Research Article

Cultural Adaptation of the "Language-Based Reading Disabilities Checklist" for Persian-Speaking Students: A Psychometric Study

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Abstract

Purpose: Regarding the prevalence of learning disabilities (LD) and its consequences, availability of a valid and reliable screening tool will help providing early diagnosis and intervention for at-risk students. Significant number of students with LD have a history of language problems, so it is rational to recognize them through a checklist entitled as "Language-Based Reading Disabilities Checklist". Translation, cross-cultural adaptation, and assessment of psychometric features of mentioned checklist for Persian-speaking students were aims of present study.

Methods: Research team administered forward & backward translations, cognitive briefing, and evaluation of validity and reliability. Content validity and face validity were calculated based on

Content Validity Ratio/CVR (critical value ≥ 0.42), Critical Validity Index/CVI (critical value ≥ 0.79), & Item Impact Score/IIS (critical value ≥ 1.5). The Kuder-Richardson-21 was administered to calculate internal consistency.
Result: In translation, two words needed to be equated ('wanders' and 'rhymes'). Teachers assessed the checklist as an easy to understand and clear. They need about five minutes to fill the checklist for each student. The panelists removed two items with CVR ≤ 0.42 and one item based on CVI and IIS. The internal consistency of the checklist was 0.94 and ICC for items were between 0.543 and 0.885.
Conclusion: The Persian version of the language-based reading disabilities checklist is a valid and reliable tool to be applied to the Persian-speaking students in Iran. The applicability of this tool for Iranian students who are bilingual (Turkish, Kurdish, Lor, Arabic, and Baloochi) should be checked.
Keywords: Dyslexia, Language development Disorders, Psychometrics, Students

1. Introduction:

Learning disability (LD) is the largest category among 13 disabilities that demands special education (1). Learning disabilities affect between 2.6 percent (kindergarten) and 13.2 percent (5th grade) of students in U.S. (2). About 18.1 percent of students with LD drop out of schools (1). In Iran, 4.58 percent of primary school students labeled as LD (3). Considering LD through the WHO's model of international classification of functioning showed many aspects in addition to the person's function and structure (4-8) including family members and quality of lives would be affected by LD (6, 9-13). While, early diagnosis and intervention before children attain schools can resolve these issues (14).

To reach the early diagnosis and intervention goals, age of diagnosis should be around five years old. Nonetheless, Arrhenius and colleagues (2021) found in Finland (1996-2002), the age of diagnosis for 3,162 with specific learning disability was around 7.3–9.2 years of age (15). This delay in diagnosis may be a result of diagnostic criteria (16) or limitations of screening tools (14, 17). Obviously, professionals involved in assessing and intervening of LDs can be only suspicious about existence of LDs before schools started. Additionally, number of screening tools before school years are low, and these limited numbers of screening tools have serious restrictions (such as including assessment of preliminary reading skills and developmentally earlier language functions) (14).

Based on recent divisions, LDs could be categorized into two categories: *Language-based LD (LLD) & Specific LD (SLD).* The SLDs such as dyslexia have been over-studied but review of literature about LLD did not end to well-grounded research outcomes. Paul & Norbury (2012) cited a figure from U.S. Department of Education (2002) that about 80% of LDs are LLD and provided a comprehensive explanation of the typical problems seen in students with LLD (18). Students with LLD struggle with phonological processing, advanced morpho-syntactical skills, obvious deficits in pragmatic skills, and some problems in cognitive skills such as attention (18, 19). A child with LLD experiences language problems before entering school (20-31). Plenty of evidences showed language skills and learning are connected (20, 24-27, 32). Such evidences were the proper base to develop screening tools for LDs regarding to students' language skills and introducing of Language-Learning Disability or LLDs (23, 24, 33).

Paul & Norbury (2012) introduced few checklists such as *Language-based Reading Disabilities* (33)*, Clinical Discourse Analysis Worksheet (34), the Pragmatic Language Skills Inventory(35), & Children's Communication Checklist-2 (CCC-2)(36)* that can be used to screen LLDS. However, some of them have been developed according to pragmatic skills which made them cultural-based and difficult to be adapted for another culture such as Persian (33); since culture may influence predictive ability of early literacy skills for future literacy outcomes (37).

Comparison among these four measures showed that Language-based Reading Disability checklist, is a teacher-based short checklist, includes language areas other than pragmatics, can be administered at the end of kindergarten or beginning of the first grade before the child experiences all those failures at schools, and more than 85 percentages of items must have checked (ticked) to identify a child at risk for LD (18). This checklist became as a revised protocol to screen children for the possibility of LDS in USA and has not been adapted for any other language or cultures (this might be a consequence of differences in education systems or visual language structures) (38, 39).

