

# TEACHERS' FAMILIARITY AND PRACTICES OF DYSLEXIA ASSOCIATED WITH WEAK WORKING MEMORY IN SAUDI ARABIA

Turki Alqarni

Najran University, Saudi Arabia. Email: tmalqarni@nu.edu.sa

Article History: Received on 01<sup>st</sup> January 2020, Revised on 01<sup>st</sup> February 2020, Published on 23<sup>rd</sup> February 2020

### Abstract

**Purpose of the Study:** The present study investigates teachers' familiarity and practices of dyslexia related to weak working memory.

**Methodology:** A quantitative approach was used to collect data from teachers of learning disabilities. This paper presents the findings of a survey design research by a set of questionnaires carried out in southern regions of Saudi Arabia (n=90)out of 114 male teachers and 99 female teachers.

**Results:** The main findings indicated that teachers are familiar with information and practices related to dyslexia associated with poor working memory, and there are a significant prediction and relationship between the teachers' familiarity and practices of this disorder.

**Applications of this study:** This study provides beneficial ideas and insights to reform the special education systems in Saudi Arabia regarding dyslexia associated with weak working memory. The results emphasized on increasing the familiarity of teachers to support their practices. This can be applied through the teacher's training, the strength of multidisciplinary teams, and dyslexia awareness.

**Novelty/Originality of this study:** The literature showed that there is an association between dyslexia and weak working memory. However, there is no study examined teachers' familiarity and practices of this association. This study attempt to fill in the gap by identifying the best variable predicting the teachers' familiarity and the practices of dyslexia associated with weak working memory.

Keywords: Dyslexia, Weak Working Memory, Practices, Teachers, Knowledge.

# INTRODUCTION

Working memory refers to a framework that is responsible for storing and controlling data (<u>Alloway, 2006</u>). Working memory works as an intellectual workspace that can be adapted and used to strengthen regular intellectual exercises that require both preparation and capacity, such as logical number juggling. In any situation, the limit of working memory is constrained, and the problem of either abundance stockpiling or handling requests throughout an ongoing subjective movement will prompt more loss of data from this impermanent memory framework (<u>Albano, Garcia, & Cornoldi, 2016</u>).

There is much proof that working memory plays an essential role in adaptation, particularly within the adolescent years (<u>Gathercole & Alloway, 2004</u>). Many studies have researched the connection between youngsters' working memory shortage and their learning achievements in many domains (e.g., education, language, and mathematical calculations). Complex memory, by which the child needs to store and process data at the same time, measures working memory. A critical element of working memory deficiency among adolescents is the degree to which it shifts broadly across people of a similar age (<u>Toffalini, Marsura, Garcia, & Cornoldi, 2019</u>).

Dyslexia, as a learning challenge, can essentially hinder the abilities required in familiar and precise writing and reading, which can occur over a range of academic capacities (Xu, Tan, & Perfetti, 2019). Many studies indicated attributes of dyslexia including poor phonological mindfulness, poor verbal memory, and low speed of verbal preparation (Pradhan, Parikh, Sahoo, Selznick, & Goodman, 2017; Wong et al., 2017). They also clarify that one should not consider dyslexia a separate class, but existing on a continuum from mild to severe (Phillips & Kelly, 2018). Due to the misunderstanding that dyslexia on the comprehension and learning of mathematics is less severe than in most other subjects because of the decreased requirement for familiar and precise writing and reading (Daloiso, 2017). However, there is a group of research, for example, the findings of Miles and Miles (2004) who proposed that such a doubt would not be justified and may prompt poor results for dyslexic understudies in mathematics.

Many believe that dyslexia influences the neurological abilities of the human cerebrum, especially in perusing, composing, and spelling issues (<u>Gathercole & Alloway, 2004</u>). Dyslexia causes individuals to be unable to remember events for an extended period and easily oversee many things in the short-term, which effectively influences individuals' accomplishments in the learning process (<u>Phillips & Kelly, 2018</u>). Because of the harm to the nerve cells in the human cerebrum, many



specialists may overlook dyslexia. Due to the inadequacy in the neurosensory organs in the cerebrum, it is difficult for the general population with dyslexia to remember anything in the short-term, likewise termed short-term memory loss (Busz & Oginska-Dutkiewicz, 2015).

# Need for the Study

The essential issue which many dyslexic students face is the deficiency of working memory and learning memory (<u>Gathercole & Alloway, 2004</u>). Several studies have found a significant association between dyslexia and reduced working memory and recommended that teachers need to develop their knowledge and understanding of this association (<u>Wong et al., 2017</u>). <u>Gathercole et al. (2008</u>) posited that children with dyslexia and working memory impairments have sometimes been misdiagnosed or typically reported by teachers as being lazy, inattentive, or having low intelligence. further report that teachers need to work hand-in-hand with dyslexic children to improve their working memory and increase their chances of success in the classroom (<u>Kane et al., 2007</u>). Teachers play a vital role in recognizing behaviors that may be indicators of dyslexia, which they can initially identify through the introduction of classroom checklists, as well as being aware of their respective contributions as teachers of literacy in providing evidence for whole-school improvement and inspection (<u>Reid, Elbeheri, & Everatt, 2015</u>).

Last year the Ministry of Education in Saudi Arabia reported the estimated rate of dyslexia, which was between 10 and 16% among students with learning disabilities in Saudi Arabia. This percentage has not changed over 10 years prior (Ministry of Saudi Education, 2019). Therefore, in order to support students with dyslexia, it is helpful if teachers understand what dyslexia is and its causes and characteristics (Knight, 2018). However, "a lack of understanding of the nature of dyslexia leads to unhelpful and damaging comments from some teachers which have long-lasting detrimental effects" (Action, 2012, p.7).

