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Development and Preliminary Validation of an Indigenous Scale for Assessment of Learning Disabilities

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The present study was conducted to develop a valid and reliable indigenous scale for assessment of Learning Disabilities. The study was divided in two phases. In Phase I a culturally relevant item pool was generated through a review of literature and conducting interviews with primary school teachers, parents of primary school children, school counselors and school psychologists, and existing scales of learning disabilities. In phase II, factor structure, internal consistency and validity of the scale were established. Exploratory Factor Analysis was applied to identify the factor structure of 99 items of Learning Disabilities Scale (LDS). Factorial validity was estimated on a sample of 300 students and four factors were explored. These four factors were spoken language, listening ability & cognition, reading ability, writing skill & spelling ability and numerical ability. These factors explained almost 59% of the total item variance and yielded a significant Cronbach alpha (α = .98). Criterion related construct validity was established by comparing normal children with those diagnosed with learning disabilities. The results showed that LDS significantly discriminates the mentioned groups which proved the validity of the scale. The study holds useful implications for teachers, parents, school counsellors and school psychologists.

Keywords: learning disabilities, assessment, reading ability, writing ability, numerical ability.

Learning disabilities is a broad term that refers to a varied group of disabilities manifested by important difficulties in the acquisition and use of listening, speaking, reading, writing, spelling, reasoning or mathematical abilities, processing and organizing information, which affects a person's academic performance (Hammill, Leigh, McNutt, & Larsen, 1988). Learning disabilities develop at a very young age and children from all racial, economic and cultural backgrounds are affected. Kamran (2011) asserted that 10 to 18 percent children in Pakistan's private schools are suffering from learning disabilities while in government schools, where attention towards children is already negligible, the situation is even worse (cf Siddique, 2011).

Health Grades (2011) concerning the occurrence rate for learning disabilities in the populations of various countries and regions show that Pakistan has an extrapolated occurrence of learning disabilities. According to this study, 16.91 % of children suffer from learning disabilities in Pakistan. Moreover, learning disabilities are one of the major causes of dropout in schools in addition to poor parental economic conditions, parental carelessness, grade retention, children's health issues and student-parents literacy (Farooq, 2013).

Learning disability includes a wide range of functions in which an individual faces difficulty learning in a typical manner, usually caused by an unknown factor or factors. Learning disabilities are diagnosed according to DSM-IV-TR (2000) when a person's achievement on individually administered, standardized tests in reading, mathematics, or written expression are considerably below that expected for age, schooling, and level of intelligence and the learning problems significantly interfere with academic achievement or activities of daily living that require reading, mathematical, or writing skills (DSM-IV-TR, 2000). Whereas learning disabilities are diagnosed differently in DSM-V (2013); with a significant consolidation of separate learning disabilities that had appeared in DSM-IV-TR (2000) reading disorder, mathematics disorder, and disorder of written expression into one diagnosis called 'specific learning disorder'. This new criteria of DSM-V (2013) for learning disabilities describe difficulties in learning and academic achievement (DSM-5, 2013). Specific learning disorder' is now a single, overall diagnosis, incorporating disabilities that influence academic achievement. Rather than limiting learning disorders to diagnoses particular to reading, mathematics, and written expression, the criteria describe inadequacies in general academic skills and provide detailed specifications for the areas of reading, mathematics, and written expression (American Psychiatric Association, 2013).

According to DSM-V (2013), 'Specific learning disorder' is diagnosed when there are specific insufficiencies in an individual's ability to recognize information precisely. This neurodevelopmental disorder manifests during the years of early schooling and is characterized by persistent and impairing difficulties with learning foundational academic skills in reading, writing, and/or math. Specific learning disorder may occur in individuals identified as intellectually gifted and become obvious only when the learning demands or assessment procedures (e.g., timed tests) pose barriers that cannot be overcome by their innate intelligence and compensatory strategies. For all individuals, specific learning disorder can produce lifelong damages in activities dependent on the skills, including occupational performances (DSM-V, 2013).

Waber (2005) has differentiated between learning disabilities and disorders by stating that; a *learning disorder* is a diagnostic and medical term, therefore, a *learning disability* can be considered as more of an official term employed by education departments that identify the line past which a school is required to make special measures to help a child learn. This means that a child might have a learning *disorder*, but if it is not shown to adequately impact his school performance, the school will not consider it to be a

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learning *disability*, and will not consider him eligible for special services (Waber, 2005).

Similarly, the main difference between learning disorders and learning disabilities was identified by Stock (2009) when he defined 'learning disorder' as a condition as it relates to the diagnostic criteria used in the Diagnostic and Statistical Manual. As a diagnostic guide for mental health disorders professionals all over the globe use DSM that influence learning. The three primary types of learning disorders are reading, writing and math disorders. Reading disorders are often referred to as dyslexia; math disorders as dyscalculia, and writing disorders as Dysgraphia (Stock, 2009).

The DSM-IV TR (2000) diagnostic criteria for learning disorders states: "Learning Disorders are diagnosed when the individual's achievement measured by individually administered standardized tests, is substantially below that expected for age, schooling, and level of intelligence. The learning problems significantly affect academic achievement or activities of daily life that require reading, mathematical, or writing skills" (DSM - IV TR, 2000, p.49). The psychologists who are evaluating the individuals are given freedom to determine if the level of disability caused by the condition exceeds the limits defined in the diagnostic criteria.

