Validation of a Screening Tool for Learning Disorder in Children

Varsha Vidyadharan, Harish M. Tharayil, Biju George

ABSTRACT

Background: Learning disorder (LD) is a common cause for poor academic performance among school students. Poor detection of this may be due to lack of proper validated diagnostic and screening tools, leading to considerable difficulty for affected children and their families. This study aims to validate a screening tool developed by us among students with poor scholastic performance. It is an easy-to-use tool that can be used by parents or teachers. Preliminary validation was done earlier using case-control design among 100 students, and the results were encouraging. Materials and Methods: A tool with 26 items was applied in 365 schoolchildren with poor scholastic performance in Calicut district. Receiver operating characteristic curve analysis was done to find area under curve (AUC) and to obtain the sensitivity and specificity at the predefined cutoff score ≥10. Results: ROC analysis showed AUC of 0.93 for differentiating LD cases against the normal children. The optimum cutoff was taken as score ≥10 which has a sensitivity and specificity of 84.7% and 100%, respectively. Conclusions: The new tool showed promising validity.

Key words: Learning disability, learning disorder, screening tool

INTRODUCTION

Learning disorders (LDs) or specific LDs are diagnosed during developmental age when there are specific deficits in an individual’s ability to perceive or process information efficiently and accurately.[1] There must be a significant impairment in the specified scholastic skill and this impairment should not be due to mental retardation (MR), low general intelligence, poor teaching, lack of adequate stimulation, or such external causes.[2] These groups of neurodevelopmental disorders manifest during formal schooling and lead to persistent and impairing difficulties in learning foundational academic skills for reading, writing, and/or mathematics. LDs constitute a major cause for academic underachievement in young children. They exist across the globe irrespective of their mother tongue and medium of instruction.[3] Delayed and conflicting diagnoses are often common, leading to belated intervention and considerable suffering for the affected kids.

The early detection of LDs is hampered by various factors such as poor class room conditions, multilingualism, and/or mathematics. LDs constitute a major cause for academic underachievement in young children. They exist across the globe irrespective of their mother tongue and medium of instruction.[3] Delayed and conflicting diagnoses are often common, leading to belated intervention and considerable suffering for the affected kids.

Access this article online

Website: www.ipm.info

DOI: 10.4103/IJPSYM.IJPSYM_29_17

How to cite this article: Vidyadharan V, Tharayil HM, George B. Validation of a screening tool for learning disorder in children. Indian J Psychol Med 2017;39:737-40.
socioeconomic backwardness, different syllabi, and medium of instruction. Poor awareness and lack of simple and validated tools for assessment among parents and teachers are issues that impede early diagnosis.

Early detection would help in developing individualized learning strategies for each child, thereby helping them to overcome their deficits. A valid and reliable screening tool that can be used by teachers or parents on children is thus the need of the hour. We had developed a tool for screening the LD which had excellent validity parameters (area under curve [AUC] of 0.96 and a sensitivity of 100% and specificity of 77.2% at a cutoff score of >10) along with good reliability measures (Cronbach’s alpha of 0.95). Those particular results may have been biased as the study was done using a case–control design in a hospital setting. In the current study, we aim to test this tool in the actual school scenario among children with poor scholastic performance with a larger sample size and thus validating this tool for actual field use.

MATERIALS AND METHODS

The study was approved by the Institutional Ethics Committee of the institution and was done using a cross-sectional design. The study participants were identified by the resource teachers at the block resource centers with the help of class teachers of various schools based on poor scholastic performance. These children were referred for evaluation using the screening tool which was developed by the authors. The screening tool contained 26 items from the domains of reading, writing, spelling, and mathematics. Parents were asked to fill in the tool distributed after a brief introduction. The children were also clinically evaluated in a blind manner by the principal investigator and diagnosed as LD/non-LD cases based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) criteria (reference criteria). The principal investigator is a qualified psychiatrist with training and experience in diagnosing and managing children with LD.

Data was entered onto Microsoft excel sheet by an independent person and analysis was done using PASW version 18 (SPSS Inc., Chicago, USA). Mean score and standard deviation (SD) were calculated for total scores using the LD tool and compared between the different final diagnostic groups by using one way ANOVA followed by Bonferroni test as a post hoc test for multiple comparison between the groups.

Receiver operating characteristic (ROC) curve analysis was done to find out the best cut-off points for differentiating the LD children from others. AUC was calculated to find out the accuracy of the tool. Validity parameters like sensitivity, specificity, and positive predictive value (PPV) and negative predictive value and likely hood ratios for different ranges were calculated along with their 95% confidence interval at the optimum cut-off point using the Open Epi software version 3.01 (Dean AG, Sullivan KM, Soe MM. Open Epi. Emory University, Atlanta, USA).