# **Research Questions**

- *RQ1:* What are the teachers' familiarity and practices of dyslexia related to poor working memory?
- *RQ2:* What is the relationship between the teachers' familiarity and practices of dyslexia associated with poor working memory?
- *RQ3:* How well is a set of variables able to predict the teachers' practices of dyslexia associated with poor working memory?

# LITERATURE REVIEW

# **Dyslexia and Its Causes**

It is a fact that dyslexic students cannot be moderate at certain essential elements of arithmetic; for example, learning multiplication tables or including sections of figures (Miles & Miles, 2004). The primary elements of dyslexia include poor phonological mindfulness, poor verbal memory, and low speed of verbal preparation (Pradhan et al., 2017; Wong et al., 2017). Phonological mindfulness is the capacity to hear and prepare the sound structures of a dialect and relates to how well we can recover phonic data from long-term memory (Rapgay, 2019). It is challenging to see specifically how phonological mindfulness applies to mathematics (Higgins & Eden, 2018). A few types of research show that discourse sounds assume an essential role in computational assignments (Jordan, Wylie, & Mulhern, 2010). In addition, poor phonological mindfulness may have implications for working memory (Bull & Johnston, 1997).

Poor verbal memory causes numerous issues for many dyslexic students (<u>Gathercole & Alloway, 2004</u>). For instance, poor verbal memory can influence dyslexic students' capacity to memorize multiplication tables successfully (<u>Pradhan et al., 2017</u>). Non-dyslexics typically have great verbal memory and can like this practical examination, by verbal affiliation, the response to, for instance, six times seven is 42 (<u>Wong et al., 2017</u>). Most dyslexic students, by examination, have a considerable problem making the verbal relationship with exact words to make up an individual table line (<u>Rouweler, Varkevisser, Brysbaert, Maassen, & Tops, 2019</u>). As a result, educators may find that conventional repetition learning techniques will not be effective if used to show table representations to dyslexic learners.

Reduced verbal preparation speed, or the time taken to process recognizable verbal data such as letters and digits, promotes a variety of issues associated with poor verbal memory, increasing problems with cognizance, and logical number juggling (<u>Rouweler et al., 2019</u>). There is much research showing a significant connection between dyslexia and poor working memory (Jeffries &Everatt, 2004). Therefore, it is conceivable that for some students with dyslexia, this may likewise be a significant feature (<u>Wong et al., 2017</u>). Teachers can test the poor working memory of students with dyslexia through rational numbers juggling and how dyslexics struggle to hold values for calculation in their minds (<u>Pradhan et al., 2017</u>). These related memory issues can create sequencing problems and precise retention of well-ordered techniques. This produces matters in assessment, which in arithmetic, in the same way as other center subjects, is the form to a great extent in



light of the maintenance and review of actualities, which would consequently be a problem for students with dyslexia who display memory limitations (<u>Albano et al., 2016</u>).

In a study by <u>Jeffries and Everatt (2004)</u> the researchers explained children's capacities in terms of assignments that evaluate phonological preparation, visual-spatial and motor coordination, and official/inhibitory working, being focused on appraisal given theoretical proposition identified with the working memory display. The researchers evaluated 21 learners with dyslexia without comorbid challenges, surveyed 26 youngsters with problems including dyspraxia, passionate/behavioral issues, and consideration shortfalls, and included 40 children with no public training-related shortages as the control group. Both special education needs (SEN) groups performed poorly compared to the control group on working memory phonological circle round measures.

Currently, working memory weakness is known as the prime contributor to the concept of dyslexia. Also, all dimensions of working memory, including visual-spatial, phonological, and working memory plays an important role in reading proficiency (<u>Dehn, 2016</u>). Consequently, this can be evidence of the causal relationship between dyslexia and poor working memory.

### The Association of Dyslexia and Weak Working Memory

Past studies have revealed a relationship between reading deficiencies and poor working memory, which can lead to many disadvantages regarding the academic achievements of students with dyslexia. Most reading abilities, such as reading decoding and reading comprehension, as well as math problem solving, are associated with the capabilities of working memory (Booth, Boyle, & Kelly, 2014). However, bringing and discussing thoughts depend heavily on the status of working memory(Dehn, 2016). Therefore, any deficit in the learner's working memory can lead to many disabilities in the learner's reading achievements as the results <u>Nicolson, Fawcett, and Baddeley (1992)</u> study showed noticed a significantly lower achievement of younger students with dyslexia who had reduced working memory compared to their chronological age, which had an effect on phonological discrimination, non-word repetition, and articulation rate (<u>Swanson, Zheng, & Jerman, 2009</u>). However, their reading age is significantly lower, which controls the repetition of longer non-words.

Although <u>Nicolson et al. (1992)</u> note that lack of fluency in articulation was the major remaining problem for children with dyslexia, word-level skills, and vocabulary knowledge moderate the influence of verbal working memory on connected oral text reading fluency in adolescents with dyslexia. Those researches mentioned that there was a significant prediction for verbal working memory related to connected text oral reading fluency in a sample of adolescents with dyslexia. However, they found a negative interaction between oral reading memory and expressive words, and both working memory and vocabulary knowledge can be a significant predictor of oral reading fluency in adolescent students with dyslexia (<u>Rose & Rouhani, 2012</u>).

