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Article:	**Intelligence and Academic Achievement as Predictors of Reading Disability: A Comparative Study**
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Abstract

Children at risk of dyslexia face problems in academic achievement and they were often viewed as children with low intelligence. The purpose of the study was to investigate the relationship between academic achievement and intelligence. The study also aimed to find out academic achievement and intelligence as predictors of children at risk of dyslexia. The study was conducted from September 2020 to November 2020. Sample of 268 students exhibiting problems in reading, writing or mathematical expression was selected from 1532 students with the help of teachers. Dyslexia screening test Junior (DST-J) was used for screening (Nicolson & Fawcett, 1996). Standard Progressive Matrices (SPM) (Raven, Raven, & Court, 1998) were used to assess intelligence. Academic record of all the students was obtained based on their performance in last examination. Results showed children had above average intelligence. Further, academic achievement showed significant positive relationship with intelligence (r=.32, p<.001). Moreover, intelligence and academic achievement were found to be significant predictors of performance of children at risk of dyslexia. Results concluded that children should be given intervention to improve their academic performance.

Key words: Reading Disability, Academic achievement, Intelligence Quotient

Introduction

Acquisition of education is one of the most imperative tasks in an individual's life which affect individual in various ways. The school environment provides educational planning in terms of different goals which can be achieved through quality teaching and the classroom environment affect pupil's learning by teaching skills of the teacher, assessment and feedback (Christenon & Ysseldyke, 1989; Reynolds, 1997). In addition, pupil's own characteristics like his aptitude, talent and potential for knowledge procurement are essential in learning (Aro & Ahonen, 2011). However, approximately every fifth child face problems in academics in school due to several social, environmental and psychological factors including developmental disorders (Kumari & Barkiya, 2016). One such type of disorders is specific learning disorders.

The term Specific learning disorders is being used in DSM V. Specific learning disorders include impairment in reading or dyslexia, dyscalculia or impairment in mathematics, dysgraphia or disorder of written expression. These learning difficulties profoundly hinder daily life activities and academic achievement (American Psychological Association [APA], 2012).

Review Of The Literature

Academic achievement is the proficiency on the particular content gained through the specialized information and expertise in a particular field. Academic achievement's foundation lies in the effort and strength one puts in to gain accomplishment. Since ages, academic achievement is determined by intelligence which differentiates high achievers and under achievers (Ali & Ara, 2017). Since the start of 20th century, intelligence tests had been used in educational settings. These tests assessed various aspects of cognitive functioning like verbal and spatial ability, perceptual speed and memory (Petrill & Wilkerson, 2000). All these factors are called group factors which correlate with each other to form general intelligence (Carroll, 1993). According to Martinez, (2000) the general intelligence was the capability of an individual to comprehend multifaceted connections and answer different questions. Therefore, various researches empirically established that general intelligence and academic achievement showed strong relationship with each other (McArdle & Woodcock, 2014; Kvist & Gustafsson, 2008). In addition, Schneider and McGrew (2012) explained that academic achievement also had a strong relationship with crystallized intelligence which focused on the complexity and extent of information grounded in individual's culture. Therefore, it can be said that intelligence is related to the capability or aptitude of an individual whereas achievement is the accomplishment of that capability. Even though intelligence and achievement are two different constructs but could be seen as two coinciding factors of Catell's investment theory (Kvist & Gustafsson, 2008). Consequently, the theory suggested that proficient and fast learning for achievement is based on intelligence. Different approaches to intelligence +measured the strength and weakness of different cognitive process in different individuals. The results of the assessment of these cognitive processes address reading disability or dyslexia which is the most common form of learning disability (Lyon, 1996).

Historically, the most imperative function of the intelligence testing for children with learning disabilities was to determine whether the differences existed in intellectual and academic achievement of these children (Elliott & Resing, 2015). This had been considered as the significant benchmark for the diagnosing a child as dyslexic in both the US and the UK (Elliott & Resing, 2015).

With the increase in the role of intelligence testing and achievement testing in our educational system, it is vital to understand the relationship of these two constructs in Pakistani context. Thus, the aim of the study was to examine the role of intelligence and academic achievement as predictors of children at risk of reading disability or dyslexia in

Pakistani context. Moreover, the study would also compare intelligence and academic achievement between at risk dyslexic and typically developed children.

Objectives of the Research

The objectives of the study were to

- Examine intelligence as a predictor in children at risk of dyslexia and typically developed children
- Investigate academic achievement as a predictor in children at risk of dyslexia and typically developed children.