In Pakistan the criteria that most public schools use to identify if a student has a learning disability, and is therefore entitled for special education services, including an Individualized Education Plan (IEP) are as follows:

a. The student must possess average intelligence or higher.
b. A processing problem with receiving, processing, storing or producing of information that occurs across the lifespan.
c. Statistically significant difference of -1.75 or greater between the person's achievement and ability.
d. These significant disabilities cannot be mainly due to visual, hearing or physical damage, mental retardation, serious emotional disturbance, or to environmental, cultural or economic inadequacy (Stock, 2009).

In addition to the above discussion, it can be concluded that although learning disorders and learning disabilities are two different terms but are related to each other as in DSM-IV-TR (2000) *learning disabilities* are described under *learning disorders* and categorized as Reading Disorder, Mathematics Disorder, Disorder of Written Expression. While in DSM-5 (2013), *learning disabilities* are described under 'specific learning disorder'.

According to the National Joint Committee on Learning Disabilities (NJCLD) (1980), *Learning disability* is a condition in which a person has considerable learning difficulty in an academic area. These difficulties, however, are not enough to justify an official diagnosis. Therefore, *Learning disorder*, is an official clinical diagnosis, whereby the individual meets certain criteria, as determined by a clinical psychologist, psychiatrist etc. Keeping in mind the differences in degree, frequency, and intensity of reported symptoms and problems, the two are not to be confused.

There are several assessment tools available for the assessment of learning disabilities which have been developed all over the world. These include the *Learning Disabilities Diagnostic Inventory (LDDI)* by Hammill and Bryant (1998), *The Learning Disability Evaluation Scale* (LDES; McCarney, 1996), *The Woodcock-Johnson III Normative Update* (WJ-III NU; Woodcock, McGrew, Schrank, & Mather, 2001, 2007) was published in 2007; *Bangor Dyslexia Test* by Miles (1983); *Shortened Visuospatial Questionnaire (SVS)* by Fastame and Penna (2003); *Dyslexia Screening Test (DST)* (Fawcett and Nicolson, 1996) *and Dyslexia Screening Test - Junior (DST-J)* (Fawcett and Nicolson, 2004). However, these were all developed in the English language and were designed to be used in western cultures. They cannot be readily used in Pakistan because they need to be adapted according to the cultural norms and translated into Urdu.

Some scales have been adapted for use with Pakistani children for assessment of their learning disabilities over the last decade. These include ***Adaptation and Standardization of Bangor Dyslexia Test*** by Gul and Majeed (2004), ***Development of the scale to measure learning*** *disabilities* by Irshad (2005) and also developed *The Screening Checklist* by ***Special Education Department of Pakistan*** (2010). However, the psychometric properties of all above mentioned scales were not properly established and many limitations were observed. Therefore, there was a need to develop a standardized scale for use with Pakistani children. Moreover, there was a dire requirement to develop an indigenous scale to assess learning disabilities among children, which taps the existence of learning disabilities as they exist in our indigenous cultural context.

A major factor restricting estimation of the prevalence of disability in young children in developing countries is the limited availability of simple and efficient screening tools. Development of an indigenous learning disabilities scale (LDS) can help in assessing the prevalence of learning disabilities in different schools of Pakistan and it can also help different professionals to assess learning disabilities of children from age 6 to12 years. This early age is highly significant for identification and diagnosis of learning disabilities because these disabilities can be effectively managed at a tender age as compared to later ages.

The main objective of this study is to develop a standardized indigenous scale for the assessment of learning disabilities in primary school children of Pakistan.

Method

The study was divided into two parts; in part one an item pool was generated for Learning Disabilities Scale (LDS), this was piloted and the factor structure established. Part two concerned the validation of the new scale.

Part 1: Generation of Item Pool, determining Factor Structure and Internal Consistency of Learning Disabilities Scale (LDS)

This part comprised of two phases:

a.) Generation of item pool for development of indigenous scale of learning disabilities.
b.) Determining factor structure and internal consistency of newly developed Learning Disabilities Scale (LDS).

Phase 1: Generation of item pool for Learning Disabilities Scale (LDS)

Participants

The sample for generating item pool consisted of primary school teachers, parents of primary school children, school counsellors and school psychologists. The sample size was 30. The sample was obtained from both public and private schools of Lahore.

In the second step of phase I, ratings were taken from five experts in the field of Psychology. Among those three experts were PhD in

Psychology and two experts were practicing Clinical Psychologists. They were approached to evaluate the items regarding: Relevance to content, clarity of concept, comprehensibility & redundancy of items of LDS.

At the end of this phase a sample was selected for pilot testing. Pilot testing was done after taking expert ratings on LDS, the sample for pilot testing consisted of 20 children; 10 boys and 10 girls, where 10 children were from private schools and 10 children were from public sector schools of Lahore. The age range of the sample was from 6 to 12 years (M = 8.9, SD = 2.3). Moreover, the learning disabilities scale (LDS) was administered on the pilot sample to asses face validity and item appropriateness. Newly constructed **'**Learning Disabilities Scale' (LDS) was used as a tool of assessment of learning disabilities.

Procedure

In phase I of study, relevant domains of learning disabilities were selected on the basis of review of the relevant literature; selecting most frequently researched/ reported domains. Then, an item pool was generated by following rational reviewing and selecting items from previously developed scales of learning disabilities. In addition, diagnostic criteria for Learning disabilities in DSM-IV-TR (2000) and DSM-V (2013) were also reviewed.