The explanation of reading types and poor working memory explain the role of memory. <u>Dehn (2016)</u> mentioned that in order to convert printed letters to phonemes, learners need to rely on decoding reading, which requires both visual-special processing and the capability of visual-special short-term memory (<u>Albano et al., 2016; Dehn, 2016</u>). Also, learners need to match the printed letters with phonemes, which helps record visual stimuli. In order for the recording to occur, the learner needs to retain the printed letter long enough (<u>Phillips & Kelly, 2018</u>). After that, short-term phonological memory recalls the gathering sequence of phonemes until they transform the last letter, and the full order of sounds mixes into a full word (<u>Miles & Miles, 2004</u>).

An interesting study <u>Ghani and Gathercole (2013)</u> focusing on investigating the working memory performance and selfreported learning strategies of postsecondary students sufficiently explained the role of working memory for learners with and without dyslexia. <u>Ghani and Gathercole (2013)</u> listed the study strategies, including scheduling, note-taking, organizing information, storing information, concentrating, processing, and internal motivation. A total of 58 students recruited from the disability services of universities and colleges of York and Leeds participated in the study (<u>Ghani & Gathercole, 2013</u>). All students participated in eight tasks in individual sessions lasting 90 minutes with a questionnaire concentrating on study skills. The findings were differently significant among the comparison groups. In all working memory measures, students without dyslexia scored significantly higher compared to students with dyslexia (<u>Ghani & Gathercole, 2013</u>; <u>Nelson, Lindstrom, & Foels, 2015</u>). For the study skills results, older students with dyslexia scored lower on anxiety, concentration, and attention, selecting main ideas, time management, and test strategies (<u>Ghani & Gathercole, 2013</u>).

### Teachers'Knowledge of Dyslexia

Several studies have indicated the extent of teachers' knowledge of dyslexia and its advantages on students' performance in schools (<u>Nascimento, Rosal, & Queiroga, 2018; Washburn, Binks-Cantrell, & Joshi, 2014; Washburn, Joshi, & Cantrell, 2011; Washburn, Mulcahy, Musante, & Joshi, 2017</u>). The more education teachers receive about dyslexia and its characteristics, the more they can meet the needs of those students. <u>Washburn et al. (2011)</u> conducted a study examining preservice teachers' knowledge of dyslexia and basic language constructions in elementary school. A general finding of this study was that teachers hold a misunderstanding that dyslexia is a visual perception deficit rather than an issue with



# Humanities & Social Sciences Reviews eISSN: 2395-6518, Vol 8, No 1, 2020, pp 740-750 https://doi.org/10.18510/hssr.2020.8189

phonological processing. Although the pre-service teachers have some correct knowledge of dyslexia, many of them show misconceptions related to dyslexia, which are profound and could continue during their years of classroom teaching. Therefore, making the teachers aware of phonological awareness is prioritized and could help them to impact the reading and spelling of students with dyslexia (<u>Bell, McPhillips, & Doveston, 2011</u>).

<u>Nascimento et al. (2018)</u> carried out a study exploring elementary teachers' knowledge of children with dyslexia in Brazil. The researchers interviewed 10 teachers using a semi-structured interview and guiding questions. The results showed that teachers had participated in courses, lectures, and training offered by the municipal education department, but never included dyslexia subjects in the offered courses. There are three thematic classifications of dyslexia knowledge; first, training of a teacher does not overcome dyslexia. The teachers pointed out that they had no experience with dyslexia and did not know how to identify children with dyslexia sufficiently. Secondly, the feeling and problems of illiteracy impact dyslexia knowledge (<u>Nascimento et al., 2018; Soriano-Ferrer, Echegaray-Bengoa, & Joshi, 2016</u>). Teachers feel frustrated with children who do not learn, have educational difficulties, and lack family support. Finally, <u>Richardson(1996</u>) article mentioned that school administration lacks knowledge of dyslexia. Richardson stressed the idea of redesigning teacher education programs to improve the undergraduate and postgraduate levels. This author emphasized language processing by improving the regular and special education teachers' knowledge of the language and alphabetic writing system.

<u>Washburn et al. (2017)</u> conducted an exploratory study to identify the ability of teachers with less experience about the characteristics of dyslexia and reading disabilities and whether the degree and type of certificate and exposure to the content of reading increase the teachers' knowledge of the concept of dyslexia. The study involved 271 students from teacher preparation and postgraduate programs from U.S. universities who responded to questions about the difference between the characteristics of dyslexia and reading disabilities. The results showed that half of the teachers had misinformation about dyslexia. At the same time, the teachers' certificates or the courses they received towards language or literacy were not predictive of identifying teachers with language characteristics or misinformation about dyslexia. However, the level of the degree of the certificate was one of the most important predictive variables with the answers of secondary teachers, who had the highest percentage of misconceptions. As a consequence, "teacher preparation programs should ensure that teachers possess the foundational knowledge necessary for providing early systematic reading instruction" (Bos, Mather, Dickson, Podhajski, & Chard, 2001, p.112).

(Washburn et al., 2014) conducted a study aimed at discovering the extent to which pre-service teachers in the United States and the United Kingdom define dyslexia as a difficult language to learn. The researchers used a questionnaire to collect information, with a total of 101 teachers from the United States and 70 participants from the United Kingdom. Generally, the results showed that pre-service teachers from the United States had the highest percentage of knowledge about dyslexia compared to pre-service teachers from the United Kingdom. The results also showed that these teachers had similar responses, with a total of 19 elements. Seven of these elements were related to misconceptions about dyslexia. Similarly, many teachers in integration schools in Ireland and England viewed dyslexia from the perspective of behavior rather than inherent difficulties, which shows that teachers are not sufficiently aware of the appropriate planning and assessment procedures for students with dyslexia (Bell et al., 2011).