In Iran, students would be screened for their vision, hearing, non-verbal cognitive skill, and motion before entering schools. If the child fails in the primary screening, s/he will be a candidate for secondary screening by an experts' committee. The failure in secondary screening can lead to several outcomes. The child may be placed in an education-rehabilitation program in special schools for one year and be re-evaluated with the hope to enter regular schools next year. Here, Speech and Language Therapists or SLTs will be a member of rehabilitation team that work with the child. Some families prefer not to register their child for this program, instead, they will register for services from a polyclinic and receive different types of rehabilitations by a multidisciplinary team (including the SLT services). While, students receive SLT services in either way, there is not any specific speech and language screening tool in primary or secondary screenings. Such paucity will make the provision of early diagnosis and intervention for children with LDs difficult and restricted, unless a proper tool can be introduced. In order to help SLTs in Iran to start screening children at risk for LLDs, this study was the beginning of a long journey aimed at:

a) Translate the revised version of "language-based reading disabilities checklist" from English to Persian

b) Evaluate some of psychometric features of the Persian version of the *Language-Based Reading Disability Checklist* including face and content validity, reliability, Item Impact Score (IIS), and future directions.

2. Materials & Methods:

Participants:

Target population was different in each step. For content validity, sampling method was purposeful sampling. Four bilingual persons for forward and backward translations, and 82 teachers in grade 1 out of 51 elementary first grade teachers to run face validity and cognitive debriefing. For the final testing, by cluster random selection 20 primary schools out of 81 were selected. Selected schools were from low, middle, and high socioeconomic status included equally numbers of private, semiprivate, and government-based. 31 teachers in grade 1 filled out Persian version of revised checklist. Those teachers who did not wish to be part of the study were eliminated without any impression, those teachers who did not complete the form for all of their students were excluded too. All teachers should have at least four years of experiences teaching in grade 1 with a related university degree. Twenty out of 25 SLTs responded to our invitation letter, and completed validity appraisal forms. The invited SLTs should have been professors, clinicians, and master/PhD students in speech and language therapy with at least 4 years of clinical experience in schools. Any incomplete appraisal form was excluded.

Tools:

English version of "Language-Based Screening of Reading Disorders" has child's name (for anonymity, child's code in teachers' diaries were used), date of birth, and date of completion of checklist at the top. Its next section includes 30 items categorized under eight subcategories

including: *Speech sound awareness (5 items), Written language awareness (2 items), Letter name knowledge (3 items), Word retrieval (4 items), Speech production/perception (4 items), Comprehension (4 items), Expressive language (6 items), and Literacy motivation (2 items).*
The appraisal sheet to examine the necessity and relevancy was designed according to our previous studies with similar designs. In terms of relevancy, the experts scored each item from 1 to 4 (1 = 'not relevant'; 2 = 'somewhat relevant'; 3 = 'relevant'; 4 = 'completely relevant'), and for the necessity part from 1 to 3 (1 = 'not essential; 2 = 'useful, but not essential; 3 = 'necessary') (40).

Procedures:
Permission was obtained from the publisher (see index 1), Beaton and colleagues 'guideline (2000) was used to adapt the checklist (41) in following stages.

1) Stage I: Forward Translation: Two translators whose mother tongue was Persian, one familiar with the subject and the other one was unfamiliar, and were fluent in English provided two independent translations of the checklist from English to the Persian.
2) Stage II: Synthesis of translations: The research team compared outcomes of the previous stage and checked ambiguous wording or discrepancies in translations. They synthesized both translations, compared them with original checklist, and reached consensus.
3) Stage III: Backward Translation: the final Persian scale from stage II was translated by another two independent translators (English was his mother tongue) both blind to the project. They translated the checklist back into English. Team compared original English version and the translated ones to find and resolve any inconsistencies or conceptual errors.
4) Stage IV: Team consolidated all versions of checklist and provided a pre-final version of checklist for stage V. By considering semantic, idiomatic, experiential, and conceptual equivalencies, team decided in all issues to keep equality between original English version and Persian version.
5) Stage V: Pre-testing and *cognitive debriefing* were conducted with 11 teachers. Each participant was asked to fill the pre-final version of the checklist and the examiner asked them to answer verbally the following questions:

"What does each item ask? Do they need to read each question many times and repeat and translate it in their own language to understand the questionnaire? What comes to mind when they hear a certain phrase?"
They were asked about the questions not understandable for them. If the participants suggested other equivalent words about a term, it was recorded to be included in next steps. Participants answered questions verbally and the researcher took notes. She compared teachers' verbal answers with options they chose in checklist. Through this stage, the researcher would find any potential issues in checklist items that might lead to misperception or vagueness from teachers (42). These interviews were done at schools where the teachers chose.
6) Stage VI: Face & Content Validity: Figure 1 displayed steps to evaluate face and content validity. CVR was calculated according Lawshe (1975) (43) (figure 2):

$$CVR = \frac{n_E - \frac{N}{2}}{\frac{N}{2}}$$

Figure 2: CVR Formula (‘n_E’: number of experts indicating an item as "essential"; ‘N’ is total number of experts) The CVR is a direct linear transformation from the percentage saying "essential", its utility comes from its features. When fewer than 50% of the panelists say "essential," the CVR is negative; When 50% of the panelists say "essential" and half do not, the CVR is zero; When all experts score an item as "essential," the CVR is 1.00; and When more than half of the experts –not all of them- say "essential", the CVR is a score between zero and 0.99. According to Lawshe’s critical values, when number of panelists are 20, CVR equals to 0.42 will be required to keep the item (43).

To calculate CVI, number of SLTs who chose options 3 and 4 were divided by total number of specialists. If resulting value was smaller than 0.7, the item was eliminated; If it was between 0.7 and 0.79, it was revised, and if it was greater than 0.79, it was appropriate (44, 45). Types of CVI indices are I-CVI (item levels) and S-CVI (scale level). S-CVI examines content validity at the level of a multi-item scale. S-CVI considered as “the proportion of total items judged content valid” (46) or “the proportion of items on an instrument that achieved a rating of 3 or 4 by the content experts” (47).

A supplemental form of validity was to determine face validity of checklist. Researcher asked another 40 teachers in grade 1 to judge whether checklist apparently had validity for themselves. Difficulty level of items, desired suitability and relationship between items and the main objective of an instrument, ambiguity and misinterpretations of items, and/or complexity of meaning of words were the subjects discussed with participants (34). To calculate Item Impact Score or IIS as a measure of face validity and as a way of factor analysis (48), these 40 teachers assessed the importance of each item as ‘very important’ (5), ‘important’ (4), ‘relatively important’ (3), ‘slightly important’ (2), and ‘unimportant’ (1). Then, percentages of teachers who scored 4 or 5 to item importance (frequency) were calculated, and mean importance score of item was obtained. Frequency was multiplied by importance to have IIS (IIS = Frequency * Importance). If IIS of an item was at or above 1.5, it was kept; otherwise, it was excluded (49).

7) Stage VII: Final test & Reliability: The final checklist was completed by 31 teachers for each of their students (number of students 800). One third of the studied samples (that is, all 31 teachers for at least 258 students) answered the checklist again two weeks after the first assessment. Random selection was taken place by the SPSS-24.