Moreover, a sample was contacted and interviewed in order to generate culturally relevant domains of learning disabilities and culturally relevant items for the scale. In the first step of phase I, pool of 111 items was generated. These items were presented to the five experts for evaluation regarding relevance to content, clarity of concept, and comprehensibility & redundancy of items of LDS. Then pilot testing was conducted.

After pilot testing and expert ratings on learning disabilities scale (LDS), many items were eliminated from the scale due to overlapping, weak clarity of concept and redundancy. Few similar items were also collated. After pilot study and expert ratings, 99 items were selected out of 111 items for factor analysis.

Phase II: Factor Structure and Internal Consistency of Learning Disabilities Scale (LDS)

Participants

The sample comprised of 300 children both boys (*n* = 150) and girls (*n* =150) with an age between 6 to 12 years (M =8.9) were approached in private and public sector schools; using a purposive sampling strategy. Purposive sampling is a non-representative subset of larger population, and is designed to serve a very specific purpose or need. Thus purposive sampling was used in order to reach the primary goal of research which was to know the actual learning problems faced by Pakistani students in Primary schools. Descriptive of the sample are shown in Table 1.

Procedure

Permission was obtained from school authorities and parents before collecting data, after which the Learning Disabilities Scale (LDS) was presented to the class teachers of grade 1 to grade 5 to rate children of their respective grades. Teachers were asked to rate 10 students from their respective class, whereas the total number of students was approximately 30 in each class. During this process only those class teachers were approached who had been teaching these children for last six months. The teachers were asked to rate the students keeping in view their performance during the last six months in the classroom. Teachers did not appear to have any difficulty in rating children on LDS and they took approximately 15-20 minutes to fill one questionnaire.

Table 1
Descriptive for Sample A (N=300)

Variables	*f*	*%*	*M*	*SD*
Age			8.9	2.3
Gender				
Male	150	50		
Female	150	50		
Grade				
1st	41	13.7		
2nd	52	17.3		
3rd	44	14.7		
4th	58	19.3		
5th	47	15.7		
6th	58	19.3		
School Type				
Private	150	50		
Public	150	50		

Later on, the questionnaires were scored for the purpose of analysis. For the purpose of analysis SPSS 18 (PASW Statistics 18) was used, all questionnaires of LDS were entered in SPSS and then factor analysis and reliability analysis was run on SPSS 18 in order to assess the factor structure and internal consistency of the scale (LDS).

Part 2: Construct Validity of Learning Disabilities Scale (LDS)

This part of study included determining Construct Validity of Learning Disabilities Scale (LDS) using the method of contrasted groups. Anastasi (1997) defines construct validity as "The construct validity of a test is the extent to which the test may be said to measure a theoretical construct or trait".

Participants

The sample of this part consisted of 60 children; where 30 children were typical having no learning disability selected from private and public schools of Lahore and 30 children diagnosed with different types of learning disabilities were approached through Clinical Psychologists. Hence, diagnosis was done by the Clinical Psychologists. The age range of the sample was from 6 to 12 years (M =8.9, M= 8.6). Typical/normal children were those having excellent academic record (i.e. securing A Grade) in subjects of English and Mathematics during previous two quarters. This information was obtained by teachers and they helped to select children fulfilling the pre-set criteria. Purposive sampling strategy was used to select the sample. Descriptive of participants are shown in Table 2. Learning Disabilities Scale (LDS) was used as a tool of assessing learning disabilities.

Procedure

Permission was obtained from school authorities to collect data. Informed consent of teachers and parents was obtained for data

collection. The learning disabilities scale (LDS) was administered to teachers to rate normal children on LDS. Children diagnosed with learning disabilities were approached through Clinical Psychologists and their teachers were approached to get their rating of the child on LDS. Questionnaires were scored for the purpose of analysis. The scores of both normal children and children with learning disabilities were compared and analyzed. Independent Samples t-test was used to compare means of two groups.

Table 2
Descriptive for Sample B (N=60)

Variables	Children with Learning Disabilities N=30 *f (%)*	Children without Learning Disabilities N=30 *f (%)*
Age M (SD)	8.9 (1.2)	8.6 (1.6)
Gender		
Male	14 (46.7)	16 (53.3)
Female	16 (53.3)	14 (46.7)
Grade		
1st	1 (3.3)	5 (16.7)
2nd	9 (30.0)	10 (33.3)
3rd	11 (36.7)	7 (23.3)
4th	7 (23.3)	___
5th	2 (6.7)	8 (26.7)
School Type		
Private	30 (100.0)	19 (63.3)
Public	___	11 (36.7)

Results

Exploratory Factor Analysis

Exploratory Factor Analysis was used to identify the factor structure of 99 items of learning disabilities scale. As the factor analysis extraction technique Principle Component Analysis was performed using a Varimax Rotation on Learning Disability Scale. Varimax Rotation was performed to enhance the interpretability of the factor structure.

Moreover, sampling adequacy was assessed using Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity. Bartlett's Test of Sphericity is used to test whether the variables are uncorrelated (i.e an identity matrix). Bartlett's Test of Sphericity was significant (p<.001) which means that data is factorable. Furthermore, KMO also predicts if the data is suitable for factor analysis based on correlations and partial correlations (Kaiser, 1974). The value of KMO was .96 which shows that the sampling adequacy for factor analysis was excellent.

