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Research article

The prevalence of the academic learning difficulties: An observation tool

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ABSTRACT

This study seeks to develop an effective observation tool to determine the prevalence of various academic learning difficulties among school students at the primary level in Sana'a City, Yemen. A measure comprising of 34 items has been processed by the EFA and CFA for contriving ALD's psychometric properties. The study sample comprised 714 students between 6 – 14 years of age. The study's findings revealed that the observation tool under development could measure the prevalence of various academic learning difficulties to a great extent with accuracy. The learning difficulties were classified under five categories based on observation scores. The observed raw scores were standardised after taking the standard deviation from the sample's mean value into consideration. The study's findings suggested that the gender and grade of the subjects affected academic learning difficulties significantly. A brief discussion of the educational implications of these findings has also been presented.

1. Introduction

A country is dependent on its human resource capital for boosting the growth of its economy. Hence, it makes sense for them to develop various plans and strategies that help their citizens advance through their educational system and gain the qualifications and abilities that are in the nation's best interests. Yemen has invested a considerable amount of resources in its primary education sector. The effects of its pro-education policies are reflected in primary school enrollment rates, which have shot up to 622,909 in 2008 from a low of 310,167 in 1991 (Alzalabani, 2002; Roy and Irelan, 1992). However, there are several technical flaws inherent to the educational curriculum in Yemen that damage the students' ability to succeed in their academic and professional goals (Masters, 2013). Instead of becoming contributing members of society, they wind up becoming a burden. Many children in Yemen possess high or normal levels of intelligence, yet are unable to cope with the demands of the current educational system opposite (World Economic and Social Survey, 2013). Due to this, parents, specialists, researchers and organizations worldwide are now sponsoring initiatives for identifying the symptoms inherent to learning difficulties and trying to discover appropriate solutions. Numerous organizations and research centres like the World Organization for Learning Disabilities, the American National Center for Learning Disabilities, and the Learning Disabilities Association of Canada have been set up with this very intention in mind (Grünke and Cavendish, 2016; Hallett and Armstrong, 2012; Reardon et al., 2018).

Additionally, several factors lead to poor academic performance, including but not limited to the community around them, their friends, their school, psychological disorders, and family problems. Certain students who possess normal Intelligence Quotient (IQ) scores (Evelin, 2017; Mahin et al., 2014) may suffer from learning difficulties caused by the abnormal functioning of their nervous system, also known as 'Learning Disability'. The trouble lies in the fact that learning disabilities are not always outright noticeable, resulting in delayed support, assistance, and intervention (Deb et al., 2001; Emerson, 2003; Krumm et al., 2008). The research around learning disabilities remains incomplete to a great extent as it is a relatively modern field. The term 'learning disability' was coined recently as 1963 by famed psychologist and educator Samuel Kirk (Katsafanas, 2006). Five years later, the US National Advisory Committee defined the term 'children with learning disabilities' to include children who suffered from a disorder in executing

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basic psychological functions related to the communication or comprehension of a language, whether written or spoken. Learning disabilities would manifest themselves by affecting the ability to spell, write, read, think, speak, or perform basic mathematical calculations. These disorders also include health conditions like brain injury, perceptual handicaps, developmental aphasia, dyslexia, and brain dysfunction (DOE, 1995; Macdonald, 2010). However, this definition doesn't include children whose learning difficulties are primarily due to economic, cultural, or environmental disadvantages, mental retardation, motor, hearing, or visual handicaps (Fletcher, 2013; Western Australian Council for Special Education, 1984). In 2009, The National Institute for Literacy defined learning difficulties to include problems that manifest after school enrollment, which may be reflected in their behaviour and struggles while learning specific skills, namely: calculation, writing, and reading despite possessing above-average or average levels of intelligence. This causes them to experience subpar levels of educational achievements, which causes them to fall short of their potential (Dilshad, 2006; Ferrer et al., 2010; National Council for Special Education, 2014).

Modern educational and psychological literature defines students with learning difficulties to include students whose actual performance (measured by various achievement tests) fall short of their expected performance (measured by different mental capacity tests) in their academic endeavours due to various difficulties related to basic psychological processing functions (Korhonen, 2016). This definition is applicable irrespective of the stage (preparatory, primary, pre-school, school, college) at which such difficulties become apparent (Dowdy et al., 1992). It must be noted that the term 'Learning Difficulties' is preferred over 'Learning Disabilities'. The former can be managed with the help of intensive educational intervention, whereas Learning Disabilities tend to be pervasive and lifelong and cannot usually be managed (Keyes and Brandon, 2011; Thomas and Whitten, 2012).

As stated in the beginning, developed nations ascribe a high degree of importance to their human resources and, therefore, conduct studies into children with academic learning difficulties. The findings are then used to minimise the damage caused by the mistreatment of children with learning difficulties (Chapman and Wu, 2012). Consequently, developed countries devote more resources to help these children via systems and programmes, which are implemented by various organizations and agencies responsible for providing special care services for children with learning difficulties. The US Education Department reported that over 51.1% of all special education service recipient cases were related to children with learning difficulties (U.S. Department of Education, 2021). During 2000–01, Canadian school committees estimated that over 11% of school students required support, with the majority of them being students with learning difficulties (Gerber et al., 2004; Hanvey, 2002).

Although there is not an accurate record of the total number of children with learning difficulties across the Arabic world, certain global calculations estimate that over 15% of the Arab student population suffers from learning difficulties. In 2012, the WHO reported that over 53 million Arab citizens had learning difficulties (Hadidi and Al Khateeb, 2015; WHO, 2012). However, it is important to note that the governments of Saudi Arabia and Kuwait have made several efforts to reduce this number. For example, Kuwait houses The Child Evaluation and Teaching Centre, which was established back in 1984 to detect students with learning difficulties and design programs to help these students (Elbeheri et al., 2006; ALmenaye, 2009; WHO, 2011; Alawadh, 2016). Similarly, Saudi Arabia also established a program at King Saud University, back in 1992, to train teachers in learning difficulties (Al-khresheh, 2020a). In 1995, the General Secretarial of Special Education or GSSE established a department for managing and intensifying learning difficulties programmes operational in Saudi Arabian elementary schools (Al-Hano, 2006). However, Yemen, a country with a high population density at over 21 million citizens has no learning difficulties studies in place. Over 50% of the population is around 15 years of age or lower (Alyahri and Goodman, 2007).