As can be noticed from the previous studies, no study concentrated on the teachers' knowledge and practices of dyslexia associated with poor working memory. Although many authors pointed out that there was a strong connection between the weakness of working memory and dyslexia, no study has been conducted to investigate whether teachers are knowledgeable and experienced with dyslexia associated with poor working memory. Therefore, conducting a study in this area may support teachers and reinforce the best practices provided to students with dyslexia in their classrooms.

### **RESEARCH METHODOLOGY**

### **Research Design**

In this study, the researcher used a survey research design, specifically a cross-sectional survey design, which helps researchers collect data at a single point in time (<u>Mills, 2019</u>). The primary purpose of this study was to investigate teachers' familiarity with dyslexia related to poor working memory. More specifically, the researcher examined the association between dyslexia and weak working memory from the teachers' points of view. Additionally, this study explored the relationship between teachers' familiarity and practices of dyslexia associated with poor working memory. The <u>Cambridge</u> (2018) defines familiarity as "a good knowledge of something, or the fact that you know it so well."

### Variables of the study

Independent variables: Teachers' familiarity and practices

Dependent Variable: Dyslexia associated with weak working memory

### The Setting and Population



# Humanities & Social Sciences Reviews eISSN: 2395-6518, Vol 8, No 1, 2020, pp 740-750 https://doi.org/10.18510/hssr.2020.8189

The researcher selected participants from Saudi schools in southern regions of Saudi Arabia. A non-probability convenience sample of subjects (teachers majoring in learning disabilities), along with the method of purposive sampling, was used to collect the data due to the use of an online survey for this study. The population was teachers (N=213) in southern schools of Saudi Arabia who met the criteria and were asked to take the survey, with 114 male teachers and 99 female teachers based on the statistical guide of special education programs in Saudi Arabia (2017). See Table 1. However, only 90 teachers participated in this study.

Region	Male teachers	Female teachers
Assir	60	53
Jazan	33	22
Sabia	9	7
Najran	12	17
Total	114	99
Overall		213

Table	1:	Setting	and P	opulation
		···· (7		

### The Study Instrument

The researcher created the survey to investigate the teachers' familiarity and practices of dyslexia associated with poor working memory. The survey consisted of 22 questions and consisted of three parts. The first part asked about the demographic characteristics of participants, including the teachers' level of schools, age, gender, and the highest level of education. The second part inquired about the teachers' familiarity with dyslexia associated with poor working memory, followed by five Likert-type scale responses ranging from being *very unfamiliar* to *very familiar*. The third part of the survey instrument represented the relationship between teachers' familiarity and practices of dyslexia associated with poor working memory, followed by five Likert-type scale responses ranging from being *very unfamiliar* to *very familiar*.

The Study Instrument						
Den	Demographic Variables					
1	What is the level of schools?					
2	Age?					
3	Gender?					
4	Education?					
5	Experiences?					
Tea	chers' Familiarity with Dyslexia Associated with Weak Working Memory					
6	The ability to retain verbal information in working memory is essential for reading and learning					
7	Dyslexia involves deficits in both phonological loop and central executive functioning.					
8	Weak working memory affects children's acquisition of phonics.					
9	Poor phonics skills are a significant indicator of early literacy problems.					
10	Students with weak working memory unable to analyze sound words.					



- *11 Poor reading comprehension is often related to poor working memory.*
- <sup>12</sup> Children with dyslexia are particularly poor at recalling phonologically novel names for new concepts.

### Practices of Dyslexia Associated with Weak Working Memory

- *13 I provide the students with a list of written directions as a cue.*
- <sup>14</sup> I break a complex procedure into component skills, teach them separately and then working on integrating.
- 15 I use visual organizers to provide a written record of key ideas.
- 16 I incorporate activities that target phonological awareness.
- 17 I use computerized training paradigms to train students' working memory
- 18 I repeatedly rehearse the to-be-remembered information aloud.
- <sup>19</sup> I create a sentence or story from the words or generating visual images of the information.
- <sup>20</sup> *I give enough time for reading assignments to finish and setting up the assignments early.*
- 21 *I write the sheets in the textual styles like Arial, Papyrus (likewise called as sans-serif textual styles)*
- 22 I clarify the importance of new words particularly if they are long words.

### Validity and Reliability

The researcher proposed the study instrument to a few professors with a major in special education at Najran University in order to ensure the validity of the study. The reviewers recommended a few modifications to the Arabic language version of the instrument. However, the researcher investigated the reliability of the study by implementing this survey on a sample of teacher participants (n=30) through the use of Cronbach's alpha.

### **Data Collection**

The researcher asked for an official letter from the dean of the Education College at Najran University and the General Director of Education in Southern Regions of Saudi Arabia to collect data from the participants. The researcher prepared the survey through the use of Qualtrics and provided detailed information about the study and explained that the teachers' confidentiality was protected because the researcher only contacted the special education administrators who delivered the survey to teachers via email.

### **Data Analysis**

After collecting the responses, the researcher transferred them to a computer through SPSS software. The researchers cleaned the data of missed responses and prepared them for analysis. Next, the researcher started analyzing responses based on the proposed questions. The first question, "What are the teachers' familiarity and practices of dyslexia related to poor working memory?" was answered by using descriptive analysis, including means, frequencies, and standard deviations. The second question, "What is the relationship between the teachers' familiarity and practices of dyslexia associated with poor working memory?" was answered through the use of correlation analysis. The third question, "How well can a set of variables predict the teachers' practices of dyslexia associated with poor working memory?" was analyzed using hierarchical multiple regression.