After examining the correlation matrix, it is indicated that a significant number of correlations for each item were greater than .30 (Child, 1979). Factor loadings on all items ranged from .32—.76. Moreover, the communalities for majority of the variables were also above .5. Therefore, all the variables were retained for the purpose of factor analysis (Field, 2009).

The Principle Component Analysis using Varimax rotation yielded 15 factor solution with Eigen value greater than 1 using Kaiser's criteria for factor retention. However, Kaiser's criteria has been criticised for extracting large number of factors. Therefore, based on theoretical underpinning, principle component analysis with varimax rotation was performed again using 7, 6, 5 and 4 factor solutions in order to reach most suitable factor solution. The 4 factor solution provided the simplest structure that best fit the data with minimum cross loading of items. Eigen values of factor 1, 2, 3 and 4 were 48.9, 4.7, 2.3 and 2.21 respectively and these 4 factors explained almost 59% of the total item variance.

The 1st factor explained 49.46 % of the variance, the 2nd factor explained 4.80% of the variance, the 3rd factor explained 2.39% of the variance and the 4th factor explained 2.24 % of the variance respectively. Thus the final 4 factor solution was retained for 99 items of LDS. The items loading on each factor were analysed in the light of theoretical model of learning disabilities. The items loading on similar factor appeared to be conceptually related, whereas items loading on separate factors appeared to be conceptually distinct from one another.

Factor 1 (Spoken Language, Listening Ability & Cognition)

Maximum number of items loaded on factor 1 (i.e 39 items) which included items related to spoken language, listening ability and cognition i.e. poor listening skill, poor in hearing sounds from environment, has poor speech, slow in retrieving words, speaking too fast, poor in staying on one thinking task at a time, poor in remembering sequences of events in daily routine, has difficulty in generating different ideas & has difficulty in recognizing similarities and differences etc. Thus the factor was named as "Spoken Language, Listening Ability & Cognition". All 39 items loaded highly on factor 1with no cross loadings at 0.3 and above on any other factor.

Factor 2 (Reading Ability)

Minimum number of items (i.e. 14 items) loaded on factor 2; all of which were measuring reading ability. Thus the factor 2 was labelled as "Reading Ability". These 14 items loaded highly on factor 2 with no cross loadings at 0.3 and above on any other factor.

Factor 3 (Writing Skill & Spelling Ability)

After factor 1 maximum number of items (i.e., 29 items) loaded on factor 3. All the items loaded on factor 3 appeared to measure writing skill and spelling ability. Thus the factor 3 was labelled as "Writing Skill & Spelling Ability". On this factor 23 items out of 29 items loaded significantly with no cross loadings at 0.3 and above on any other factor. However 6 items out of 29 (e.g., 27, 36, 39, 41, 42 & 43) loaded at 0.3 and above on more than one factors. For example, item 27, 42 & 43 loaded on both factor 2 and 3, item 36 loaded both on 1 & 3, item 39 & 41 loaded on factor1, 2 & 3 simultaneously. After careful examination these items were placed in the factor to which they appeared theoretically related to (i.e., factor 3).

Factor 4 (Numerical Ability)

17 items loaded on factor 4 which appeared to measure numerical ability, thus the factor 4 was labelled as "Numerical Ability". 15 items out of 17 loaded highly on factor 4 with no cross loadings at .30 and above on any other factor. However, 2 items out of 17 had a loading of .30 and above on more than one factors. For example, item 83 loaded on factor 1, 3 & 4 simultaneously and item 84 loaded on both factor 1 & factor 4.Again after careful consideration of the items item 83& 84 were placed in the factor to which they appeared to be conceptually related i.e. factor 4.

Table 3
Factor loadings of 99 items of Learning Disabilities Scale (LDS) on four factor solution obtained through varimax rotation.

		Factors			
		I	II	III	IV
Sr. No	Item no.	Spoken Language, Listening Ability & Cognition	Reading Ability	Writing Skill & Spelling Ability	Numerical Ability
1	Leaves out/ skips sounds or words when speaking.	.759			
2	Has slow speech.	.735			
3	Slow in retrieving words.	.722			
4	Problem in delivering oral commands	.696			
5	Difficulty in differentiating sounds from immediate environment.	.691			
6	Speaking too fast	.69			
7	Difficulty in understanding and concentrating on directions and commands	.686			
8	Poor in retrieving appropriate words, e.g., asks for a marker when wanting a pencil.	.666			
9	Unable to complete sentences while speaking	.661			
10	Has poor speech.	.66			
11	Substitutes, adds and rearranging sounds or words when speaking.	.656			
12	Poor in hearing sounds from environment.	.638			
13	Has difficulty in engaging in activities that require listening e.g., games in which receives oral directions.	.624			
14	Poor in carrying out conversations with others	.617			
15	Unable to concentrate on simple nouns and confuses them (e.g., "cat" for "tat" and "dog" for "bog").	.617			
16	Poor in pronouncing words or sounds when speaking	.613			
17	Unable to use appropriate grammar while speaking	.605			
18	Has difficulty in fluent speaking.	.598			
19	Has difficulty in recognizing similarities and differences	.597			
20	Poor listening skill	.59			
21	Difficulty in understanding rapidly spoken words and sentences	.584			
22	Unable to follow multiple directions	.583			
23	Problem in understanding the speech of others	.583			
24	Poor in staying on one thinking task at a time	.582			
25	Has difficulty in generating different ideas.	.58			
26	Having difficulty in categorizing information	.579			
27	Poor in remembering sequences of events in daily routine	.579			
28	Has difficulty in recognizing the words that are beginning and ending with similar sounds.	.558			
29	Has difficulty in recognizing the words that are beginning and ending with different sounds.	.556			
30	Has difficulty in demonstration logical thinking (e.g., making decisions and solving problems)	.551			
31	Difficult to comprehend the spoken language, but can read it easily.	.55			
32	Has difficulty in understanding spatial relationships, e.g. over & under, above & below, right or left etc.	.537			
33	Has difficulty in moving from one idea to another.	.527			
34	Poor in remembering two or three step directions	.526			
35	Has difficulty in remembering information received visually	.524			
36	Demands for repeating the directions	.497			
37	Lack of concentration	.495			
38	Difficulty in understanding the long/complex words	.476			
39	Has difficulty in remembering auditory information.	.369			