1.1. Types of academic learning difficulties

As per McCarney and Arthaud (2007) and Dhanda and Jagawat (2013), the most commonly reported academic learning difficulties are those that affect one's ability to calculate, write, read, and express oneself. Other associated difficulties are not normally designated as a learning difficulty. While they may occur parallel to other difficulties, these five aspects remain distinct in their impact on learning.

Reading difficulty can be defined to mean partial difficulties in comprehending or reading whatever has been read out to the students, either loudly or silently. Both Elkins and Kird affirmed that over 60%–70% of all children enrolled in the programme meant for learning difficulties suffered from dyslexia. Estimates regarding the prevalence of reading disorders range anywhere between 5%–17.5%. Males are more vulnerable to reading disorders than global studies (Rajinder et al., 2017). In 2013, Mwanamukubi conducted a detailed study of the various factors that give rise to reading difficulties. The study's sample group comprised of over 206 students in Grade 6 from Zambia's Eastern province. The study's findings showed that most Grade 6 students were incapable of reading or comprehending their grade materials with a proficiency level consistent with their grade. The students' reading difficulties were classified into 3 categories: reading errors, lack of comprehension, and word misidentification (Moll et al., 2014; Karanja, 2010). Cecilia, Vittorini, Cofini and Orio (2014) conducted a deeper investigation about reading difficulties prevalent among school-going children. It was found that over 11% of all learners possessed weak to poor comprehension skills. Their reading speed was also incredibly abysmal – over 7% of the children could not read at a normal pace. Age and gender differences caused no significant variations in these observations.

Writing difficulties refer to the issues faced by individuals who cannot write content coherently, transcript what was said to them effectively, or write legibly (Hadi, 2016). Writing difficulties include the following: lack of the ability to write properly on the very same line, mixing similar-looking letters, incorrect order of letters or words in a sentence, reversal of numbers and letters, irregular letter shape and size, spelling mistakes, errors while copying text from the board or book, poor fonts, non-existence of adequate space between the margins and the letters, improper usage of the lines, and the inability to open one's thoughts accurately (Martinsa et al., 2013; Al-khresheh, 2020b).

Expression difficulties happen to be incredibly common among school children of all ages. However, it is startling to note that many academicians are yet to arrive at a common definition (Al-khresheh, 2018; Zapparoli, 2009). In 2007, Re, Pedron, and Cornoldi discovered that children who exhibited symptoms of ADHD displayed an abysmal degree of performance while using expressions or basic spellings.

Many students who have calculation difficulties also have problems making adequate progress in school subjects like mathematics. Several studies have proven that students with basic calculation difficulties also suffer from writing and reading difficulties (Jordan et al., 2015). For instance, in 2015, Özsoy, Kuruyer & Çakiroğlu analysed the correlation between students' reading skills and their ability to solve mathematical problems. The sample groups comprised of six students from Grade 3 who possessed different levels of reading skills. The authors concluded that the student's reading level had a tangible relationship with solving mathematical problems.

Additionally, Jovanović et al. (2013) studied over 1424 students hailing from the third grade. The sample's CD frequency turned out to be higher. There was also a marked difference in the test scores of female and male students. Talepasand and Vahed (2012) analysed the mathematical difficulties faced by a sample group of 432 students where the estimated prevalence rate was around 0.46%, which wasn't affected by either grade or gender.

General study difficulties include problems caused by a lack of adequate organisation skills and school work. Bryan, Burstein and Bryan (2001) concluded that organizational skill deficits in calculation,

writing, and reading affected a student's homework performance to a great extent.

1.2. The current study

Although many studies have been conducted to learn more about academic learning difficulties, there does not exist any independent research (apart from standardization studies), which has provided a comprehensive understanding of its psychometric properties or data about its utility as part of comprehensive assessments or as predictors of academic learning difficulties. Further evidence obtained from teacher observations may help develop a system for the comprehensive screening, assessment, and diagnosis of academic learning difficulties since the observations made by teachers are based on direct experiences and interactions with students staggered across a long period, unlike conventional tests that only cover a single time segment. Therefore, if the observations made by the teachers are found to be adequate, it is possible to diagnose and provide them with the help they need until standardized tools advance well enough to provide accurate results. This requirement is even more urgent in Sana'a, Yemen, where standardized student assessment tests happen to be quite rare. The academic achievements of several students are at subpar levels, which placed them at significant risk of failure. In an educational survey that was conducted throughout the schools in Yemen in 2004, the findings revealed that writing and reading difficulties were the most impactful causes that lead to students dropping out of school - a figure that had reached alarming rates (43%) in many primary schools (Project performance assessment report Yemen, 2005; Save the Children Aden, 2008; UNICEF, 2014).

Several students suffer from no apparent neurological disorders, yet their scholastic achievements do not match their abilities, which has presented a new puzzler for specialists and parents (Berninge et al., 1995; Al-khresheh, 2020a). In light of this information, it is all the more important for schools in Sana'a, Yemen, to access to standardized student assessment tools. To aid this, it was deemed necessary to come up with a reasonable measure that can serve the objectives of an observation tool for determining the academic learning difficulties of students. This tool would also provide much-needed guidance to both specialists and teachers attempting to diagnose the students at risk and develop programmes for overcoming these difficulties.

The study's primary purpose is to aid the development of an effective diagnostic tool for ALD that can standardize the entire evaluation process. Additionally, it can also be used for determining the prevalence of ALD in students at the primary school level. It can be used for standardizing student scores after considering the arithmetic mean value of the peer group and analysing the extent of ALD on the basis of gender and grade.

2. Methods

The study's primary objective was to develop an effective observation tool for measuring the prevalence of ALD in school students. The validity and reliability of a measurement tool are referred to as psychometric properties. A questionnaire must be thoroughly evaluated before it can be said to have excellent psychometric properties, which means that it is both reliable and valid. Moreover, numerous studies have highlighted the difficulties in identifying children with Developmental Coordination Disorder (DCD) in population-based samples using initial observational screening tools (Asunta et al., 2019).

This study makes use of the psychometric method to aid the development of the observation tool. This design was found to be ideal for this study since it allowed the researchers to gather information related to the prevalence and nature of ALD plaguing students at the primary school level in Sana'a. It helped them arrive at various methods that assisted the teachers in diagnosing ALD in students.

2.1. Research design

This observation tool underwent three stages of development. In the first stage, details regarding ALD were gathered and recorded accordingly. In the next stage, the opinions of educational specialists and experts regarding the validity of ALDs were gathered and the observations were modified and tested accordingly. Finally, discriminant validity, AVE, CFA, and EFA methods were utilised for investigating the validity of these constructs. Additionally, Cronbach's alpha, re-test, and composite reliability were also tested to serve the study's goals.