Subjects And Method

The sample of the study consisted of students from different schools of Sargodha road, Gujrat city. Six schools were selected on the basis of permission granted by the school authorities to collect data from the students. A total of 1532 students were approached with the age range 6.5-11.5 years. Initially, teachers filled out teacher identification checklist based on DSM V criteria of specific learning disorder for each student of their class who exhibit problems in writing, reading and mathematics. This checklist consisted of 10 different items and the items are scored on either "yes" or "no". Consequently, 268 identified students were screened out using Dyslexia screening test Junior (DST-J) (Nicolson & Fawcett, 1996). Standard Progressive Matrices (SPM) (Raven, Raven, & Court, 1998) were used to assess non-verbal intelligence of the children. Academic record of all the students was obtained based on their performance in last examination. DST (Nicolson & Fawcett, 1996) is a performance based test which was administered individually. It took approximately 35 minutes to be conducted on each individual. The reliability of the scale was reported to be (α = 0.9). The SPM contains total of 60 items, organized in five sets of 12 items each (Sets A, B, C, D, and E) progressively items get difficult in the set. It was used to test non-verbal ability and general intelligence of the students. Psychometric properties were well established throughout the globe and it is the most widely used tool for intelligence testing (Kline, 2013; Sbaibi, Aboussaleh & Ahami, 2014). All the questionnaires were administered individually on all the students in a noise free room without interruption. Approximately, it took 45-50 minutes to administer all the tests on students. Informed Consent and demographic sheet were filled out by parents for all the students who participated in the study. Confidentiality was ensured.

Ethical Consideration

The present study was approved from Doctoral Research and Review Committee (DRRC), Board of Faculty and Advanced Studies and Research Board (ASRB) of University of Gujrat, Pakistan. The present study was conducted as a pilot study and it is a part of PhD dissertation of the first author. The study followed the ethical guidelines of American Psychological Association (American Psychiatric Association, 2009). No student was harmed, informed consent and confidentiality was maintained in the study.

Results

Table-1: Demographic characteristics of the students (N=268)

Variable	Levels	Frequency	Percentage	Mean	SD
Gender					
	Male	122	45.5		
	Female	146	54.5		
Category	at risk	88	32.8		
	not at risk	180	67.2		
Age					
	7	26	9.7		
	8	47	17.5		
	9	68	25.4		

	10	74	27.6		
	11	53	19.8		
AA				80.73	19.25
Percentile of SPM				80.20	25.1
SPM					
	superior intelligence	148	55.2		
	above average	77	28.7		
	average intelligence	30	11.2		
	below average intelligence	3	1.1		
	poor intelligence	10	3.7		

Note: AA: Academic Achievement, SPM: Standard progressive matrices

Table 1 showed the demographic characteristics of participants. There were 146 females and 122 males whereas 88 participants were at risk of dyslexia. SPM categories showed that most of the participants fall in above average and superior intelligence categories and less participants fall in other categories.

Table 2: Correlation of gender, academic achievement and standard progressive matrices with Dyslexia screening tests scores (N= 268)

Variables	**gender**	**academic achievement**	**standard progressive matrices**	**Dyslexia Screening test score**
Gender	-	.008	-.11	-.051
academic achievement		-	.32**	-.73**
standard progressive matrices			-	-.38**
Dyslexia Screening test score				-

Note: **p<.001

The table 2 reported the relationship among different variables. It showed that academic achievement showed highly significant positive relationship with the percentile scores of SPM whereas academic achievement has highly significant negative relationship with DST scores.

Table-3: Academic Achievement as a predictor of DST scores in at risk dyslexics and typically developed children controlling gender and age (N=268)

DST Score			**Model 2**		
				95% CI	
Category	Predictors	Model 1 B	B	UL	LL
at risk Dyslexic	(Constant)	1.37**	1.56**	0.602	2.14
	Gender	0.006	-0.13	-0.19	0.21
	Age	0.044	0.06	-0.03	0.12
	academic achievement		-.01**	-0.01	-0.003
	R^2	0.02	0.12		
	F	0.64	3.88*		
	ΔR^2		0.11		
	ΔF		0.53		

Typically developed Children	Constant	.84**	.84**	0.61	1.07
	Gender	-0.003	-0.003	-0.03	0.03
	Age	-0.004	-0.004	-0.017	0.009
	academic achievement		-0.005	-0.002	0.002
	R^2	0.002	0.002		
	F	0.16	0.11		
	ΔR^2		0.00		
	ΔF		0.96		

Table 3 showed that academic achievement was a highly significant predictor of DST scores in at risk dyslexic children whereas academic achievement is not a significant predictor of DST scores in typically developed children while controlling other demographic variables like gender and age. The above table also revealed that academic achievement explained 12% variance in DST scores in at risk dyslexic children. On contrary, the value of R^2 was only .002% which showed that academic achievement explained only .02% variance in DST scores in typically developed children.