40	Reading is too much slow.	.753		
41	Omits letters/ words when reading	.74		
42	Unable to reproduce the material, which has been read	.735		
43	Has limited vocabulary	.718		
44	Poor in oral reading	.712		
45	Poor vocabulary of words and letters	.699		
46	Miss out words, lines and sentences while reading	.689		
47	Makes mistakes while reading unfamiliar words	.667		
48	Has difficulty to read independently.	.665		
49	Unable to recognize words/letters	.639		
50	Reverses different sounds, letters and words while reading (e.g. "pat" instead of "tap")	.629		
51	Poor in silent reading	.613		
52	Difficulty in reading similar letters accurately (e.g., b and d, p and q)	.581		
53	Confuses in reading the words which appear similar (e.g., "mat" for "map").	.579		
54	Slow in writing.		.717	
55	Poor paragraph organization		.678	
56	Poor in spelling		.659	
57	Multiple spelling errors		.654	
58	Skips letters and words while writing		0.643	
59	Difficulty in learning spelling in English and Urdu		0.638	
60	Poor hand writing.		0.635	
61	Difficulty in producing accurate spelling		0.628	
62	Poor in following grammatical rules		0.585	
63	Omits and adds letters in spelling.		0.574	
64	Poor formation of sentences		0.571	
65	Unable to memorize words, letters, and sentences, which have been written		0.53	
66	Difficulty in writing complex sentences		0.488	
67	Unable to write independently		.48	
68	Unable to memorize letters in spelling		.467	
69	Writes in mirror image (reverses similar letters and numbers when writing e.g., b for d, p for q and 9 for 6 or vice versa)		.466	
70	Unable to copy words, letters, sentences and numbers from a textbook		.462	
71	Has difficulty in spelling complex/long words		.461	
72	Adds and omits words in sentences		.445	
73	Poor in using punctuation while writing		.436	
74	Misspells words badly and change the sense of words.		.417	
75	Has difficulty in spelling unfamiliar words.		.412	
76	Poor in rearranging the letters in spelling		.405	
77	Fails to write in complete sentences		.398	
78	Unable to write in available space		.391	
79	Has difficulty in spelling with phonics (unable to spell the words the way they sound).		.367	
80	Fails to reproduce spelling in different contexts (e.g., does not spell words correctly in dictation but does spell them correctly while writing them in sentences)		.367	
81	Poor in using word endings correctly when spelling (e.g., ed, ing, er and ly etc)		.362	
82	Poor in sequencing the spelling e.g., "aeting" for "eating"		.354	
83	Has difficulty in remembering to add in “carried” numbers			.727
84	Has difficulty in memorizing the mathematical facts and figures			.683
85	Difficulty in copying numbers or figures correctively			.681
86	Poor in using columns when working with math problems			.651
87	Difficulty in counting objects			.635
88	Has difficulty in understanding common mathematical signs e.g. + and - etc.			.603

89	Has difficulty in clustering objects into groups.				.587
90	Difficulty in understanding or naming mathematical terms, operations and concepts				.587
91	Has difficulty in following sequences of mathematical steps.				.576
92	Has difficulty in counting numbers on fingers.				.536
93	Has difficulty in solving mathematical questions independently.				.514
94	Difficulty in learning and reproducing multiplication tables				.513
95	Poor in solving calculations related to multiplications and divisions.				.471
96	Has difficulty in switching from one math operation to another e.g., problem in starting with addition and then changing to subtraction.				.453
97	Has difficulty in remembering to add in "carried" numbers.				.373
98	Has difficulty in remembering digits and numbers.				.434
99	Poor in solving math problems				.325
Eigen Values		48.97	4.75	2.36	2.21
Percentages of Variance		49.46	4.80	2.39	2.24
Cumulative Percentages		49.46	54.26	56.65	58.89
Kaiser-Meyer-Olkin Measure of Sampling Adequacy				0.96	
Bartlett's Test of sphericity, Approx.Chi-Square				31028.33***	

****P<.001*

The final 4-factor solution and the loadings of items on each factor are presented in Table 3 (see Table 3).

The final 4-factor solution and the number of items included in each factor is given in Table 4 (see Table 4).

Table 4
Final items included in each factor

Factor no	Factor label	Items
1	Spoken Language, Listening Ability & Cognition	44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82.
2	Reading Ability	1,2,3,4,5,6,7,8,9,10,11,12,13,14.
3	Writing Skill & Spelling Ability	15,16,17,18,19,20,21,22,23,245,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43.
4	Numerical Ability	83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99.

Thus after factor analysis using varimax rotation method the final Learning Disabilities Scale (LDS) consisted of 99 items emerged with four well-defined factors.