### Results

The first question, "What are the teachers' familiarity and practices of dyslexia related to poor working memory?" was analyzed through the use of descriptive analysis. Table 2 shows the results of teachers' familiarity and practices of dyslexia associated with poor working memory. The mean score for teachers' familiarity is M=2.9921, which indicates that teachers were almost "familiar" with dyslexia associated with poor working memory. However, Table 2 shows that the mean score for teachers' practices was M=3.6078, which corresponds to "familiar" with dyslexia associated with poor working memory. The minimum and maximum values are 1 and 5, respectively; this shows that some of the teachers were unfamiliar, and



some were very familiar with dyslexia associated with poor working memory. However, on average, it can be inferred that all of them were familiar with dyslexia associated with poor working memory.

	Range	Min	Max	Sum	М	SD	Variance	Skewness	Std. Error	Kurtosis	Std. Error
Teachers' Familiarity	4.00	1.00	5.00	269.29	2.9921	.83061	.690	.522	.254	.238	.503
Teachers' Practices	3.40	1.60	5.00	324.70	3.6078	.74430	.554	240	.254	091-	.503
Valid N (listwise)											

Table 2:	Descriptive	Statistics	(N=90)	)
	Descriptive	Dianonos	(1) - 20	,

Next, the analysis for addressing the second research question was performed, which was, "What is the relationship between the teachers' familiarity and practices of dyslexia associated with poor working memory?" For this part, the researcher analyzed the responses through the use of Pearson's correlation because the data were continuous. Table 3 shows these results.

<b>Table 3:</b> Correlations Statistic
--

		Teachers' Familiarity	Teachers' Practices
	Pearson Correlation	1	. 484**
Teachers' Familiarity	Sig. (2-tailed)		.000
	N	90	90
Teachers' Practices	Pearson Correlation	.484**	1
	Sig. (2-tailed)	.000	
	N	90	90

*Note.* \*\* Correlation is significant at the 0.01 level (2-tailed).

In the Pearson correlation test, the researcher tested the correlation of teachers' familiarity and practices of dyslexia associated with poor working memory in Saudi Arabia. Teacher familiarity had a significant relationship with the teaching practices of dyslexia associated with poor working memory in Saudi Arabia (r=0.484, p=.000). This result indicates that if teachers are willing to develop teaching practices of dyslexia associated with poor working memory, they need to increase their knowledge of this disorder.

The last question, "*How well can a set of variables predict teachers' practices of dyslexia associated with poor working memory?*" was analyzed using hierarchical regression to determine the variables that would predict teachers' practices of dyslexia associated with poor working memory (see Table 4).In Model 1, some demographic variables were tested, including experiences, gender, and age, because researchers have documented demographic variables as statistically significant factors on teachers' practices of dyslexia (e.g., Washburn et al., 2017). Also, researchers typically use the demographic variables in the first model. Then the researcher created Model 2 by adding the teachers' familiarity variable because it is attitudinal. After adding the teachers' familiarity variable, the results indicated no significant impact, but the teachers' familiarity had a statistically significant impact on the teachers' practices. Finally, the researcher added the education and level of school variables in the third model because these two variables could predict the teachers' information and teaching practices of dyslexia associated with working memory.

Table 4: Hierarchical Regression Analysis of Teachers' Practices of Dyslexia Associated with Poor Working Memory

	Model 1	Model 2	Model 3
A	193	195	188
Age	(164)	(166)	(160)



Experiences	.109	087	.086
Experiences	(.154)	(.124)	(.122)
Gandar	.177	.274	.280
Gender	(.110)	(.169)	(.173)
Taaahara' Familiarity		.487***	.484***
reachers Fainmanty		(.544)	(.540)
Education		135	136
		(152)	(153)
Level of Schools			029
Level of Schools			(031)
Constant	3.427***	2.096	2.133
$R^2$	.020	.295	.296
$\Delta R^2$	.020	.275	.001
<i>F</i> -statistic	.583	7.031****	5.815***
$\Delta F$	.583	16.389***	.108

# *Note.*\**p*<0.05, \*\**p*<0.01, \*\*\**p*<0.001

Model 1 uses only demographic characteristics as independent variables, and Model 2 uses demographic characteristics with teachers' familiarity as independent variables. Model 3 uses demographic characteristics with teachers' familiarity, education, and level of schools as independent variables. Model 1 ( $R^2 = .020$ ) indicates that experiences, gender, and age have insignificant impacts on the teachers' practices of dyslexia associated with poor working memory.

However, Model 2 indicates that the teachers' familiarity has significant impacts on teachers' practices of dyslexia associated with poor working memory. The variable "teachers' familiarity" had the most positive impact on teachers' practices among all variables (B=0.487, p<0.001), which indicated that teachers who are familiar with dyslexia associated with poor working memory are more likely to use best teaching practices toward dyslexia associated with poor working memory. Model 2 shows excellent improvement in the goodness-of-fit ( $R^2 = .295$ ). By examining Model 3, this model ( $R^2 = .296$ ) indicates that the teachers' familiarity remained significant for teachers' practices of dyslexia associated with poor working memory. In this model, confidence in teachers' familiarity (B=0.484, p<0.001) has positive impacts on teachers' practices of dyslexia associated with qyslexia associated with poor working memory, which infers that teachers with higher familiarity of students with dyslexia associated with poor working memory are more likely to be familiar and knowledgeable of the teaching practices appropriate with those students. However, Model 3 shows no positive impacts on teachers' practices of dyslexia associated with poor working memory are more likely to be familiar and knowledgeable of the teaching practices appropriate with those students. However, Model 3 shows no positive impacts on teachers' practices of dyslexia associated with poor working memory and level of school variables.