2.2. Participants

This study was conducted in over ten public primary schools, which were selected at random. Each of them was chosen from a single educational district during the academic year 2018–19. The total student count at the primary level in these districts amounted to 291,015 based on the latest Yemeni statistic (Statistical Yearbook, 2016). The sample used in this study has been chosen using the equation of Krejcie and Morgan (1970), $S = X^2\,NP\,(1-P) \div d^2\,(N-1) + X^2\,P\,(1-P)$ (Zulkipli and Ali, 2018). Because Yemen's educational system divides males and females, there are five schools for males and five schools for females. Only 30 teachers expressed interest and volunteered to observe the students while they were under their supervision. This is why these schools were chosen as a research sample.

The study comprised of a total of 714 primary school students with 354 females and 360 males. The sample size was deemed large enough to generate accurate results for the entire study population. The students in this sample were between 6 -14 years of age, with the group's mean value at 9.33 and SD at 1.86. They were selected from Grades 1–6 and observed by a group of thirty teachers.

Before data collection, preparations were made to get approval from ten schools in Sana'a through the Ministry of education, office of education in Sana'a, learning division, resource room. Once approval has been granted, the study's main objective was clearly explained to teachers participants. Then, they were asked to simplify it more to the students participants. All participants were requested to grant consent for the use of their data in this study. It was also emphasized that all data would be kept confidential and would not be divulged apart from the purposes of this study.

2.3. Research tool

The results of previous studies that dealt with academic learning difficulties and their prevalence among students at the primary school level (e.g., McCarney and Arthaud, 2007) were utilized for evolving the study items to become relevant to the Yemeni school environment. The study also included items from the literature on ALD, including the Pupil Rating Scale, which was developed in 1981 by Helmer Myklebust in the US (Obringer, 1985; Rasugu, 2010). This tool was developed in Arabic since the participants' native language was Arabic. It initially utilized 42 different items for improving the efficacy of its observation tool.

This research tool was then presented to a diverse panel consisting of 5 experts and specialists in education and psychology to confirm the tool's face validity. After implementing the modifications proposed by this panel, certain words were improved, replaced, or modified, with four other items being excluded as well. These items and modifications include: "fails to finish assignments because of reading difficulties (reads too slowly to finish on time)": "fails to change from one calculation operation to another (starts with addition and does not change to subtraction)": "learners' difficulty to recall word and formulate ideas" and "comprehending class instructions". The observation tool was then tested on a pilot basis to support the panel's viewpoints and verify the preliminary psychometric properties (validity and reliability). The results showed the Cronbach's Alpha (α) = 0.713 and the square root of α that used to determine the validity = $\sqrt{\alpha} = 0.844$ (Smits et al., 2018), which

indicate that reliability and validity values were acceptable as specified by Heale and Twycross (2015). The tool was eventually refined to include 38 items. The tool required teachers to specify the degree to which they agreed to a statement after a detailed observation of student behaviour and achievements concerning the items specified in the observation tool, using a five-level Likert scale (always applicable, almost applicable, sometimes applicable, seldom applicable and not applicable at all). The teachers in this study volunteered their efforts for this study and all requisite permissions were obtained from the school authorities.

2.4. Data analysis

The factorial structure of the ALD was evaluated using Exploratory Factor Analysis (EFA) and confirmatory factor analysis (CFA) on the items' polychoric correlation matrix using the WLSMV (weighted least squares means and variance adjusted) estimator (Finney et al., 2016).

Goodness of fit was evaluated according to the comparative fit indices (CFI), the Tucker–Lewis index (TLI), and the root mean square error of approximation (RMSEA). CFI and TLI values higher than .90 and RMSEA values lower than .08 were considered to indicate good structural fit (Ki and Hon, 2008). Tests for the Chi-Square between nested models calculated using the WLSMV estimator were undertaken based on Satorra and Bentler (2010).

Apart from Cronbach's alpha, composite reliability and test-re-test observations based on the findings of Geldhof et al. (2014) were used as well. Convergent & discriminant validity was examined with the help of the average variance extracted (AVE) and other factor correlations on the basis of Hair et al. (2014), Casanova et al. (2019), and other fit indices and descriptive statistics, such as One Way Anova, T-Test, Standard Deviations, and Means. JASP, AMOS, and SPSS programmes were used for the analysis of the data gathered by the study.

3. Results

The ALD observation tool meant to evaluate academic learning difficulties in primary school students included 38 items. A detailed verification of the scale's content and construct validity has been carried out as well. The principal component analysis has been executed to examine the construct validity and determine the factors on which the items are loaded and for appropriate labelling of the factors. Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity (BST) have been carried out to ascertain the appropriateness of the data for the analysis. The results displayed a KMO value of 0.953. Kaiser, 1974, indicated that factor analysis could be carried out when the KMO value was greater than 0.5 (Watkins, 2018), while Field (2009) implied KMO values above 0.9 to be strong.

The KMO value acquired in this study is greater than the values suggested in previous studies (Watkins, 2018; Field, 2009). The Chi-squared statistics obtained at the end of the BST displayed the normal distribution of the data with multiple variables. The BST also significantly impacts the study's findings (Chi-Square = 18923.208; $\rho = 0.000$). These results prove that the observation tool is appropriate for factor analysis. As a consequence of the first exploratory factor analysis, the items of the tool been classified on the basis of their relationship with the five factors. The factor loads are categorized by the use of varimax, an orthogonal rotation technique. For an item to be loaded on a factor, the factor load should be at least 0.40 (Blaikie, 2004). Therefore, a value of 0.40 is considered to be the minimum criterion for the factor loads. Any item with a factor loads lower than 0.40 is not to be included in the analysis.

Table 1 presents the exploratory factor values of the 34 items used for analysis, with the eigenvalues for each factor, after excluding item 13 value which is less than 0.40, "Learner's limited vocabulary" and (item 16, item 19 and itme28) values had been loaded on more than one factor "Learner takes a long time to answer a question", "Learner's difficulty to distinguish between different geometric shapes", "Lack of organizational

Table 1. ALD items and item factor load values.