Reliability Analysis

In order to determine the internal consistency of the scale reliability analysis using Cronbach's Alpha coefficient was employed to assess the reliability of the total scale and the subscales of LDS. The reliability of the total scale was .98, which is considered excellent as per the ranges given by DeVellis (1991). He recommends an alpha below .60 is as unacceptable; .60—.65 undesirable; .65—.70 minimally acceptable; .70—.80 respectable; .80—.90 very good; and if much above .90 excellent. Moreover, according to DeVellis (1991) scales that will be used for diagnostic, employment, academic placement, or other important purposes should have higher reliabilities, in the .90s. Furthermore, test length also factors into the reliability estimate. Simply, longer tests yield higher estimates of reliability (Crocket & Algina, 1986; Mehrens & Lehman, 1991; Gregory, 1992).

Reliability of LDS subscales; spoken language, listening ability & cognition; reading ability; writing skill & spelling ability and numerical ability using Cronbach's Alpha coefficient was .97, .92, .97 & .95 respectively. The results of reliability analysis are presented in Table 5 (see Table 5).

Table 5
Reliability Coefficients of Total and Subscales of LDS (N= 300)

Name of scale	Number of items	Alpha coefficients
Spoken Language, Listening Ability & Cognition	39	.97
Reading Ability	14	.92
Writing Skill & Spelling Ability	29	.97
Numerical Ability	17	.95
Total LDS	99	.98

Item Total Correlation of the LDS Scale (N=300)

The 99 items Learning Disabilities Scale (LDS) was subjected to Item total correlation analysis. Item total correlation ranged from .47 to .77 and was found to be significant. The criteria for the retention of the items was that each item correlation with the total score should be .30 and above. All 99 items correlated significantly with the total score and thus were retained in the final version of the scale LDS. The result is presented in the Table 6 (see Table 6).

Item Scale Correlation of the Learning Disabilities Scale (LDS)

The 99 items Learning Disabilities Scale was subjected to Item scale correlation analysis. Item scale correlation ranged from .57 to .85 and was found to be significant. The criteria for the retention of the items was that each item correlation with the total score should be .30 and above. All 99 items correlated significantly with the total score of their respective subscales and thus were retained in the final version of the scale LDS.

Table 6
Item Total Correlation of the Learning Disabilities Scale LDS (N=300)

Item no	Correlation with Total Score	Item no	Correlation with Total Score
1	.67***	51	.72***
2	.71***	52	.66***
3	.73***	53	.71***
4	.73***	54	.67***
5	.63***	55	.69***
6	.71***	56	.75***
7	.71***	57	.73***
8	.73***	58	.62***
9	.67***	59	.71***
10	.64***	60	.75***
11	.62***	61	.68***
12	.69***	62	.73***
13	.63***	63	.68***
14	.65***	64	.75***
15	.68***	65	.70***
16	.74***	66	.76***
17	.75***	67	.67***
18	.73***	68	.74***
19	.71***	69	.70***
20	.70***	70	.72***
21	.69***	71	.75***
22	.66***	72	.75***
23	.72***	73	.72***
24	.70***	74	.69***
25	.64***	75	.63***
26	.69***	76	.67***
27	.66***	77	.65***
28	.76***	78	.72***
29	.72***	79	.75***
30	.71***	80	.76***
31	.73***	81	.72***
32	.65***	82	.75***
33	.69***	83	.69***
34	.68***	84	.76***
35	.40***	85	.76***
36	.66***	86	.75***
37	.72***	87	.68***
38	.77***	88	.74***
39	.73***	89	.70***
40	.71***	90	.72***
41	.68***	91	.67***
42	.64***	92	.69***
43	.73***	93	.67***
44	.72***	94	.69***
45	.72***	95	.73***
46	.69***	96	.70***
47	.72***	97	.60***
48	.68***	98	.47***
49	.71***	99	.70***
50	.69***		

****p<.001*

Correlations of the Subscales of Learning Disabilities Scale (LDS) with the Total score of LDS

Inter correlations among four subscales and correlation between score on each subscale and total score on LDS was calculated using Pearson Product Moment Correlation. Results showed that all the subscales were significantly and positively correlated with one another and with total score of LDS. The inter correlations among four subscales though significant ($p < .001$) were smaller as compared to each subscale's correlation with the total score on LDS . This shows that the four subscales represent slightly distinct aspects of the Learning Disabilities Scale (LDS).

Construct validity of Learning Disabilities Scale (LDS)

Construct validity can be evaluated by different means. One method for calculating construct validity is by correlating the newly developed scale with already developed scales of constructs that are similar or opposite to the construct under investigation (i.e. by calculating discriminant and convergent validity). Another method of calculating construct validity is by comparing contrasted groups on the scale also known as known groups validation method. Known group validation method typically involves demonstrating that the scale can differentiate between members of different groups (DeVellis, 1991).

In this research contrasted groups method was used to assess the construct validity of the Learning Disabilities Scale (LDS). Since the scale assesses the presence of the learning disabilities; the scale was administered on a group of normal children and children with learning disabilities (i.e. contrasted groups). It was hypothesized that children with learning disabilities would score high on LDS as compared to the normal children. In order to test this hypothesis Independent Sample *t* test was employed to assess whether LDS score of children with learning disabilities is significantly high as compared to the score of normal children.

Moreover, the reliability analysis for the Learning Disabilities Scale (LDS) was also computed for the current sample. Results are presented in Table 7 (see Table 7).