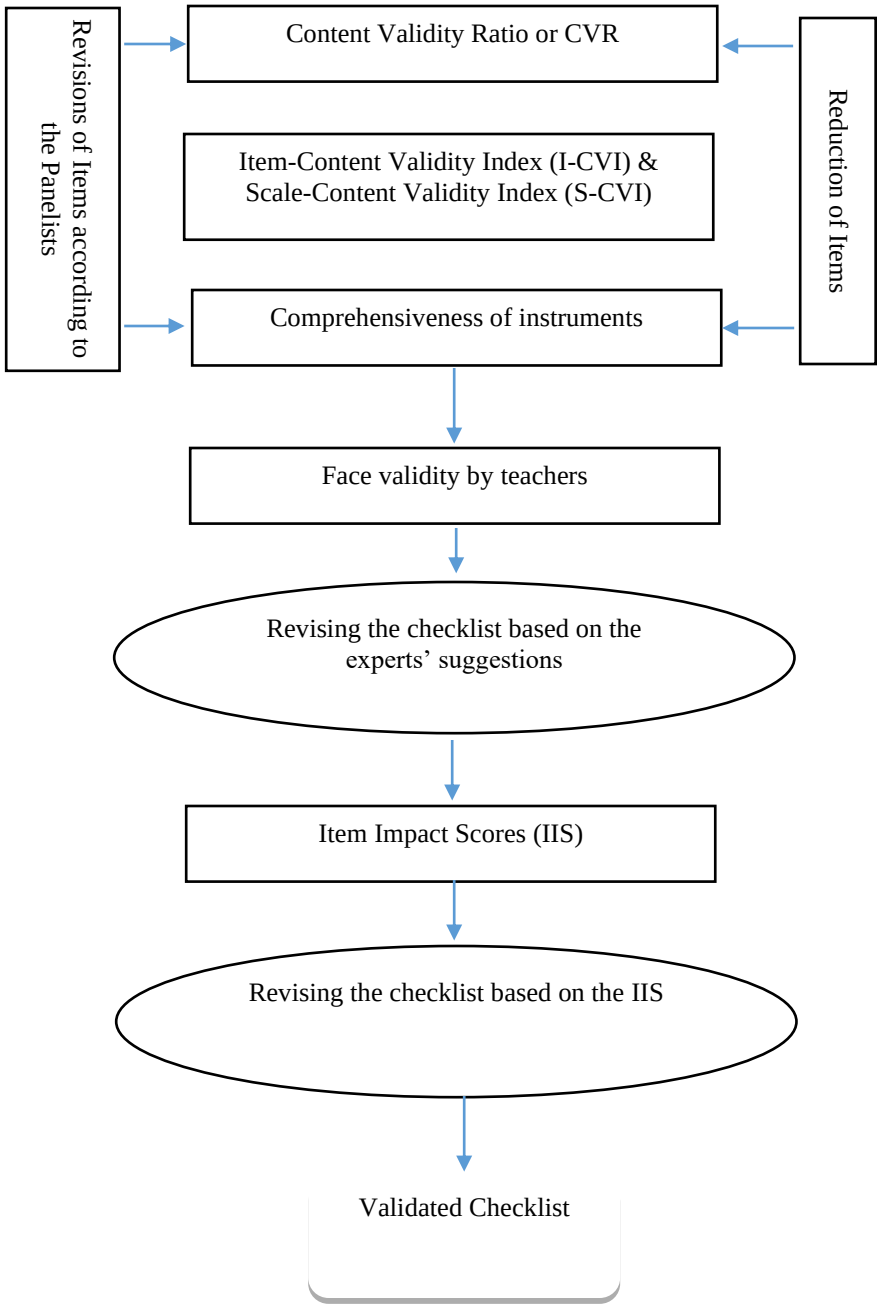

Figure 1: Face & Content Validity Process

Human Ethics and Consent to Participate declarations:
In accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later ethical standards, written consent forms were obtained from all participants. Contributing in present study did not have any harm or side effects on participants. Human Ethics Committee at Semnan University of Medical Sciences approved present study (IR.SEMUMS.REC.1401.083).

Statistical analysis:
All data were entered into SPSS software version 24. Normal distribution was measured by Shapiro-Wilk. Reliability and stability of each item was evaluated by Intra-Class Correlation

Coefficient or ICC using two-way random model and definite agreement. Checklist had a dichotomous scoring system, therefore, Kuder-Richardson 21 has been used to calculate internal consistency reliability of checklist on STATA. P-value less than 0.05 was considered significant in all tests.

3. Results:

In combining translations, semantic complexities, inconsistency between English and Farsi terms, as well as lack of coordination between translations were resolved based on consensus of research team's opinions. Only two words “rhymes” & “wanders” were discussed and proper Persian equivalents were used. To do so, while these two words were only one word, their equivalents came out as a noun phrase (rhymes) and a compound verb (Wanders). Two English translations were converted into one translation by team. Team compared obtained translation with original version and content of resulting translation was approved by team. In cognitive de-briefing, eleven first grade teachers needed an average of five minutes to fill out checklist for each random student. Examining teachers' responses showed that items were clear and understandable. Seventy percent of them did not need to read items again or to repeat items in their language. They had similar responses in oral asking compared with their written answers. Their suggestion was changing the time of the questionnaire administration (at the end of the school year) which was against early diagnosis.

Out of the 25 SLTs, 20 SLTs filled out item evaluation form separately and sent it to team via email. CVR, I-CVI & S-CVI/AVE were calculated and presented in table 1.

