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Original Paper

A Comparison of Teachers Perceptions, Misconceptions, and Teaching of Students with Dyslexia

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Abstract

Teachers commonly work with students with dyslexia. They may not have been aware that the reason a student struggled with many academic tasks, was due to challenges with mental processing associated with the dyslexia. Dyslexia tends to be difficult to recognize. However, the commonly associated behaviors such as acting out, withdrawing, or simply trying and failing are readily noticeable. Because of the hidden nature of dyslexia, many teachers may attribute students' lack of academic success to other easily explainable issues, such as attention deficit disorder or issues with family function. Students' academic and potentially life-long success, could be influenced by the lack of teacher awareness or ability to recognize the executive functioning issues of students with dyslexia. Thus, there is a need for teachers at all levels to understand what dyslexia is, hold accurate conceptions of dyslexia, and know how to effectively support the learning of students with dyslexia. Given the critical role teachers play in working with students with dyslexia and the potential teachers have to support or hinder students long term success, there is warrant for examining the perceptions, attitudes, misconceptions, and practice of teachers working with students with dyslexia.

Keywords

dyslexia, misconceptions, teaching, grade level difference, professional development

1. Introduction

Teachers' understanding of dyslexia and effective use of instruction to teach students with dyslexia, is fundamental to the success of students. Therefore, we need to have deeper understanding of the perception, misconceptions, and instructional approaches of teachers associating with students with dyslexia. Prior research has explored some aspects of teachers' understanding of dyslexia (e.g.,

Washburn, Binks-Contrell, Joshi, Martin-Chang, & Arrow, 2016; Washburn, Mulcahy, Joshi, & Binks-Contrell, 2016; Washburn, Mulcahy, Musante, & Joshi, 2017) but there are gaps in our understanding of the relationship among teachers' perceptions, misconceptions, instructional approaches, and teacher personal and professional variables associated with teaching students with dyslexia. For example, there is a need to understand how K-12 inservice teachers in upper grades (middle and high school) understand dyslexia and support the learning of students with dyslexia. There is also a need to determine how the perceptions and instructional approaches toward students with dyslexia, may be different between rural, suburban, and urban teachers. The gaps in knowledge and the importance of understanding dyslexia, for the success of the students with the disability, motivated us to explore the similarities and differences between and among teachers working in different K-12 education conditions.

2. Review of Literature

2.1 Myths and Misconceptions of Dyslexia

The abundant and readily available scientific and empirically based information about dyslexia (e.g., Lyon, Shaywitz, & Shaywitz, 2003; Snowling, 2013), does not seem to be sufficient to overcome the commonly held myths and misconceptions of the disorder, including the very common perception that dyslexia is essentially letter reversals (Thorwarth, 2014). Previously, dyslexia was commonly used to define the thinking of people with brain damage, however, Williams and Lynch (2010) have attempted to change the conversation and associate the term dyslexia with a learning disability associated with phonological awareness and executive brain processing functions. Williams and Lynch (2010) also explore the myth that a person with dyslexia perceives words are jumping around on pages of text and provides the clarification that dyslexia is not a visual problem, but a language processing issue at the phoneme level. As Williams and Lynch (2010) explain, people with dyslexia tend to have average to high intelligence scores, countering the common misconception about people with dyslexia having low intelligence scores.

Given how common it is for people, including preservice teachers, to hold misconceptions of dyslexia (Wadlington & Wadlington, 2005), it is possible that many inservice teachers (Regan & Woods, 2000) may also hold many of the same misconceptions of dyslexia. Given the critical role that teachers play in recognizing and supporting the learning of students with dyslexia, there is justification for continuing to examine the perceptions and misconceptions of dyslexia that are held by teachers. The research is particularly important as the knowledge of dyslexia increases and the approaches for teaching learners with dyslexia becomes more scientifically based.

2.2 Teacher Knowledge and Perceptions of Dyslexia

Educators in all grade levels need preparation to be able to identify and provide evidence-based instruction to students struggling in reading due to dyslexia (Mills & Clarke, 2017). For example, teachers can more effectively teach students with dyslexia if they understand the constructs of language;

which includes phonology, phonics, and morphology (Washburn, 2009). However, it is possible that there is a mismatch between what educators believe and think about effective reading instruction and the evidence supporting effective reading instruction. In addition, many teachers perceive themselves as only somewhat prepared to teach struggling readers (Bos, Mather, Dickson, Podhajski, & Chard, 2001), and are uncomfortable working with students with reading difficulties (IDA, 2018; Shaywitz, Gruen, & Shaywitz., 2007; Shaywitz, Morris, & Shaywitz, 2008).