Cronbach's Alpha coefficient was used to assess the internal consistency of the Learning Disabilities Scale (LDS) for the current sample. The results are presented in Table 7 (see Table 7).

Independent sample *t* - test was employed to test the hypothesis that children with learning disabilities would score significantly higher on the Learning Disabilities Scale as compared to the normal children. The results are presented in Table 8 (see Table 8).

Children with learning disabilities (M=213.80, SD= 23.81) scored significantly higher on the Learning Disabilities Scale (LDS) as compared to normal children (M=129.63, SD=30.27), results are significant $t\ (58) = 11.97$, $p<.001$. Moreover, Children with learning disabilities also scored significantly higher on four subscales of the LDS (M=80.30, SD= 12.28); (M= 29.83, SD=6.64); (M=66.60, SD=9.09) and (M=37.06, SD=5.86) as compared to normal children (M=52.93, SD= 10.63); (M=16.60, SD=4.39); (M=37.60, SD=11.69) and (M=22.50, SD=6.19) respectively. Consequently, results of four subscales are also significant $t\ (58) = 9.22$, $p<.001$; $t\ (50.02) = 9.09$, $p<.001$; $t\ (58) = 10.72$, $p<.001$ and $t\ (58) = 9.35$, $p<.001$ respectively.

Thus it is concluded that Learning Disabilities Scale (LDS) is a valid scale for the assessment of learning disabilities among primary school children as the score of children with learning disabilities is significantly high as compared to the score of normal children.

Table 7
Mean, standard deviation and Alpha coefficient of the Learning Disabilities Scale (LDS) (N=60)

Scale (LDS) Subscales	No. of Items	*M*	*SD*	α
Learning Disabilities Scale (LDS)	99	171.72	50.30	.98
Spoken Language, Listening Ability & Cognition	39	66.61	17.89	.96
Reading Ability	14	23.21	8.70	.96
Writing Skill & Spelling Ability	29	52.10	17.93	.97
Numerical Ability	17	29.78	9.46	.94

Table 8
Independent samples t test comparing scores of normal children and children with learning disabilities on LDS (N=60)

Variable	Normal Children		Children with Learning Disabilities		*t (58)*	*P cohen's d*
	M	*SD*	*M*	*SD*		
Learning Disabilities Scale (LDS)	129.63	30.27	213.80	23.81	11.97(58)	<.001 3.14
Spoken Language, Listening Ability & Cognition	52.93	10.63	80.30	12.28	9.22(58)	<.001 2.42
Reading Ability	16.60	4.39	29.83	6.64	9.09(50.02)	<.001 2.56
Writing Skill & Spelling Ability	37.60	11.69	66.60	9.09	10.72(58)	<.001 2.81
Numerical Ability	22.50	6.19	37.06	5.86	9.35(58)	<.001 2.45

Discussion

The present study yielded an indigenous multidimensional measure of learning disabilities for primary school children. Learning disabilities are one of the most rapidly growing health issues among primary school children of Pakistan. According to Sidiqque (2011), in Pakistan 10 to 18 % of students of private schools are suffering from learning disabilities but in public sector schools of Pakistan the situation is even worse where attention towards the children is already trifling (Sidiqque, 2011).

Thus, above mentioned studies show, learning disabilities is one of the most critical difficulties faced by primary school children of Pakistan and there is a vibrant cultural variation in the concept of learning disabilities in Pakistan and among other countries of world. Most of the children of Pakistan speak and understand Urdu more clearly as compared to other languages especially English language. Urdu is the national language of Pakistan and is frequently used in everyday life. However, most of the children have to learn English language in order to study different courses in their schools. Most of the Pakistani children are facing bilingual dilemma that lies in their cultural context. Therefore, sometimes difficulty in learning English is misinterpreted as learning disability.

However, a large number of scales for measuring learning disabilities have been developed and being used all over the world to measure learning disabilities among children. Nevertheless, content of these scales is culturally different from the culture of Pakistan, thus it is hard to assess learning disabilities among children of Pakistan with all these foreign measures due to cultural variation. Among the available scales of learning disabilities, unfortunately there isn't a single reliable and valid assessment scale developed and published according to Pakistani cultural context. Moreover, few scales for learning disabilities have been developed in Pakistan but their validity and internal consistency is questionable. Therefore, there was a dire need to develop an indigenous scale for learning disabilities with high validity and reliability containing elaborated items based on all cultural aspects of Pakistani children. The current study was an effort to develop a valid indigenous scale of learning disabilities. Thus the present research is based on development of an indigenous scale for learning disabilities focusing on every possible dimension of learning disabilities faced by primary school children of Pakistan. In this study a principle component analysis was applied to 99-item scale of learning disabilities scale (LDS) to determine the factor structure of the feature of learning disabilities in Pakistani cultural context.

The inter-correlation matrix among 99 items of LDS was factor analysed and a principle component solution was obtained. The items loading on similar factor appeared to be conceptually related, whereas items loading on separate factors appeared to be conceptually distinct from one another.

In order to determine the internal consistency of the scale reliability analysis using Cronbach's Alpha coefficient was employed to assess the reliability of the total scale and the subscales of learning disabilities scale (LDS).

The 99 items Learning Disabilities Scale (LDS) was then subjected to Item total correlation analysis. Item total correlation ranged from .47 to .77 and was found to be significant. All 99 items correlated significantly with the total score and thus were taken in the final version of the scale LDS.