Table 1: Content validity Scores for Reading Disability Checklist

Speech sound awareness	CVR*	I-CVI**
Does not understand and enjoy rhymes	0/86	0/93
Does not easily recognize that words may begin with the same sound	1	1
Has difficulty counting the syllables in spoken words	1	1
Has problems clapping hands or tapping feet in rhythm with songs and/or rhythms	0/33	0/93
Demonstrates problems learning sound-letter correspondences	0/73	1
Written language awareness		
Does not orient book properly during book-looking	0/46	0/93
Cannot identify words and letters in a picture book	0/75	0/75
Letter name knowledge		
Cannot recite the alphabet	0/06	0/73
Cannot identify printed letters when named by teacher ("Where is the A?")	0/73	0/93
Cannot name letters when asked	0/46	0/86
Word retrieval		
Has difficulty retrieving a specific word (e.g., calls a sheep a "goat" or Says you know, a woolly animal")	0/73	1
Shows poor memory for classmates names	0/46	1
Speech is hesitant, filled with pauses or vocalizations (e.g., "um," "you know")	0/38	0/63
Frequently uses words lacking specificity (e.g., "stuff," "thing," " what you call it")	0/5	0/75
Speech production/perception		
Has problems saying common words with difficult sound patterns (e.g., refrigerator, plate, & bicycle)	0/88	0/75
Mishears and subsequently mispronounces words or names	0/46	0/93
Combines sound patterns of similar words (e.g., saying '"escavator" for escalator)	0/88	0/88
Shows frequent slips of the tongue (e.g., saying "brue blush" for blue brush)	0/88	0/88
Comprehension		
Only responds to part of a multiple-element request or instruction	0/73	0/86
Requests multiple repetitions of instructions/directions with little improvement in comprehension	1	1
Fails to understand age-appropriate stories	0/86	0/93
Lacks understanding of spatial terms, such as left-right, front-back	0/60	0/93
Expressive language		
Talks in short sentences	0/46	0/80
Makes errors in grammar (e.g., "he goed to the store," "me want that")	0/86	0/93
Lacks variety in vocabulary (e.g., uses "good" to mean happy, kind, polite)	0/33	1
Has difficulty giving directions or explanations (e.g., may show multiple revisions or dead ends)	0/73	0/93

Relates stories or events in a disorganized or incomplete manner	0/73	0/93
May have much to say, but provides little specific detail	0/73	0/93
Literacy motivation		
Does not enjoy classroom story-time; wanders, fails to pay attention to stories read by teacher	0/73	0/93
Shows little or no engagement in classroom literacy activities, such as writing, book-looking	0/73	0/86
S-CVI/AVE	Not Applicable	0.897

Based on CVR value, item 4 from first subcategory (speech sound awareness), item 1 from third subcategory (letter name knowledge), items 3 and 4 from fourth subcategory (word retrieval), item 4 from fifth subcategory (speech production/perception) and item 3 from seventh subcategory (expressive language) of checklist were subject to deletion. However, team considered the CVI, teachers' opinion, SLTs, and diagnostic value of aforementioned items to identify LLD, voted to remove only item 4 from first subcategory “Has problems clapping hands or tapping feet in rhythm with songs and/or rhythms” and 1 from third subcategory “Cannot recite the alphabet”. Decision to exclude other items depended on results of revision of items, recalculation of CVR, and calculation of IIS.

Revised Items: CVI

In revision, three items had I-CVI above 0.79 and escaped from elimination. However, four items including “Cannot identify words and letters in a picture book”, “Speech is hesitant, filled with pauses or vocalizations (e.g., "um," "you know")”, “Frequently uses words lacking specificity (e.g., "stuff," "thing," " what you call it")”, & “Has problems saying common words with difficult sound patterns (e.g., refrigerator, plate, & bicycle)” had I-CVI between 0.70 and 0.79. To eliminate mentioned items, team considered IIS process.

Team eliminated only one item that scored less than 1.5 was “Speech is hesitant, filled with pauses or vocalizations (e.g., "um," "you know")” (IIS = 1.403) and saved other three since their IISs were above critical score. Number of items was reduced to 27.

After applying teachers’ and experts’ opinions in the face validity section, it was determined that checklist was completely in plain language, understandable, without ambiguous and complicated words. A committee consisted of main researcher, supervisors, advisors, a biostatistician, teachers, and an expert test maker, all the contradictions and ambiguities were discussed by suggesting some examples to make item clearer, and a semi-final version was prepared for next phase. All SLTs evaluated the checklist as “comprehensive”.

At-risk students

In revised version of the checklist cited in Paul & Norbury (2012) (18), there is an instruction that said “a child receiving a substantial number of checks should be considered at-risk for language disability”. 1.5 percentages of students (12 out of 800) received checks in more than 75 percent of the indicators. If the number of checks in 50 percent of indicators can be considered as a code of risk, 5.3 percent of students (30 out of 800) were at risk to be diagnosed as LLD. However, further evaluations are granted to be sure about the presence of LLD.