# DISCUSSION

The study carried out three essential questions regarding the teachers' familiarity and practices of dyslexia associated with poor working memory. These questions specified the purposes of this study, which mainly focused on the relationship between teachers' familiarity and practices of dyslexia associated with poor working memory, and the major variables that would predict the best practices of teaching dyslexia associated with poor working memory.

For the first question, this study showed that the Saudi teachers of learning disabilities are just familiar with dyslexia associated with poor working memory and appropriate teaching practices for this disability. This result may indicate that teachers have had exposure to adequate knowledge or practices of dyslexia associated with working memory. However, they have not developed their knowledge and practices to be very familiar whenever they need to manage students with dyslexia. This result is different from <u>Washburn et al. (2011)</u> study, who found that many pre-service teachers have little or inaccurate knowledge regarding dyslexia. However, this could indicate that in-service teachers could be more familiar with dyslexia associated with poor working memory. In other words, when teachers spend time teaching students in the schools or have extensive experience in dealing with dyslexic students, they could have more familiarity and teaching practices of dyslexia associated with poor working memory.

For the second question, teachers' familiarity significantly correlated with their teaching practices of dyslexia associated with poor working memory, which many previous studies similarly proved. This finding was comparable to <u>Knight (2018)</u>, who assumed that when teachers have competent knowledge of dyslexia, they may show competent practices of dyslexia. Therefore, "poor knowledge of dyslexia leads to poor practice" (<u>Knight, 2018, p.217</u>).

However, this finding was quite different from <u>Washburn et al. (2011)</u> study, in which the researchers found that teachers had poor knowledge regarding reading constructs for students with dyslexia. In contrast, they were moderately able to teach



students with dyslexia, which indicates that teachers may unexpectedly use appropriate teaching practices without adequate knowledge or awareness about reading challenges of children with dyslexia.

For the third question, the author added some variables including age, experiences, gender, teachers' familiarity, education, and level of schools to see whether they would significantly predict teachers' practices of dyslexia associated with poor working memory. Only teachers' familiarity with dyslexia significantly predicted teachers' practices of dyslexia associated with poor working memory. In order to determine whether teachers possess the best practices of dyslexia associated with poor working memory, they need to enhance their knowledge and readings of dyslexia associated with poor working memory.

This finding was comparable to <u>Nascimento et al. (2018)</u>, who believe that teachers can be prepared to deal with dyslexic students if they deepen their knowledge about the symptoms and characteristics associated with dyslexia. Also, increasing teachers' familiarity with dyslexia can lead them to adjust their teaching practices in a way that supports children with dyslexia to release their isolation in the school environment and express themselves. Therefore, investigating teachers' familiarity with dyslexia associated with working memory can demonstrate how well they use their teaching practices to meet the needs of students with dyslexia and poor working memory.

In order to enhance teachers' familiarity and practices of dyslexia associated with poor working memory, teachers need to follow the author's suggestions. First, school principals should allow adequate time for training teachers, focusing on increasing the teachers' knowledge and teaching strategies for students with dyslexia and poor working memory. This additional time can undoubtedly afford them the best practices and eliminate ineffective practices used to teach those students. It is essential to take care of teachers' school load when planning for the training because this can allow teachers to attend all the training sessions.

Additionally, it is undeniable that the importance of strengthening multidisciplinary teams can be effective in supporting students with dyslexia and poor working memory. <u>Nascimento et al. (2018)</u> believe that psychologists, speech therapists, and psycho-pedagogues are commonly absent in multidisciplinary teams, which may result in their lack of knowledge and teaching practices of dyslexia. The school principals should stress the collaboration of a multidisciplinary team to work together with teachers in learning about dyslexia and poor working memory.

Thirdly, most Saudi teachers lack the knowledge of neuroeducation, genetics, and brain matters due to the weakness of college preparation programs, which are very important to understand the mechanism of dyslexia and poor working memory. It would be very beneficial for teachers to undertake some courses in the area of neurology that require them to visit neurological labs. Here they may observe actual brains and explanations of how the brain processes information and reading and the related parts of the brain responsible for reading words. This experience may certainly expand their familiarity with the relationship between dyslexia and weak working memory and expose them to recent practices to overcome this disorder.

Finally, the results showed that teachers' familiarity was a significant predictor of the relationship with teachers' practices of dyslexia associated with poor working memory. This finding necessitates the implementation of awareness programs about dyslexia and working memory, which may improve the teachers' practices with this disorder. It is essential to focus on increasing teachers' knowledge of evidence-based practices appropriate for students with dyslexia and poor working memory. Trainees should be trained by "evidence-based, using up-to-date academic knowledge, which covers the biological, cognitive, and behavioral aspects of dyslexia" (Knight, 2018, p. 217).