NO	Items	Factor				
		I	II	III	IV	V
8	Difficulty to read	.799				
5	Learner's difficulty to pronounce some letters	.790				
9	Learner's difficulty to distinguish between spoken voices	.784				
4	Learner lacks the ability to distinguish between similar letters in pronunciation	.777				
6	Learner's difficulty to remember the alphabet in sequence after hearing them.	.775				
7	Learner reflecting letters and numbers when reading	.758				
3	Learner increases the letters in the word	.748				
2	Learner deleting one or more characters from the word while reading.	.695				
1	Replacing the character with another character while reading	.629				
23	Learner's difficulty writing words correctly.		.781			
24	Learner writes what he sees incorrectly from both the book and the blackboard		.761			
27	Learner uses incomplete sentences and is full of syntactic and verbal errors		.740			
21	Learner reflecting letters and numbers while writing		.723			
22	Learner scratches and replaces them with other words		.696			
15	Learner writes an error that cannot be read		.628			
25	Learner's difficulty in arranging ideas in a sequence.			.776		
26	It is difficult for a learner to tell a story in a clear and an understandable way			.707		
18	Learner's difficulty to express themselves verbally			.660		
17	Learner's difficulty in arranging letters and their composition to form vocabulary			.643		
20	Learner uses a single word to answer			.570		
12	learner uses incomplete or faulty sentences			.458		
11	learner uses weak words to express			.407		
38	Learner's difficulty to perform calculations				.754	
10	Learner's difficulty naming numbers.				.720	

(continued on next page)

Table 1 (*continued*)

NO	Items	Factor				
		I	II	III	IV	V
33	Learner reverses numbers while writing				.718	
37	Learner's confusion in the writing of similar numbers such as 21 to 12.				.716	
34	Learner's difficulty to name terms, elements,				.703	
14	Learner's difficulty to know the values of number by their digits				.565	
32	Learner's deficiency to recap geometric shapes					.694
31	Learner's performance varies from day to day					.675
29	Learner cannot complete any task within the time allocated					.668
35	Learner is unable to follow the instructions given to them					.629
30	Learner's difficulty in concentration during discussion in classroom.					.621
36	Learner's difficulty in completing their school duties					.617
	Eigenvalues	15.372	2.587	2.310	1.890	1.456
	Variance Explained (%)	17.704	11.485	11.218	10.987	10.753
	Total Variance Explained (%) 62.146					

skills and procrastination". Furthermore, Table 1 and Figure 1 illustrate the factor load values sorted from high to low. The study shows that the first factor (RD) consists of nine items whose factor loads range between 0.629 and 0.799, the second factor (WD) consists of six items whose factor loads range between 0.628 and 0.781, the third factor (ED) consists of seven items whose factor loads range between 0.407 and 0.776, the fourth factor (CD) consists of six items whose factor loads range between 0.565 and 0.754 and the fifth factor (GSD) consists of six items whose factor loads range between 0.617 and 0.694. All these factors accounted for 62.146% of the total variance of the observation tool factors. "Reading Difficulties Factor " explained for 17.704% of the total variance and has been labelled accordingly; "Writing Difficulties Factor " explained for 11.485% of the total variance and has been labelled accordingly; "Expression Difficulties Factor " explained for 11.218% of the total variance and has been labelled accordingly; "Calculation Difficulties Factor " explained for 10.987% of the total variance and has been labelled accordingly; and "General Study Difficulties Factor" explained for 10.753% of the total variance and has been labelled accordingly.

Criterion-related validity has also been studied or arriving at the correlation between the students' academic achievement scores for the previous year (which has been helpful for verifying the credibility of the observation tool) and the scores assigned by the observation tool in Table 2. The negative sign is an indication of the fact that the increase in ALD issues affects academic achievements negatively (Dilshad, 2006; Ferrer et al. (2010); National Council for Special Education, 2014).

Table 3 presented the fit indices corresponding to the final observation tool models; all fit indices were found to obey the criterion, indicating that the final five-factor model showed a satisfactory fit, as illustrated in Figure 2.

The factor loadings demonstrated that all items of each indicator in the measurement model showed relatively high loadings. All items were higher than 0.50 standardized loadings except Item 11, which was 0.48 in the third factor's model (ED). All factor loadings were deemed to be

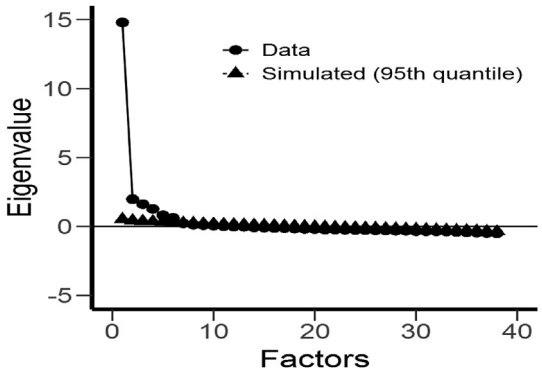

Figure 1. Scree plot of ALD.

statistically significant at $p < 0.01$. The measurement model and fit indices were presented in Table 3 and Figure 2. Consequently, the AVE is higher than 0.50, indicating of good convergent validity (Hair et al., 2014). To assess discriminant validity, the AVE of each factor with the squared correlation among factors was compared and consequently reported in Table 4. Evidence of discriminant validity was accepted (Hair et al., 2014).

The final observation tool consisted of 34 items confirmed under five factor-model, in which: (1) RD model included 9 items, (2) WD model included 6 items, (3) ED model included 7 items and (4) CD model included 6 items and (5) GSD model included 6 items as illustrated in Figure 2.

3.1. Reliability

The value of Cronbach's alpha has been calculated based on the five-factor model for developing the observation tool. The Cronbach's alpha (α) for each factor was RD = 0.841, WD = 0.697, ED = 0.709, CD = 0.755, and GSD = 0.716. Composite Reliability (CR) was RD = 0.873, WD = 0.791, ED = 0.845, CD = 0.813, and GSD = 0.789 as illustrated in Table 4. All of the mentioned values are suitable and acceptable ratios for this measure (Heale and Twycross, 2015). These results are also in line with the findings of Tavakol and Dennick (2011). The teachers observed 50 students under the parameters of the observation tool used for the current study. Students have been observed twice with an interval of two weeks between observations for this study. The reliability was RD = 0.809, WD = 0.833, ED = 0.815, CD = 0.829, and GSD = 0.827 based on re-test (re-observation). This indicates that there is a stable coefficient indicator that is acceptable (Heale and Twycross, 2015).

The following findings were made regarding the prevalence of academic learning difficulties as presented in Table 5:

3.2. Reading difficulties

The findings revealed that 156 students (22%) had negligible reading difficulties, 153 students or 21% had minor reading difficulties, 176

Table 2. Correlation between the observational score and the academic achievement.