Teachers' lack of comfort with working with students with dyslexia, is consistent with their self-perceived limitations in knowledge of teaching students with learning disabilities in general (Bos et al., 2001). Paradoxically, Washburn (2009) reports teachers tend to feel confident in their abilities to identify and work with students who struggle with reading. The conflicting results of studies on teacher comfort with working with students with dyslexia, may be indicators of teachers overestimating their abilities to effectively teach students with dyslexia. Washburn (2009) argues that teacher preparation programs may not provide teachers with knowledge about basic language constructs and reading instruction that is scientifically based. Thus, it seems logical for Williams (2012) to report that teachers' knowledge of effective instruction for students with dyslexia is elusive. Efforts to include the science of reading in initial teacher preparation programs, may enhance teachers' understanding of dyslexia and effective strategies for teaching students with dyslexia. However, some secondary teacher preparation programs may not integrate the science of reading and teaching of dyslexia as part of the curriculum (Shaywitz, Morris, & Shaywitz, 2008). The lack of knowledge about dyslexia, has caused an increase in placement of students with dyslexia in special education services which, in most cases, is not an appropriate intervention, as the students commonly have average or above average intelligence (Ferrer, Shaywitz, Holahan, Marchione, & Shaywitz, 2010; Mills & Clarke, 2017). Thus, even with additional professional development and preparation it is possible that teachers continue to lack sufficient or accurate skills and knowledge to teach students with dyslexia.

Inservice teachers tend to hold higher levels of knowledge of phonology and phonics than preservice teachers, yet both groups of teachers share an array of definitions of dyslexia (International Dyslexia Association (IDA), 2018). Both groups of teachers fail to recognize morphology in relation to dyslexia (Bjorn, 2016). Thus, both inservice and preservice teachers potentially perceive dyslexia as a visual perception deficit rather than a phonological processing issue.

The potentially higher level of understanding of dyslexia by inservice teachers, could be attributed to their years of experience teaching children with dyslexia, and their post graduate education or professional development focused on working with students with dyslexia. While inservice teachers tend to be more comfortable identifying struggling readers than preservice teachers, both groups are likely to overestimate their knowledge of language processing (Aro, 2015). As we continue to gain a deeper understanding of dyslexia, there is a need for educators to learn or keep learning the knowledge and skills needed to effectively support students with dyslexia (Flink, 2014; Mills & Clark, 2017; Shaywitz, Morris, & Shaywitz, 2008; Shaywitz et al., 2007). Initial teacher preparation programs may

not be adequate for preparing teachers to assist students who are diagnosed with dyslexia or display dyslexic traits or symptoms (Shaywitz & Shaywits, 2017; Shaywitz, Morris, & Shaywitz, 2008). This provides support for the need for teachers to engage in on going professional development.

Due to the range of teachers' knowledge of how to effectively teach students with dyslexia, and the mixture of evidence of teachers being comfortable teaching students with learning disabilities, there is a need to continue to research on teachers' understanding and engagement in teaching students with dyslexia. In particular, there is a need to examine how teachers perceive students with dyslexia should be taught, teachers' knowledge and conceptions of dyslexia, comfort teaching students with dyslexia, and their engagement in professional development focused on dyslexia.

2.3 Teaching Students with Dyslexia

According to the International Dyslexia Association (2017), an estimated 15% to 20% of the general population experiences one or more symptoms of dyslexia or reading problems in their first three years of school, suggesting it is highly likely that nearly all K-12 teachers are tasked with teaching students with dyslexia. Thus, all teachers should have working knowledge of teaching students with reading disabilities and the ability to support student acquisition of basic literacy skills. Dyslexia is a complex information processing disorder of the brain, which increases the need for teachers to understand the psychology of dyslexia, the individual factors of the students with dyslexia, and the complex interactions that take place in school-based learning (Kraus, 2012; Mills & Clarke, 2017; Ramus, 2014). Therefore, teachers need to recognize that many students who struggle with learning may have trouble with reading and need interventions (Frost, 2000). This is particularly true for students with dyslexia who are learning the fundamentals of reading. It is important to note, many teachers can recognize students who struggle to read but feel ill-equipped to provide interventions or support (Frost, 2000). It is also interesting to note that rural educators have been routinely neglected from many of the studies of educator knowledge and engagement in teaching students with dyslexia.

The challenges for teachers to support the learning of students with dyslexia, increases as the students get older. Secondary level teachers frequently lack knowledge of how to support students with dyslexia (Joshi, 2004). We maintain, with the exception of reading specialists, that there is a low likelihood that secondary teachers are taught how to effectively support students with reading disabilities in their preparation programs. Many secondary teachers hold the perception that students with dyslexia should have learned the skills necessary to succeed while in elementary school (Joshi, 2004). We speculate that many secondary teachers lack awareness that students may need to receive continuous support, in a range of learning opportunities, to develop the skills necessary to engage in the complexity of reading and writing more sophisticated text.