# CONCLUSION AND IMPLICATIONS

This study mainly examined teachers' familiarity and practices of dyslexia associated with poor working memory. The findings indicated that Saudi teachers are not yet very familiar with dyslexia associated with poor working memory. Moreover, the teachers' familiarity is the most predictable variable among all the variables to improve the teachers' teaching practices of dyslexia associated with working memory. As a future scope, Saudi education should make significant changes to improve the teachers' knowledge and teaching strategies of dyslexia associated with poor working memory. Personally, it would be beneficial for Saudi education to follow some of the recommendations proposed by <u>Richardson (1996)</u>. For example, the colleges of education at Saudi universities need to adopt the education of multisensory, structured language in the preparation of pre-service teachers' education. Additionally, the administrative staff needs in-service education in collaboration with psychologists, speech-language pathologists, regular and special education teachers, reading specialists, and guidance counselors. Finally, teachers need to know that providing a modified curriculum and methods, such as multisensory, structured education is effective in teaching children with dyslexia from preschool through the fourth grade.

# LIMITATIONS

The main limitation of this study was the sample size of the study population, which was too low in terms of reality. The recommended sample size was 130 teachers, including male and female teachers, but only 90 teachers participated in this



study. Thus, it will be challenging to generalize the results of this study to all regions of Saudi Arabia. Another limitation of this study was the lack of dyslexia studies conducted in Saudi Arabia. Although the author found a few studies that investigated teachers' perceptions of interventions to overcome dyslexia, no studies have reviewed teachers' familiarity with dyslexia or dyslexia associated with poor working memory; this challenged the author to discuss the findings with the same demographic population.

# ACKNOWLEDGMENTS

This study was supported by a grant from the Deanship of Scientific Research at Najran University (NU/SHED/16/197). I would like to thank all participating teachers.

### REFERENCES

- 1. Action, D. (2012). Dyslexia Still Matters Dyslexia in our Schools Today: Progress, Challenges, Solutions. *Dyslexia Action, York, June.*
- 2. Albano, D., Garcia, R. B., & Cornoldi, C. (2016). Deficits in working memory visual-phonological binding in children with dyslexia. *Psychology & Neuroscience*, 9(4), 411. <u>https://doi.org/10.1037/pne0000066</u>
- 3. Alloway, T. P. (2006). How does working memory work in the classroom? *Educational Research and Reviews*, 1(4), 134-139.
- 4. Bell, S., McPhillips, T., & Doveston, M. (2011). How do teachers in Ireland and England conceptualize dyslexia? *Journal of research in reading*, 34(2), 171-192. <u>https://doi.org/10.1111/j.1467-9817.2009.01419.x</u>
- Booth, J. N., Boyle, J. M., & Kelly, S. W. (2014). The relationship between inhibition and working memory in predicting children's reading difficulties. *Journal of research in reading*, 37(1), 84-101. <u>https://doi.org/10.1111/1467-9817.12011</u>
- Bos, C., Mather, N., Dickson, S., Podhajski, B., & Chard, D. (2001). Perceptions and knowledge of preservice and in-service educators about early reading instruction. *Annals of dyslexia*, 51(1), 97-120. https://doi.org/10.1007/s11881-001-0007-0
- Bull, R., & Johnston, R. S. (1997). Children's arithmetical difficulties: Contributions from processing speed, item identification, and short-term memory. *Journal of experimental child psychology*, 65(1), 1-24. <u>https://doi.org/10.1006/jecp.1996.2358</u>
- 8. Busz, T. E., & Oginska-Dutkiewicz, B. (2015). Developmental Gains for a Child With Dyslexia and Allergies.
- 9. Cambridge, D. (2018). Familiarity [Online]. Retrieved from https://dictionary.cambridge.org/ dictionary/english/familiarity:.
- 10. Daloiso, M. (2017). Supporting learners with dyslexia in the ELT classroom: Oxford University Press.
- 11. Dehn, M. J. (2016). Working Memory and Dyslexia. eHearsay, 28.
- 12. Education, M. o. S. (2019). Ministry of Saudi Education. Retrieved from https://www.moe.gov.sa/en/Pages/default.aspx.
- 13. Gathercole, S. E., & Alloway, T. P. (2004). Working memory and classroom learning. Dyslexia Review, 15, 4-9.
- Gathercole, S. E., Alloway, T. P., Kirkwood, H. J., Elliott, J. G., Holmes, J., & Hilton, K. A. (2008). Attentional and executive function behaviors in children with poor working memory. *Learning and individual differences*, 18(2), 214-223. <u>https://doi.org/10.1016/j.lindif.2007.10.003</u>
- Ghani, K. A., & Gathercole, S. E. (2013). Working memory and study skills: a comparison between dyslexic and non-dyslexic adult learners. *Procedia-Social and Behavioral Sciences*, 97, 271-277. <u>https://doi.org/10.1016/j.sbspro.2013.10.233</u>
- Higgins, J., & Eden, R. (2018). Cogenerated understandings of mindfulness-based breathing in elementary mathematics classrooms. *The Journal of Educational Research*, 111(6), 678-689. <u>https://doi.org/10.1080/00220671.2017.1396438</u>
- 17. Jeffries, S., & Everatt, J. (2004). Working memory: Its role in dyslexia and other specific learning difficulties. *Dyslexia*, 10(3), 196-214. <u>https://doi.org/10.1002/dys.278</u>
- Jordan, J. A., Wylie, J., & Mulhern, G. (2010). Phonological awareness and mathematical difficulty: A longitudinal perspective. *British Journal of Developmental Psychology*, 28(1), 89-107. <u>https://doi.org/10.1348/026151010X485197</u>
- Kane, M. J., Brown, L. H., McVay, J. C., Silvia, P. J., Myin-Germeys, I., & Kwapil, T. R. (2007). For whom the mind wanders, and when: An experience-sampling study of working memory and executive control in daily life. *Psychological science*, 18(7), 614-621. <u>https://doi.org/10.1111/j.1467-9280.2007.01948.x</u>
- 20. Knight, C. (2018). What is dyslexia? An exploration of the relationship between teachers' understandings of dyslexia and their training experiences. *Dyslexia*, 24(3), 207-219. <u>https://doi.org/10.1002/dys.1593</u>
- 21. Miles, T. R., & Miles, E. (2004). Dyslexia and mathematics: Psychology Press.
- 22. Mills, G. E. (2019). Educational Research: Competencies for Analysis and Applications, 12th Edition.