Dimension	r	ρ
RD – AA	-0.823***	0.001
WD – AA	-0.859***	0.001
ED – AA	-0.799***	0.001
CD – AA	-0.811***	0.001
GD – AA	-0.805***	0.001
Overall – AA	-0.804***	0.001

Note: ***$\rho \leq 0.001$, r = Correlation, AA = Academic Achievement.

Table 3. Fit indices of the CFA proposed five-factor model.

	χ^2	df	χ^2/df	CFI	GFI	TLI	RMSEA
Observation Tool model	2386.950	550	4.339	0.931	0.912	0.901	0.073
Criteria	-	-	≤5	≥.90	≥.90	≥.90	≤.08

Note: χ^2 = Chi-square; df = degree of freedom; CFI = Comparative fit index; GFI = general fit index; TLI = Tucker – Lewis Fit Index; CFI = Comparative Fit Index; RMSEA = Root- Mean Square Error of Approximation.

students or 25% had moderate reading difficulties, 121 students or 17% had major RD issues, and 108 students or 15% suffered from debilitating reading difficulties. The SD and M values were found to be 10.513 and 22.056, respectively. These findings are similar to other studies. For instance, Elkins and Kird found the estimates between 5%–17.5% regarding reading disorders among students, while Cecilia et al. (2014) found 11% of students have week to poor level in comprehension skills. Mwanamukubi (2013) also identified reading difficulty among grade 6 students in Zambia's Eastern province.

3.3. Writing difficulties

The findings revealed that 150 students or 21% had negligible writing difficulties, 164 students or 23% had minor writing difficulties, 183 students or 26% had moderate writing difficulties, 132 students or 18% had major writing difficulties, and 85 students or 12% had debilitating writing difficulties. The SD and M values were found to be 5.221 and 15.875, respectively.

3.4. Expression difficulties

The findings revealed that 144 students or 20% had negligible expression difficulties, 155 students or 22% had minor expression difficulties, 159 or 22% had moderate expression difficulties, 150 students or 21% had major expressive difficulties, and 106 students or 15% suffered from debilitating expression difficulties. The SD and mean values were found to be 7.088 and 19.277, respectively. In their research, Re et al. (2007) also found ADHD learners have difficulties in using expressions and spellings.

3.5. Calculation difficulties

The findings revealed that 125 students or 18% had negligible calculation difficulties, 153 students or 21% had minor calculation difficulties, 183 students or 26% had moderate calculation difficulties, 130 students or 18% had major calculation difficulties, and 123 students or 17% suffered from debilitating calculation difficulties. The SD and mean values were found to be 5.880 and 15.811. These results are similar to the studies of Jovanović et al. (2013) and Talepasand and Vahed (2012) in which higher levels in CD were proved.

3.6. General study difficulties

The findings revealed that 111 students or 16% had negligible GS difficulties, 150 students or 21% had minor GS difficulties, 195 students or 27% had moderate GS difficulties, 178 students or 25% had major GS difficulties, and 80 students or 11% suffered from debilitating GS difficulties. The SD and mean values were found to be 5.429 and 14.336. Bryan et al. (2001) likewise showed the existence of GS in which students' homework performance is influenced by deficiency in calculation, writing and reading.

The overall results of this study showed that 126 students or 18% of the total population had negligible academic learning difficulties, 136 students or 19% had minor academic learning difficulties, 194 students or 27% had moderate academic learning difficulties, 145 students or 20% had major academic learning difficulties, and 113 students or 16% suffered from debilitating academic learning difficulties. The SD and mean values were found to be 29.023 and 87.355.

The prevalence levels of ALD in students at the primary level were estimated by calculating the overall range (Range = Max - Min) (Probability and Statistics, 2009). It should also be noted that the observation tool used for this study included five different options. The range has been divided into five categories for determining the length of the categories (Length of category) = Range/5.

3.7. Statistical significance in the prevalence of ALD for each grade

By calculating and comparing the mean values to see whether their grade level influenced the academic learning difficulties of the students, students from grade one were calculated to have the highest mean values (SD = 25.565, M = 92.264) whereas students from Grade six has the lowest mean values (SD = 29.863, M = 79.993) as shown in Table 6 and Figure 3. However, Mwanamukubi (2013) found most Grade 6 students had difficulties in reading and understanding their grade materials with a proficiency level.

One-Way ANOVA analysis has been conducted to evaluate whether the differences between the arithmetic mean values in Table 6 are statistically significant. The analysis results are presented in Table 7, which show a significant difference based on the grades [F = 3.089, ρ = 0.009].

Findings concerning the statistical significance in the prevalence of ALD, among primary school students on the basis of gender.

From Table 8 and Figure 4, it is evident that there are differences in the academic difficulties depending on the gender variable. In terms of mean score comparisons between male and female students, the authors discovered that the mean scores for male students were significantly higher than the mean scores of the female students in the five dimensions. These results are similar to Rajinder et al. (2017) study that proved that males are more susceptible to reading disorders. However, Cecilia et al. (2014) found that gender differences caused no significant variations.

4. Discussion

This study sought to measure and evaluate the extent of Academic Learning Difficulties in school students at the primary level. Various psychometric properties inherent to ALD have been thoroughly scrutinised here. In exploratory factor analysis (EFA), the results obtained via usage of the cross-sectional design lent credence to a five-factor structure that analysed 34 aspects or items of ALD, which explained the 0.40 variance. Factor loading values were in the range of 0.407–0.799 for five-factors as well (Hair et al., 2014). The result affirmed the findings of the Al-Qaryout et al. (2013) study. Additionally, four items (13, 16, 19 & 28) were removed since the factor loading of item 13 happened to be below 0.40. Additionally, items 16, 19, and 28 had more than one loading factor.

The results affirmed the findings of several previous studies in terms of criteria and methodology (Padhy et al., 2015), despite the major differences between the factor models.

