-middle	Lower-middle	Lower-middle	Lower-middle
L1=NL (Devanagari)	12	22	7	5
L2=IL (English)	12	22	7	5

L1=First acquired language L2=Second acquired language

NL=Native language (Devnagari script-Hindi/Marathi)

IL=Instructional Language

Group 1=Specific Learning Disorders (SLD)

Group 2=Specific learning disorders with Limited English Proficiency (LEP)

Group 3=Specific learning disorders with Language Disorders (PLD)

Group 4=Non-dyslexic Controls (C)

Table 2: Pearson correlation for broad clusters of BR, BWL and BM on Woodcock Johnson test of Academic Achievement (WJACH-III).

Groups	WJ ACH -III lusters	Broad Mathematics (BM)	Broad Reading (BR)	Broad Written Language (BWL)
Group 1	Broad Mathematics (BM)	1	0.913**	0.913**
	Broad Reading (BR)	0.913**	1	0.935**
	Broad Written Language (BWL)	0.913**	0.935**	1
Group 2	Broad Mathematics (BM)	1	0.389	0.542**
	Broad Reading (BR)	0.389	1	0.804**
	Broad Written Language (BWL)	0.542**	0.804**	1
Group 3	Broad Mathematics (BM)	1	0.801*	0.686
	Broad Reading (BR)	0.801*	1	0.654
	Broad Written Language (BWL)	0.686	0.654	1

**Correlation is significant at the 0.01 level (2-tailed)

Table 3: Mean, SD of DALI domains in L1 and L2 languages across all groups.

Domains of DALI	Instructional Language	Mean and SD	Group 1	Group 2	Group 3	Group 4
Phonological Awareness	English	Mean	80.8	76.5	83.1	93.5
		SD	15.4	15.1	20.4	18.3
	Hindi/Marathi	Mean	85.4	81	83.5	95.6
		SD	16	16.5	19.4	15.8
Semantics	English	Mean	77.2	78.7	78.8	94.5
		SD	8.2	11.3	12.8	12.4
	Hindi/Marathi	Mean	76.3	78.7	79.6	84.9
		SD	7.5	13.1	16.4	13.2
Literacy	English	Mean	76.3	77.9	80.6	91.8
		SD	7.7	12.9	16.6	10.6
	Hindi/Marathi	Mean	76.5	79.1	81.9	90.3
		SD	8.1	16.5	21.3	5.9

Table 4: Linguistic Profile Test (LPT) for diagnosis of co-morbid Language disorders in study population (n=46).

Compound	Group 1 (SLD)	Group 2 (SLD with LEP)	Group 3 (SLD with LD)	Group 4 (C)
Chronological Mean Age (years)	11.2	10.6	10.4	10.6
Mean Syntactic Ages	11.1	10.9	9.3	10.8
Mean Semantic Ages	11.1	10.9	8.9	10.9
Combined Language Ages	11.1	10.9	9	10.8
Indicative diagnosis	Appropriate language	Appropriate language	Delayed language*	Appropriate language

*LPT interpretation- ≥ 6-8 months lag between the chronological and language ages is considered as significant language delay indicative of a language disorder

Group 1- Specific Learning Disorders (SLD)

Group 2- Specific learning disorders with Limited English Proficiency (LEP)

Group 3- Specific learning disorders with Language Disorders (PLD)

Group 4- Neurotypical Controls (C)

Finally, 46 children with suspected dyslexia were diagnosed as 26% Specific Learning Disorders (SLD), 47.8% limited English Language Proficiency (LEP) and 15% Primary Language Disorder (PLD).

Discussion

India with multilingualism as its norm poses a unique and formidable challenge in assessment of specific learning disorders [15]. Western researchers have emphasized that language assessment is complex and teachers confuse language acquisition to SLD leading to over referrals [16].

Cormier et al. also observed that the selection and interpretation of individually administered tests to linguistically diverse children continues to be a major challenge but critical for valid assessments [17] .

In India too with its complex native and academic language environment testing for SLD is a minefield due to possible over diagnosis. Possible SLD mimics are environmental factors such as lack of opportunity, poor SES status, limited English Language Proficiency (LEP), and primary language disorders among others.

Our study was undertaken to evaluate the language profiles and co-morbidities in children with suspected dyslexia using qualitative and quantitative tests. The demographic profile was similar to previous studies with a mean age of 10.8 years [18], majority of participants being of male gender probably due to a known gender predilection or referral bias of SLD [19]. All participants had Devanagari (Hindi/Marathi) as native language and english as the instructional language at english medium schools. All participants belonged to lower middle SES strata, the association of low SES with learning disability is well known due to social and biological patterns [20].