- 23. Nascimento, I. S. d., Rosal, A. G. C., & Queiroga, B. A. M. d. (2018). Elementary school teachers' knowledge of dyslexia. *Revista CEFAC*, 20(1), 87-94. <u>https://doi.org/10.1590/1982-021620182019117</u>
- Nelson, J. M., Lindstrom, W., & Foels, P. A. (2015). Test Anxiety Among College Students With Specific Reading Disability (Dyslexia) Nonverbal Ability and Working Memory as Predictors. *Journal of learning disabilities*, 48(4), 422-432. <u>https://doi.org/10.1177/0022219413507604</u>
- 25. Nicolson, R. I., Fawcett, A. J., & Baddeley, A. D. (1992). Working memory and dyslexia. Report LRG, 3, 91.
- 26. Phillips, S., & Kelly, K. (2018). Assessment of learners with dyslexic-type difficulties: Sage.
- Pradhan, B., Parikh, T., Sahoo, M., Selznick, R., & Goodman, M. (2017). Current understanding of dyslexia and pilot data on the efficacy of a mindfulness-based psychotherapy (MBR-RAM) model. *Adolescent Psychiatry*, 7(1), 44-55. <u>https://doi.org/10.2174/2210676607666170607160400</u>
- 28. Rapgay, L. (2019). Mindfulness and memory in early Buddhism: a response to Ven. Anālayo. *Mindfulness*, 10(3), 590-591. <u>https://doi.org/10.1007/s12671-018-1033-x</u>
- 29. Reid, G., Elbeheri, G., & Everatt, J. (2015). Assessing Children with Specific Learning Difficulties: A teacher's practical guide: Routledge. <u>https://doi.org/10.4324/9781315693873</u>
- 30. Richardson, S. O. (1996). Coping with dyslexia in the regular classroom: Inclusion or exclusion. *Annals of dyslexia*, 46(1), 37-48. <u>https://doi.org/10.1007/BF02648170</u>
- 31. Rose, L. T., & Rouhani, P. (2012). The influence of verbal working memory depends on vocabulary: Oral reading fluency in adolescents with dyslexia. *Mind, Brain, and Education,* 6(1), 1-9. <u>https://doi.org/10.1111/j.1751-228X.2011.01135.x</u>
- 32. Rouweler, L., Varkevisser, N., Brysbaert, M., Maassen, B., & Tops, W. (2019). The Flamingo test: a new diagnostic instrument for dyslexia in Dutch higher education students. *European Journal of Special Needs Education*, 1-15. <u>https://doi.org/10.1080/08856257.2019.1709703</u>
- 33. Soriano-Ferrer, M., Echegaray-Bengoa, J., & Joshi, R. M. (2016). Knowledge and beliefs about developmental dyslexia in pre-service and in-service Spanish-speaking teachers. *Annals of dyslexia*, 66(1), 91-110. <u>https://doi.org/10.1007/s11881-015-0111-1</u>
- 34. Swanson, H. L., Zheng, X., & Jerman, O. (2009). Working memory, short-term memory, and reading disabilities: A selective meta-analysis of the literature. *Journal of learning disabilities*, 42(3), 260-287. <u>https://doi.org/10.1177/0022219409331958</u>
- 35. Toffalini, E., Marsura, M., Garcia, R. B., & Cornoldi, C. (2019). A cross-modal working memory binding span deficit in reading disability. *Journal of learning disabilities*, 52(2), 99-108. <u>https://doi.org/10.1177/0022219418786691</u>
- 36. Washburn, E. K., Binks-Cantrell, E. S., & Joshi, R. M. (2014). What do preservice teachers from the USA and the UK know about dyslexia? *Dyslexia*, 20(1), 1-18. <u>https://doi.org/10.1002/dys.1459</u>
- 37. Washburn, E. K., Joshi, R. M., & Cantrell, E. B. (2011). Are preservice teachers prepared to teach struggling readers? *Annals of dyslexia*, 61(1), 21-43. <u>https://doi.org/10.1007/s11881-010-0040-y</u>
- 38. Washburn, E. K., Mulcahy, C. A., Musante, G., & Joshi, R. (2017). Novice Teachers' Knowledge of Reading-Related Disabilities and Dyslexia. *Learning Disabilities: A Contemporary Journal*, 15(2), 169-191.
- Wong, A. M.-Y., Ho, C. S.-H., Au, T. K.-F., McBride, C., Ng, A. K.-H., Yip, L. P.-W., & Lam, C. C.-C. (2017). Reading comprehension, working memory and higher-level language skills in children with SLI and/or dyslexia. *Reading and Writing*, 30(2), 337-361. <u>https://doi.org/10.1007/s11145-016-9678-0</u>
- 40. Xu, M., Tan, L. H., & Perfetti, C. (2019). 10 Developmental Dyslexia in Chinese. *Developmental Dyslexia across Languages and Writing Systems*, 200. <u>https://doi.org/10.1017/9781108553377.010</u>