Confirmatory factor analysis or CFA was subsequently conducted to emphasize the overall validity of the measured models. The final item count stood at 34. The factor loadings also ranged between 0.48 – 0.89 for every 5-factor item value. Figure 2 displayed the final observation

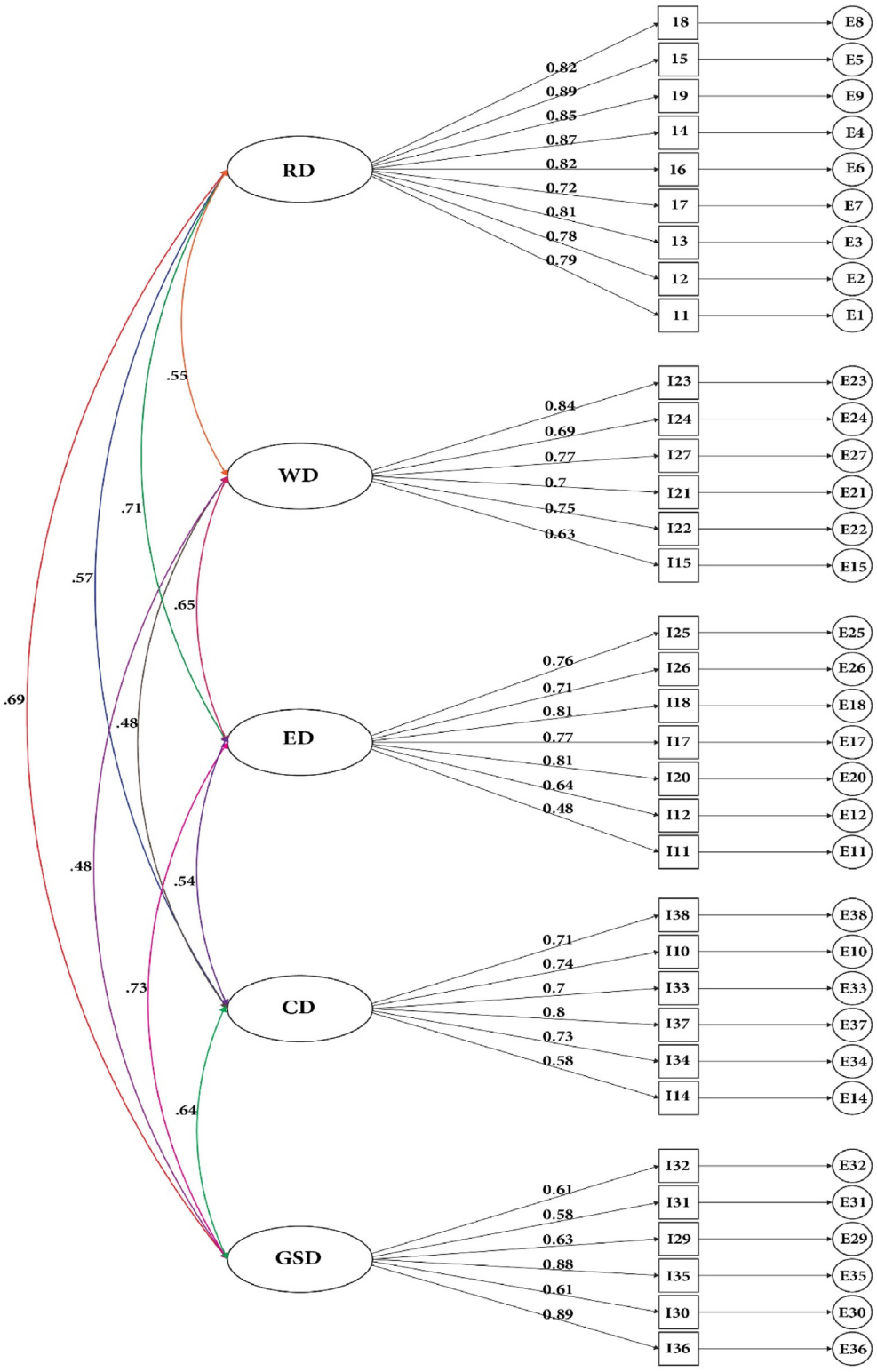

Figure 2. Five-factor model of ALD depending on CFA (34-Item).

tool's remaining items in which the loadings were shown to be above 0.50 except for Item 11, which had a loading of 0.48. These findings were in line with the conclusions of Padhy et al. (2015) and Al-Qaryout et al. (2013).

For an accurate measurement of the discriminant validity, the AVE of each factor and the squared correlation per each pair of the factors is to be compared. The discriminant validity is proved when the AVE of factors is found to be higher than the squared correlation (Casanova et al., 2019; Hair et al., 2014). In Table 4, the majority of the constructs agree with the criteria of the AVE factor through which the AVE factors are still greater than the squared correlation.

While determining the prevalence levels of ALD, the results also reveal that ED and CD are the most commonly reported learning difficulties in students. ED difficulties appear in difficulty with words to communicate ideas and necessities. This can further initiate difficulties at school and in different social settings. Students with such difficulties may

Table 4. Reliability, average variance extracted, and correlation matrix among the factor models of the observation tool.

Factor	Cronbach's Alpha(α)	Re-Test Reliability	Composite Reliability (CR)	AVE	RD	WD	ED	CD	GSD
RD	0.841	0.809	0.873	0.762	-	0.30	0.50	0.32	0.48
WD	0.697	0.833	0.791	0.626	0.55	-	0.42	0.23	0.23
ED	0.709	0.815	0.845	0.714	0.71	0.65	-	0.29	0.53
CD	0.755	0.829	0.813	0.661	0.57	0.48	0.54	-	0.41
GSD	0.716	0.827	0.789	0.623	0.69	0.48	0.73	0.64	-

Note: Values below the diagonal are correlations among constructs, and values above the diagonal are squared correlations. All correlation values are statistically significant at $\rho < 0.001$. AVE = Average Variance Extracted, RD = Reading Difficulties, WD = Writing Difficulties, ED = Expression Difficulties, CD = Calculation Difficulties, GSD = General Study Difficulties.

Table 5. The prevalence level of ALD.

Dimensions		Very High	High	Moderate	Low	Very low	Range	Σ	M (SD)	%	σ^2
RD	The category	41 - above	33–40	25–32	17–24	9–16	36	15748	22.056 (10.513)	49	110.524
	No. of students	108	121	176	153	156					
	%	15	17	25	21	22					
WD	The category	30 - above	24–29	18–23	12–17	6–11	24	11335	15.875 (5.221)	53	27.257
	No. of students	85	132	183	164	150					
	%	12	18	26	23	21					
ED	The category	33 -above	28–32	21–27	14–20	7–13	28	13764	19.277 (7.088)	55	50.240
	No. of students	106	150	159	155	144					
	%	15	21	22	22	20					
CD	The category	30-above	24–29	18–23	12–17	6–11	24	11289	15.81 (5.880)	53	34.577
	No. of students	123	130	183	153	125					
	%	17	18	26	21	18					
GSD	The category	30-above	24–29	18–23	12–17	6–11	24	10236	14.336 (5.429)	48	29.475
	No. of students	80	178	195	150	111					
	%	11	25	27	21	16					
Overall	The category	142 -above	115–141	88–114	61–87	34–60	130	62372	87.355 (29.023)	51	842.330
	No. of students	113	145	194	136	126					
	%	16	20	27	19	18					

Note: Σ = Sum of scores, M = Mean, SD = Standard deviation, σ^2 = Variance.