Without accurate knowledge about how to teach students with dyslexia, teachers may respond with inappropriate feedback to the students' errors or encourage maladaptive strategies, such as guessing at words based on context rather than paying close attention to all the letters in a word. The potential for teachers to lack the knowledge needed to effectively work with students with dyslexia, provides

justification for assessing teachers' knowledge and perceptions of effective practices, in order to optimize the reading and writing of students with dyslexia. It is particularly important to know more about how secondary teachers compare to elementary teachers, and how urban teachers compare to their rural peers.

2.4 Teaching Students with Dyslexia-Evidence Based Practices

One of the primary practices that teachers need in order to work with students with dyslexia, is the ability to recognize students who have dyslexia, particularly the ability to recognize young learners. Reading interventions that foster student development of effective reading strategies, have greater success when implemented before grade 2 (Griffiths & Stuart, 2013; Bos et al., 2001). Effective early interventions involve, "explicit teaching of grapheme-to-phoneme correspondences (structured systematic phonics), using segmenting and blending strategies, to master the alphabetic principle" (Griffiths & Stuart, 2013, p. 99). Further, students benefit when evidence-based interventions are integrated into broader literacy curriculum assignments (Griffith & Stuart, 2013), which supports the expectation for all teachers being prepared to teach students with dyslexia. Teaching Phonological Awareness (PA) is necessary when teaching students with or without a learning disability, but students with dyslexia may require specific and more intense instruction in PA (Griffiths & Stuart, 2013). Teaching PA involves instructing children to concentrate on speaking syllables and words phonemes in different ways (National Reading Panel, 2000). Older students commonly need intensive and focused approaches beyond PA such as phonics, which requires a more structured design, implementation, and a teacher with an advanced knowledge level providing the instruction (Griffiths & Stuart, 2013). Students in the more advanced grade levels (e.g., 6-12 grades) still struggling with reading, are more likely to have moderate to severe expression of dyslexia which again, requires intense and structured interventions and teachers who have the proper knowledge and skills to implement the intervention (Griffiths & Stuart, 2013).

Griffiths and Stuart (2013) maintain that there are several critical variables to consider when working with students with a severe expression of dyslexia. The variables include the intensity of instruction, the integrity of the program being used, the skill/ability and knowledge of the teacher**,** the focus of the program, the multidimensionality of the program, the student's experience/exposure, and the base reading ability of the student. Some classroom strategies provided for teachers include making assignments and lesson directions clear and simple, limiting extraneous stimuli, scaffolding assignments, providing opportunities for contextual reading, using assistive technology in reading and writing activities, maintaining routines, and using a combination of oral and written instructions for assignments (IDA, 2013). We argue that the complexity of the evidence-based dyslexia interventions requires extensive preparation, which most likely includes additional professional development.

Thus, teachers need to be aware of the complexities that students with dyslexia frequently experience when processing written information and have the knowledge necessary to address the associated learning challenges or barriers (Exley, 2003). When teaching students with dyslexia, it is important that

teachers keep in mind that students with learning disabilities are capable of learning what needs to be learned (Exley, 2003). However, teachers must also be cognizant that students with dyslexia, may engage in learning in ways that can be perceived to be non-traditional or unique as they learn to cope and compensate for their learning disabilities (Exley, 2003).

In addition to issues of learning and reading, a child with dyslexia is likely to also experience negative social and emotional consequences due to the disorder (IDA, 2013). Students with dyslexia may feel stressed or anxious as their learning needs are not met by traditional instruction, which can result in social isolation or motivate students to act out in the classroom due to frustration (IDA, 2013). Teachers should be prepared to recognize the possibility of students becoming frustrated and provide support for meeting the child's learning, without isolating them from their peers (IDA, 2013). For example, teachers can listen to students' frustrations calmly, reward the child for their effort and not just their finished work, and help students set goals that are realistic (IDA, 2013).

Because it is fundamental for teachers who teach students with dyslexia to know their students and know how they learn, there is justification for empirically documenting what the teachers perceive to be effective ways for teaching their students with dyslexia. We anticipated their responses would reveal common misconceptions or limited to no knowledge of how to effectively teach students with dyslexia. We also anticipated that the teachers would share very few evidence-based practices for teaching students with dyslexia.