RESULTS

A total of 15 camps were conducted during the month of December 2015 for evaluating the referred children. Out of the total referred cases of 586, 365 children reported to these camps. (Participation rate of 67.9%). Responders were comparable to nonresponders on both age and gender. 45.2% were aged above 10 in nonresponders versus 44.7% in responders, \( P = 0.88 \). 68.3% were male in nonresponders versus 69.6% in the responders \( (P = 0.74) \).

Socio-demographic characteristics of the study group are shown in Table 1. Majority of study group were males and belonged to the age group of 9–12 years. Eight-seven (23.8%) had a clinical diagnosis of LD, 29 (7.9%) had mild MR, 229 (62.7%) were children with borderline intelligence and rest were normal. Majority of the children (84.1%) had a score between 10 and 19 on the tool.

Mean score (SD) obtained for the total study group was 16.2 (3.4). Scores obtained in different diagnostic groups are shown in Table 2. Mean score in subjects with LD were significantly higher than normal subjects and borderline intelligence group. ROC curve analysis showed that tool has good accuracy (AUC = 0.76) to

| Table 1: Demographic characteristics of the study population |
|-------------------------------------------------------------|
| **Variable** | **Frequency (%)** |
|---|---|
| **Gender** |  |
| Male | 254 (69.6) |
| Female | 111 (30.4) |
| **Age group (years)** |  |
| <8 | 66 (18.1) |
| 9-10 | 136 (37.3) |
| 11-12 | 103 (28.2) |
| >13 | 60 (16.5) |
| **LD score category** |  |
| <10 | 10 (2.7) |
| 10-19 | 307 (84.1) |
| >20 | 48 (13.2) |
| **Final diagnosis** |  |
| LD | 87 (23.8) |
| Mild MR | 29 (7.9) |
| Borderline intelligence | 229 (62.7) |
| Normal | 20 (5.5) |

LD – Learning disorder; MR – Mental retardation
differentiate the LD group from others [Figure 1]. AUC was 0.93 to differentiate LD from normal while it was 0.65 and 0.76 respectively to differentiate LD from mild MR and borderline intelligence. A cut-off of >10 was found to maximise the yield and was considered as the optimal cut-off based on the ROC curve analysis. Score distribution of the study subjects in different diagnostic groups are shown in Table 3.

Validity measures of final tool are given in Table 4. At the cut-off of score of >10 the tool showed good sensitivity, specificity and PPV to differentiate children with LD from normal subjects. Validity parameters to differentiate LD from other mimicking diagnosis were not as good as compared to normal subjects.

**DISCUSSION**

We found that the new tool had good validity to differentiate LD patients from normal subjects and other mimicking conditions. It can be used to screen students for LD and can be used by the parents and teachers. Tool consists of 26 items and takes around 25 min for administration. Advantages compared to previous available tools are that this tool has good validity, easy to administer, comprehensive, can be used by parents and possibly by others like teachers, mental health professionals etc. Cut-off score ≤10 can rule out the disease, thus can be effectively used as a screening tool. Score 11–20 needs definitive assessment to confirm LD. Score >20 indicates diagnosis of LD.

In contrast to the Sarva Shikshya Abhiyan screening checklist for learning disability (obtained by personal communication) this tool has included more specific questions covering various domains of reading, writing, spelling and arithmetic. When
CONCLUSIONS

We have developed a new tool in assessing LD and this tool showed promising validity characteristics for future use.

Acknowledgment

Dr. Varghese P. Punnoose, Professor and Head, Department of Psychiatry, Government Medical College, Kottayam. Dr. Rani Jancy A. R, Consultant Psychiatrist, Caritas Hospital, Kottayam.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 5th ed. Washington, DC: American Psychiatric Association; 2013.
2. World Health Organization. The ICD-10 Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines. Geneva, Switzerland: World Health Organization; 1992.
3. Shah N, Bhat T. Clinical practice guidelines for the specific learning disorders. Indian J Psychiatry 2009;51:68-95.
4. John P, Rajeev KJ. School Mental Health. Cochin: Peejays Child Guidance Clinic, in Collaboration with WHO; 2016. p. 89.
5. Kapur M, John A, Rozario J, Oommen A, Uma H. Nimhans Index of specific learning disabilities. In: Hirisave U, Oommen A, Kapur M, editors. Psychological Assessment of Children in the Clinical Setting. 3rd ed. Bangalore: NIMHANS; 2011. p. 61-7.

Limitations

Subjects without LD as per the DSM-5 criteria are not exactly a normal student as they were referred due to poor scholastic performance’s this may have reduced the sensitivity and specificity estimates in our study. Even though age and sex distribution were similar between responders and nonresponders, nonresponders may be systematically different from the study group with respect to LD.