Table 6. Means, standard deviations, and number of students with grade variable.

Grade	No. of Students		M	SD
	Male	Female		
1st	63	51	92.264	25.565
2nd	96	66	90.273	29.137
3rd	78	72	89.395	34.014
4th	36	51	88.492	24.073
5th	60	66	86.720	28.071
6th	27	48	79.993	29.863
Total	360	354	87.356	29.023

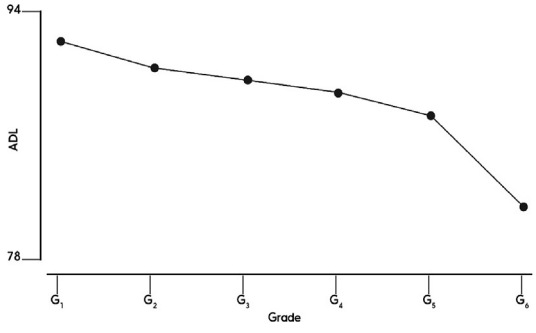

Figure 3. Show Means of ALD with grade variable.

perhaps mix up tenses, keep repeating various parts of sentences, and probably leave words beyond sentences. Being ED one of the most frequently reported learning difficulties in students. This might expectedly be attributed to hearing loss, physical impairments, and possibly neurological disorders which have been recently reported as common causes for such difficulties (Al-khresheh, 2018). As stated earlier, nearly one in 12 children might have such an ED difficulty. A similar case can be also seen in CD difficulties. Although researchers do not know unerringly what might cause such CD difficulties, there is a strong belief that at least relatively such difficulties might be due transformations in in what way

Table 7. One-way ANOVA (multiple comparisons between the six grades).

Case	Sum of Squares	df	Mean Square	F	ρ
Grade	12820.086	5.000	2564.017	3.089**	0.009
Residual	587761.556	708.000	830.172		

**$\rho < 0.01$.

brain is well-thought-out and precisely how it functions. Unsurprisingly, about five to ten percent of people might have CD difficulties. Generally, genes, heredity, and brain development could be two likely causes for

Table 8. Independent samples test for the comparison among gender variable.

Dimensions	Gander	No. of students	M	SD	T-test	DF	ρ
RD	Male	360	23.6763	11.15637	4.960***	712	.000
	Female	354	19.7811	9.07826			
WD	Male	360	16.4245	5.43003	3.354**	712	.001
	Female	354	15.1044	4.81613			
ED	Male	360	19.9592	7.62245	3.064**	712	.002
	Female	354	18.3199	6.14702			
CD	Male	360	16.3525	6.07390	2.932**	712	.003
	Female	354	15.0505	5.51786			
GSD	Male	360	14.9041	5.77631	3.336**	712	.001
	Female	354	13.5387	4.79717			
Overall	Male	360	91.3165	30.60897	4.376***	712	.000
	Female	354	81.7946	25.67340			

***ρ < 0.001; **ρ < 0.01.

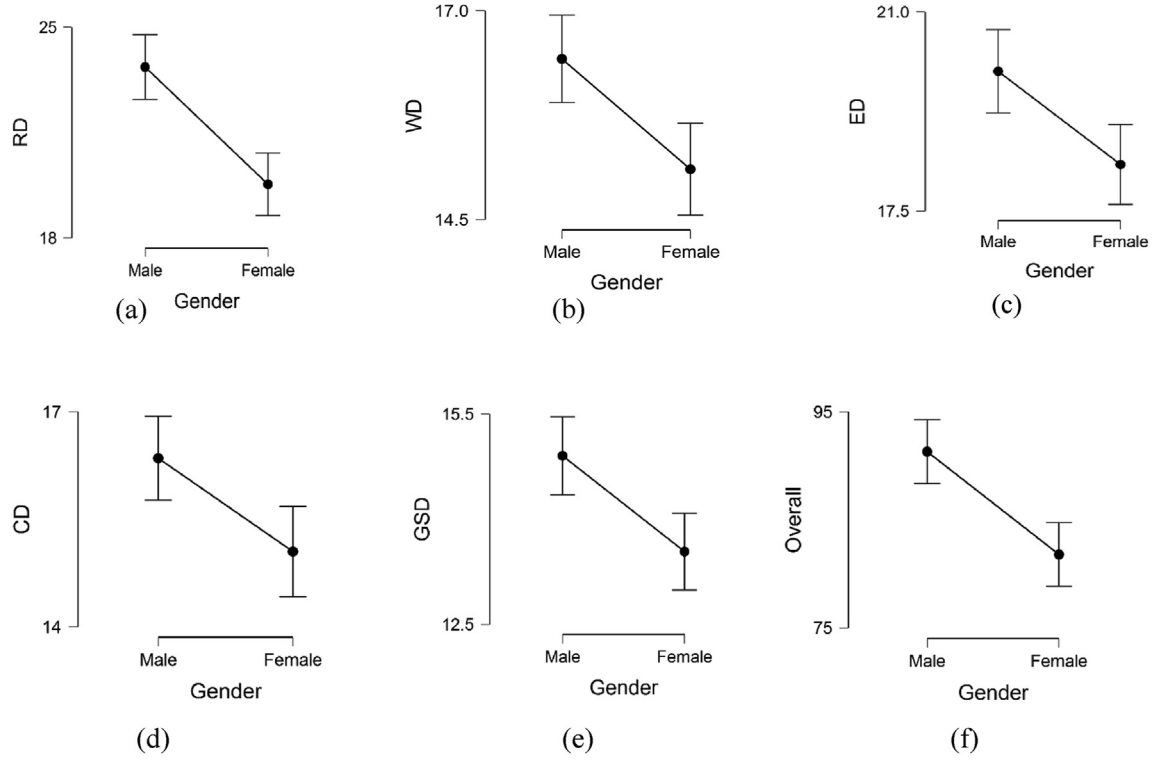

Figure 4. Show Means with gender variable.

such ED and CD difficulties (Re et al., 2007). But Moll et al. (2014) reported that ED and WD are the most frequently reported issues. However, Padhy et al. (2015) contradict this, as it states that reading and writing-related issues are the most common difficulties in the study sample. Fortes et al. (2015) and Dirks et al. (2008) suggested that RD and CD occurred at a higher rate because they were both influenced by similar cognitive predictors.