The current study not only presents information about the relationship between the 4 subscales of LDS, but also provides the facts about the strength of the findings from factor analysis that learning disabilities is multidimensional. Moreover, factor structure of the scale LDS provides four main dimensions of learning disabilities in the form of 4 factor solution and thus formulated 4 subscales of LDS; Spoken Language, Listening Ability & Cognition; Reading Ability; Writing Skill & Spelling Ability and Numerical Ability. These 4 subscales are also supported by the theoretical model of learning disabilities as there is a strong relationship between spoken language, listening ability and cognitive abilities. Many research studies support the relationship of Spoken language, Listening ability and Cognitions. On the same ground, Sypher, Bostrom, & Seibert (1989) conducted a research study on listening, communication abilities, and success at work: according to this study many researchers have argued that listening is mostly significant in all types of organizations and institutions

and this study examined a strong relationship between listening, communication related abilities, employee level, and upward mobility of employee. The results showed significant positive relationships between listening and other social cognitive abilities and communication's abilities. Furthermore, Gordon (2007) also found in his research study on children with learning disabilities, that for most children with LD, listening is really the first entry point into language the foundation of learning and of cognitive development.

Moreover, third subscale of LDS is Writing Skill & Spelling Ability according to 4-factor solution, thus the relationship between these two abilities i.e. writing and spelling also supported by different research studies. Similarly, MacArthur (2009) found a significant relationship between writing and spelling abilities. He conducted a research study on learning disabilities-writing disabilities and found that students with learning disabilities contain: less knowledge about writing, less skill with language, considerable difficulties with spelling and handwriting and less effective tactics for writing. Subsequently, their compositions are shorter, less organized and coherent, more marked by errors in spelling and grammar, and lower in overall quality.

Construct validity of the scale was determined by using the method of contrasted groups. Construct validity can also be evaluated by different means. In this study contrasted groups method was used to assess the construct validity of the Learning Disabilities Scale (LDS). Since the scale assesses the presence of the learning disabilities; the scale was administered on a group of normal children and children with learning disabilities (i.e. contrasted groups). It was hypothesized that children with learning disabilities would score higher on LDS as compared to the normal children. In order to test this hypothesis Independent Sample t test was employed to assess whether LDS score of children with learning disabilities is significantly high as compared to the score of normal children.

Furthermore, the reliability analysis for the Learning Disabilities Scale (LDS) was also computed for the current sample. Cronbach's Alpha coefficient was used to assess the internal consistency of the Learning Disabilities Scale (LDS). It was found that scale (LDS) had high internal consistency as Cronbach's alpha for the total scale was $\alpha = .98$, which is considered excellent. Moreover, Independent sample t - test was employed to test the hypothesis that children with learning disabilities would score significantly higher on the Learning Disabilities Scale (LDS) as compared to the normal children. It was seen that children with learning disabilities scored significantly higher on the Learning Disabilities Scale (LDS) as compared to normal children, thus, the results are significant. Furthermore, Children with learning disabilities also scored significantly higher on four subscales of the LDS as compared to normal children respectively, thus it is concluded that results of four subscales are also significant.

Conclusion and Implications

The rate of drop outs of children from schools due to learning disabilities increases day by day in Pakistan. Thus, it is concluded that learning disabilities is one of the most crucial health issues among primary school children of Pakistan and its frequency growing progressively. Most of the teachers are not aware of learning disabilities in their students neither are they trained to handle these kind of difficulties. Therefore, as a result of this ignorance and lack of teachers' training; a large number of children are suffering from learning disabilities among both private and public sector schools of Pakistan.

There is an obvious lack of management and assessment of learning disabilities in Pakistan. Consequently, there was an enormous need to explore this area at indigenous level and to develop an appropriate scale for assessment of learning disabilities. The present study yielded a reliable and valid measure of learning disabilities. The main reason for constructing a scale related to learning disabilities was the need for an instrument that could assess multiple dimensions of learning disabilities among primary school children of Pakistan. There already exist several measures to assess learning disabilities in the West. Though, learning disabilities have not previously, been explored in our cultural context and there was no indigenous valid and reliable instrument available for its assessment. So, keeping in mind the great need of development of an indigenous scale for assessment of learning disabilities according to our cultural context, this study was carried out.

Hence, development of an indigenous learning disabilities scale (LDS) can be a great aid in assessing the occurrence of learning disabilities among primary school children in private and public schools of Pakistan. Moreover, there is a great utility of the scale (LDS) for managing the growing number of cases of learning disabilities in Pakistan. It can be utilized by different professionals to assess learning disabilities of children from age 5—12 years. Consequently, this new scale (LDS) can also help educationists, psychiatrists, school psychologists, clinical psychologists and teachers in identifying and treating learning disabilities in primary school children in Pakistan. Hence, there is a broad utility of learning disabilities scale (LDS) at different academic levels.

Limitations and Suggestions

The current research was conducted on the sample of primary school children of urban community; however, it can be extended to the suburban and rural samples in order to get a wide-ranging picture of the indigenous sample. Moreover, sample consisted of only 300 (150 boys & 150 girls) students of primary schools of Lahore due to time constraints, so future research must be carried out on a bigger sample in order to get a true representative sample of indigenous learning disabilities in primary school children. In addition, current study lacks establishment of norms, so, further studies may be conducted to develop indigenous norms for Learning Disabilities Scale (LDS).

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