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Other psychometric features

Internal correlation of the checklist was 0.94 in Kuder-Richardson21. The test-retest was applied to calculate the reliability and ICC, 95% confidence interval and the p-value was presented in (Appendix 1) for each item separately.

4. Discussion

The present study provided the valid and reliable Persian version of "Language-Based Reading Disability Checklist". Catts' checklist was not introduced to professionals with psychometric features, this study can be recognized as a pioneer that assessed psychometric values of Persian-version of the mentioned checklist.

The study revealed not each term in English can be used straightforward in other culture including Persian. Two words were identifying during forward translation. Reconciliation was a proper way to resolve any discrepancies during forward translation especially when it had taken place through a panel included a person from target language, translators, and project manager (50). To avoid setting strict translation not proper to meet real-world situations, cognitive interview was applied. This step increased chance of finding vague items or eliminating possibility of teachers' misunderstanding in final test. Along with some suggestions to improve understandability of the checklist, teachers presented two important perspectives regarding administration time and grades. Team decided to apply teachers' suggestion about grades, only to the first grade in primary student but not the kindergarten, however, changing administration time to the end of educational year was in contradiction with the concept of early screening and intervention. Therefore, we decided to consider the change in time of administration at the end of this study.

During psychometric analysis, some items were eliminated. These eliminations do not diminish values of these items in diagnosis of language-based learning disability. Reasons were differences existed in educational systems (it is not usual to use clapping hands or tapping feet in rhythm with songs and/or rhythms in most of Iran's schools), the curriculum (formal education of Persian letters will be started from the second month of the first year in primary school, and students are able to sing alphabet song when they finish their first grade), and probably culture (recognition of "you know" as an interjection to fill pauses in English culture but not Persian).

Present study revealed that internal consistency for the checklist was excellent, which means all items on the checklist are measuring the same thing. In health studies, ICC are considered for evaluation of reliability of measurement scales (51). Koo & Li (2016) considered calculation of ICC as one of the "must do" for any measurement (52). This fact explains why ICC is a widely used reliability index in test-retest, intrarater, and interrater reliability analyses. However, the ICC may vary according to a variety of statistical assumptions such as normality and stable variance. Therefore, amount of ICC may change from 0 to 1. ICC values should be interpreted as such: less than 0.5 = poor reliability; between 0.5 and 0.75 = moderate reliability; between 0.75 and 0.9 = good reliability, and values greater than 0.90 = excellent reliability. The items of this checklist had moderate reliability (52).

The number of at-risk students picked up by the checklist is in concert with the findings presented by previous studies administered in Semnan specifically (53). They investigated prevalence of specific language impairment (SLI) in preschool students (age = 5). In first screening using a developmental questionnaire, they assessed students in different developmental aspect and found 19 out of 436 students aged five (4.36%) at risk for SLI. Instead of a standardized language assessment tool, they used mean length of utterances as an indicator of SLI when the child's MLU was 1.22 SD less than the mean obtained for typical students in the same age. With this index, the number of students with the diagnosis of SLI decreased to 15 (3.44%). If ministry of education granted team to assess students at-risk comprehensively, we would have been able to compare our findings with Mohammadi's findings (53) in full. Behrad (2006) in a meta-analysis paper estimated the prevalence of LD about 4.58% (3). If we consider the diagnosis of LD in those 30 students, then our findings based on the checklist is in full agreement with the figure calculated by Behrad (2006). But any firmed decision could be made after a comprehensive specific assessment of the suspected students run by a SLT.

5. Limitation:

Original version of the questionnaire has five items categorized as “other important factors’ related to students’ history in language, family, play and pre-literacy skills. we were not allowed to have access to students’ profiles so interaction between those confounding factors and students’ scores on the checklist could not be verified. We are still waiting for permission to be able to run specific assessment and clinical interview with students’ parents to reach confident outcomes about children picked up at-risk by the checklist.

6. Conclusion:

The present study supported previous studies about necessity of cross-cultural adaptation. Also, it confirmed some of psychometric values of the Persian version of “Language-Based Reading Disability Checklist”.

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Authors contributions:

Mi. A & MS had role in conceptualization, data collection, data analyzing, writing the manuscript, editing, and proofreading. MA & FP contributed equally in data analyzing, writing the manuscript, and proofreading.

Conflict of interest:

The authors do not have any conflict of interest to declare.

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