All enrolled n=46 suspected dyslexics were subjected to standardized psycho-educational and qualitative CB assessments and stratified into 4 groups-Group 1-cases of specific learning disorders (SLD); Group 2-cases of learning disorders and Limited English Proficiency (LEP); Group 3-cases of learning disorders and Language Disorders (PLD) and Group 4-neurotypical Controls (C).

The 3 broad clusters of reading BR, written language BWL and mathematics BM on psycho-educational tests (WJ-III ACH) had significant correlation across Group 1 suggesting affection in reading, writing and maths. In Group 2 linguistic component of reading and writing skills correlated suggesting that poor readers had poor writing skills too as compared to math skills due to language proficiency issues. In Group 3 the reading skills correlated with maths skills and the writing skills were more affected in this group suggesting that in children with LD written expression and syntactical skills were more affected.

The linguistic demand of WJ-III ACH and its influence on the performance of participants is a complex issue. It is crucial to understand the quantified linguistic demand of test directions with information about how test

items interact with the receptive and expressive language abilities of the participants. On WJ-III ACH it may be possible to predict a trend towards probable language proficiency or language disorders as a primary diagnosis in suspected dyslexia [21].

On clinical interview, E-REELS, CBA, qualitative WJ-III ACH inputs we were able to predict a trend towards a definite specific learning disorder, probable limited language proficiency and possible language development diagnosis.

We surprisingly found that DALI-iLAB scores were better in L2 than L1 suggesting a strong impact of L2 in a structured school environment. The dyslexics had affection in semantics and literacy domain, LEP cases had poor phonological awareness and PLD group closely mimicked the SLD group in overall test performance. Sotelo et al. had suggested that language of a test is an important variable in the child's performance in non-native english learners [21]. We observed that DALI helps in identifying the deficits in L1 and L2 definitively in children with LEP however among the children with suspected primary language Linguistic Profile Test (LPT) was done.

The LPT confirmed the diagnosis of primary language disorder predominantly a mixed receptive expressive type in children with suspected dyslexia. Gottlieb et al had also observed that language assessments is complex and difficult and needs multiple tests both formal and informal for a comprehensive language age of the child [22]. Flanagan et al. had described that in addition to the language of test, receptive and expressive language age of the examinee is critical in precise interpretation of tests [23].

Therefore post informal, formal tests we were able to differentiate 46 children with suspected dyslexia into primary SLD, LEP and LD.

We conclude that the confusion between second language acquisition, its proficiency, primary language disorders and learning disorders is a ground reality and leads to over referrals and uncalled stress to children and parents. Language assessments in native language or L1 assessment helps to differentiate children with learning or primary language disorders from linguistic proficiency concerns and if ignored an important piece of puzzle gets missed.

India has more than 30 recognized languages and 50 dialects and language assessments is critical and should be an accepted criteria for identification in SLD. Schools and educators have a difficult time differentiating between second-language acquisition and a language-based learning disability. Monolingual teachers may not understand the significant impact of second language acquisition on student performance, and they may misinterpret current performance levels as representative of a student's ability to learn. Language assessments are complex; hence multiple tests in formal and informal setting are required for a comprehensive SLD assessment [24].

The results of this study clearly highlight the importance of assessing children's language in both the native language and the language of instruction, to arrive at an accurate diagnosis as well as designing an individualized intervention plan. The role of language in literacy cannot be understated, and must be thoroughly assessed to identify subtle language concerns which maybe otherwise overlooked.

Conclusion

The purpose of this study was to assess the language profiles and co-morbidities in multilingual children with suspected dyslexia. To analyses the data, inferential statistics used were one-way ANOVA and pearson correlation. The findings indicate a plethora of conclusions which are as following. Findings from this study show the following. Firstly, the confusion between second language acquisition, its proficiency, primary language disorders and learning disorders is a ground reality and leads to over referrals and uncalled stress to children and parents. Secondly, CBA cluster scores on WJ as well as its qualitative input are important to obtain a definitive diagnosis of Specific Learning Disorder (SLD) and raise a suspicion of possible SLD mimic.

Thirdly, DALI-iLAB assessments in two languages are able to differentiate children of Limited English Proficiency (LEP) from suspected dyslexics and red flags concerns for a learning or primary language disorder. Finally, clinical inputs from informal and formal language test such as LPT are diagnostic of a Primary Language Disorder (PLD) in children suspected of dyslexia. Thus, it can be concluded that for the assessment of dyslexia it also important to assess the language profiles and co-morbidities in multilingual children.

Future research should examine role of language in SLD assessments–language of the test (L1 and L2), RLA, ELA, language proficiency of the examinee and linguistic demands of tests. Also, the possibility of incorporating above aspects into a single comprehensive test battery, keeping in mind time and cost constraints without compromising on valid diagnosis.

Conflict of Interest

There is no conflict of interest.

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