The results of RD show that the highest mean = 3.0084 has been scored by item (8) "Difficulty to read". The lowest mean = 2.158 has been scored by item (7) "Learner's reflecting letters and numbers when reading ". These findings align with the findings of (Cecilia et al., 2014) that reported 'difficulty to read' as the item scored the highest mean whereas reflecting letters and numbers when reading scored the lowest mean. In particular, psycho-pedagogical data showed that 1.44% of students in the sample did not possess adequate reading skills.

Mwanamukubi (2013) discovered that most students were incapable of reading the level expected of their age and grade. Whenever they read, they made several errors, including mispronouncing, substituting, adding and omitting words. Psychological factors, communication, and language issues all have a role to play in causing RD in students.

With regards to WD, the highest mean = 3.001 has been scored by item (22). For most of these students, their writing difficulties are due to them scratching the existing words out to replace them with other words. The lowest mean = 2.428 is scored by item (15) "Learner writes an error that cannot be read ". This result matches the study of (Mahin et al., 2014) who found that 36 (4.5%) students out of 793 students were experiencing writing difficulties. For most of these students, writing difficulties were due to problems with lower-level transcription skills (e.g., spelling, handwriting) rather than higher-level composing skills (e.g., generation of ideas, editing, revising, organization) (Berninge et al., 1995).

From the present study, it is evident that the expression difficulties faced by students are mostly due to 'Using weak words to express' – an item that scored M = 2.918. Re et al. (2007) discovered that students tended to organize their text poorly, were limited by their vocabulary, and used a simple and ill-articulated form of the language. Additionally, written expression and spelling errors were more widespread in students with ADHD and reading difficulties; it is theorized that these factors could be the reason behind the high prevalence rates of ED in school students.

With regards to CD, the highest mean has been scored by item 37 M = 2.869 "Learner's confusion in the writing of similar numbers such as 21 to 12." The lowest mean = 2.607 has been scored by item 14, "Learner's difficulty to know the values of number by their digits'. In the Talepasand and Vahed (2012) study, the prevalence of probable mathematical difficulties stood at 0.46%. This prevalence rate is much less compared to previously reported research results. An acceptable explanation for this fall in prevalence rate is using different measurement instruments since none of the researchers had deployed an instrument for estimating mathematical difficulties. Mathematics uses a special language that includes special terms, numbers, syntax, and symbols. Students with reading and writing difficulties were found to experience problems with mathematics as well (Özsoy et al., 2015). In addition, Jovanović et al. (2013) found that 9.9% of the study sample had CD and concluded that the prevalence rates were higher in this population than other similar studies.

In cases of GSD, it was observed that the most widely prevalent difficulties were due to problems in "completing their school duties". This item scored a staggering M = 2.670. Many studies have documented the personal difficulties faced by students, such as poor organizational skills and procrastination. Bryan et al. (2001), documented how a deficiency in organizational skills could negatively impact homework performance.

For a fair evaluation, the observations of the ALD were limited to five levels (very high, high, moderate, low, and very low). The calculation of the percentage for each factor had to be done separately. The study proved the existence of a tangible correlation between the grade level of the student and academic learning difficulties faced by them. A correlation between the prevalence of ALD and grade level has been observed. These findings are in line with the findings of Dilshad (2006). But the Talepasand and Vahed (2012) study states that male students suffer from a greater risk of encountering academic learning difficulties compared to female students. Dilshad (2006) also discovered that male students displayed 2x – 4x times greater signs of developing ALD compared to female students. Therefore, it can be concluded that gender plays a major role in the development of learning difficulties, which has lead to a sizeable achievement gap between students hailing from different genders (Reardon et al., 2018). However, some research studies contradict these findings and state that learning difficulties are more prevalent in female students compared to males. The general scientific view of this matter is that these differences result from the attitudes sported by students towards their academic endeavours (Moll et al., 2014).

4.1. Limitations and future directions

Five academic difficulties were covered under the ambit of this paper - reading difficulties, writing difficulties, expression difficulties, calculation difficulties, and general study difficulties, as proposed by McCarney and Arthaud (2007) and Helmer Mykeblust (1981) (Obringer, 1985; Rasugu, 2010). A validation tool comprising 34 items (out of an initial list of 42 items) was used to collect data to serve the study's purposes. This study has been limited to the constructs included in the items of the tool by using EFA and CFA. Secondly, it only sought data from 714 Yemeni primary school students and does not include a demographically accurate representation of the conditions of children from other countries. Therefore, the interpretation of these study results should be done on a contextual basis with ample caution. After due consideration of the limitations of this study, the conclusion is that educational facilities could be roped in for creating programmes for children with ALD based on the findings of this study after due consideration of the variables and categories covered. It is also recommended that future research studies explore various methods for expanding the constructs used for measuring the characteristics and recording the details of students struggling with ALD.

5. Conclusion

The study fashioned the psychometric properties of the scale of validity and reliability into a practical tool for assisting educationists in this field who work out therapeutic programmes for students with difficulties in learning. The items of the tool were collected to test five factors (RD, WD, ED, CD and GSD). The findings revealed several internal consistencies between the items after considering the factor loading for each item specifically and acceptable AVE and discriminant validity of the observation tool. The correlation coefficient between ALD and students' academic achievement suggested a negative correlation between the two. On the other hand, Cronbach's Alpha coefficient, re-tests, and composite reliability were employed to assess the reliability of the observation tool. The percentage of students suffering from expression difficulties stood at 55% in the sample, which was by far the highest, compared to other factors. The current study verified the tool's efficiency in diagnosing ALD in students through the usage of standardized observation raw scores, which were compared to the mean of the peers and to the standard deviation of the observed scores, to determine the ALD levels of the students. Moreover, it is noticed that whenever the scholastic grade increases, the ALD decreases compared to the mean of each grade specifically. The results showed that any programmes that sought to counter these difficulties should first consider the grade level and gender of the students. Resource rooms should also be implemented in schools for monitoring the difficulties that pose a veritable challenge to the students, which can help them overcome debilitating obstacles in their academic journey.

Declarations

Author contribution statement

Abdo Hasan AL-Qadri: Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Zhao Wei and Azzeddine Boudouaia: Contributed reagents, materials, analysis tools or data.

Miao Li and Mohammad H. Al-khresheh: Conceived and designed the experiments.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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