Table-3: Intelligence as a predictor of DST scores in at risk dyslexics and typically developed children controlling gender and age (N=268)

DST Score

			Model 2		
				95% CI	
Category	Predictors	Model 1 B	B	UL	LL
at risk Dyslexic	(Constant)	1.37**	2.07**	1.24	2.93
	Gender	0.006	-0.13	-0.21	0.18
	Age	0.044	0.008	-0.06	0.08
	SPM Percentile		-.005**	-0.009	-0.002
	R^2	0.02	0.13		
	F	0.64	4.29**		
	ΔR^2		0.12		
	ΔF		0.001		
Typically developed Children	Constant	.84**	.83**	0.67	0.97
	Gender	-0.003	-0.003	-0.03	0.03
	Age	-0.004	-0.004	-0.017	0.009
	SPM Percentile		-0.005	-0.001	0.001
	R^2	0.002	0.002		
	F	0.16	0.19		
	ΔR^2		0.001		
	ΔF		0.63		

Note: SPM percentile= standard progressive matrices percentile

Table 3 showed that standard progressive matrices percentile was a highly significant predictor of DST scores in at risk dyslexic children whereas it is not a significant predictor of DST scores in typically developed children while controlling other demographic variables like gender and age. The above table also revealed that academic achievement explained 13% variance in DST scores in at risk dyslexic children. On contrary, the value of R^2 was only .002% which showed that academic achievement explained only .02% variance in DST scores in typically developed children.

Discussion

The present study aimed to examine intelligence and academic achievement as a predictor of dyslexia. The findings of the table 2 reported that there is a relationship between academic achievement and intelligence of the participants. These finding were consistent with the findings of (Ali & Ara, 2017; Deary et al., 2007). Longitudinal research analysis presented that strength of the relationship of intelligence and academic achievement predicted both the achievement levels as well as speed of knowledge and attainment (Kvist & Gustafsson, 2008). It is pertinent here to understand that the assessment of academic achievement is generally done by taking the tests or examination in schools about the material or information taught. Therefore, it can safely be claimed that achievement and intelligence are interconnected because the intelligence is concentrated on the complexity and scope of the information embedded in one's culture (Schneider & McGrew, 2012),

The results in table 2 presented that academic achievement had a significant negative relationship with dyslexia scores which means that those who were underachievers performed poor on DST and vice versa. In a prediction analysis in table 3, academic achievement was a significant predictor of dyslexia in children at risk of dyslexia compared to typically developed students. The results of the study are in accord with the results of the previous studies which explained that students having reading disability showed problems in reading and writing assignments (Beidas, Khateb & Breznitz, 2013; Gibson, & Kendall, 2010; Re et al., 2014). Gibson and Kendall (2010) in a qualitative study explained the experiences of school students and described that all the students of their sample faced difficulties in their primary and secondary education which were distinctive to reading difficulties. The students of dyslexia exhibited low ability on reading tasks (Maughan et al., 2009). However, in a study conducted with university students with dyslexia, the results were different (Olofsson, Taube, & Ahl, 2015). University dyslexic students demonstrated normal academic achievements the reason might be that they had educational experiences from higher secondary school and college which helped them prepare for university studies. Therefore, these educational contributions lead to the development of efficient working approaches (Olofsson, Taube, & Ahl, 2015).

The negative significant relationship between intelligence and dyslexia in table 2 revealed that dyslexic students showed average or above average intelligence. It means that children with average or above average intelligence performed poor on dyslexia test. The regression analysis in table 4 reported that intelligence was the predictor of dyslexia in children at risk of dyslexia as compared to typically developed children. These results are in consistent with the results of a meta-analysis (Hoskyn & Swanson, 2000). The meta-analysis of nineteen studies indicated that children with reading difficulties showed better cognitive functioning compared to low achievers on reading tasks like pseudo-word reading and real word reading etc. These researchers concluded that children with high IQ and poor reading performed better on tasks related to intelligence (Hoskyn & Swanson, 2000). Thus, higher IQ and poor readers were identified as dyslexic whereas low IQ were recognized as poor readers having weaker cognitive processes (Elliot & Resing, 2000). Historically, Intelligence Quotient (IQ) tests had been used by practitioners to measure individual intelligence. The predictive power of the scores of these IQ tests helped estimate the functionality of individual's performance in school and professional situations. Another aim of the use of these tests was to assess individual's cognitive functioning. Different approaches claimed that cognitive functioning evaluation through intelligence testing assisted in addressing dyslexia or reading disability, the most common form of learning disorder (Lyon, 1996). Since ancient times, in different countries, like USA and UK, the vital role of the IQ tests were to find out the differences in intelligence and academic achievement of children with dyslexia. This had

served as the benchmark for diagnosing children with learning disabilities or dyslexia (Elliott & Resing, 2015).

Conclusion

Children at risk of dyslexia showed high Intelligence Quotient but low academic achievement compared to typically developed children. Results indicated that low academic achievement significantly predicts the performance of children at risk of dyslexia. Moreover, high intelligence scores are indicative of strong cognitive functioning but weak reading in children at risk of reading disabilities. Findings determined that there is a strong need for the provision of intervention to these children so that they perform can be improved.

Declaration of Interest

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