3. Method

3.1 Research Question

Our awareness and concern for the success of students with dyslexia and the gaps in the literature led us to ask; what are teachers' perceptions, knowledge, misconceptions, and instruction strategies to address the learning of students with dyslexia, and are there differences between and among teachers based on circumstances? To answer this question, we developed the following guiding research questions:

1. *What are some of the common misconceptions of dyslexia held by teachers?*
2. *How do teachers define dyslexia and what is the quality and accuracy of their definition?*
3. *What are the relationships among the teachers' perceived knowledge and practices for teaching students with dyslexia and their myths and misconceptions of dyslexia?*
4. *Are there differences in perceptions, knowledge of, and attitudes toward dyslexia among teachers at different grade levels?*
5. *Is there a relationship between coursework or professional development in dyslexia and teachers' perceptions, knowledge of, and attitudes toward dyslexia?*
6. *How do teachers perceive they should most effectively teach students with dyslexia?*

3.2 Participants

Our participants were K-12 teachers working in a region of the southern United States. We had 59 educators complete our survey, of which six identified as male and 53 identified as female. The average age of our participants was 44.94 years old (*SD* = 12.63) and their average years of experience teaching was 16.50 years (*SD* = 10.65). The majority of the teachers worked in rural school districts (76.3%), followed by suburban school districts (16.9%) and the remaining indicated that worked in urban environments (6.8%). The teachers were split between working in low-income (50.8%) and lower-middle income (45.8%) school districts, with 3.4% indicating working in a middle-income school district. The participants indicated taking a wide range of college level credit hours (0, 40) which were focused on working with students with disabilities, including dyslexia. Participants also indicated engaging in a wide range of hours of professional development in their careers (0, 400) which were focused on working with students with learning disabilities, including dyslexia. The majority of the participants taught at the elementary level (55.9%), followed by teaching at the middle level (28.8%), and the remaining indicated teaching at the high school level (11.9%).

3.3 Instrument

To conduct our research, we developed an instrument that was focused on the common myths and misconceptions of dyslexia. While there are extant instruments to assess teacher knowledge of dyslexia (e.g., Washburn, Joshi, & Binks-Cantrell, 2011; Washburn, Binks-Cantrell, & Joshi, 2014), these instruments do not focus on myths and misconceptions of dyslexia, do not assess teaching practices, or were developed for use with preservice teachers. Given our interest in inservice K-12 teachers, we contextualized our instrument to reflect common interactions and practices in K-12 schools. We began our instrument development by identifying the array of common myths and misconceptions about dyslexia (e.g., people outgrow dyslexia) and misconceptions about how to teach students with dyslexia (e.g., vision therapy, colored lenses). We then developed a series of selected Likert scale (or Likert like scale) selected response items focused on the myths and misconceptions of dyslexia, teaching students with dyslexia, and evidence based instructional methods for dyslexia. Through our item development process, we also identified some items that would be effective in a free response format.

Following the development of the items, we reviewed them for applicability to K-12 settings, possible redundancy, and alignment with our research questions. We eliminated some items to shorten the survey to increase likelihood of completion and to reduce redundancy. Once we developed our working survey, we shared it with experts in reading science and those who worked with students with dyslexia. Based on their feedback, we made minor changes to our survey.

Our final survey contained ten demographic items, three free response items, and 24 selected response items. Our free response item includes the prompt, “Please provide your definition of dyslexia” and “What is the most effective way to teach students with dyslexia”. Our selected response items included statements such as, “Dyslexia is diagnosed by observing learners reversing letters and numbers” and “Medical professionals should be relied upon to properly diagnose dyslexia” which the participants

responded to on a five-point Likert scale.

3.4 Data Collection

The population we were interested in collecting data from, were K-12 teachers working in a range of situations and across disciplines in a region of the southern United States. To collect the data, we distributed an invitation to participate in our research to teachers at multiple schools and districts, in which we had gained permission to conduct our research. We emailed approximately 120 K-12 teachers and we had 54 of the teachers complete our survey.

4. Result

4.1 Data Conditioning and Coding

We began our analysis by conditioning and coding our data. To condition our data, we eliminated any responses that were not 95% complete. We then replaced missing values from skipped items, with the series mean using the SPSS function. We reverse coded the responses to the items that were stated in the negative or were positively stated myths or misconceptions of dyslexia. For example, when a participant answered our item "People outgrow dyslexia" with "Strongly Disagree", (a code of "1") we reversed the code to be "Strongly Agree" (a code of "5"), indicating a high level of knowledge of dyslexia. The coding and conditioning are important to consider when reading and interpreting our study results.

4.2 Misconceptions and Myths

Our first guiding research question was, "What are some of the common misconceptions of dyslexia held by teachers?" To answer this question, we calculated means and standard deviations for each of our myths and misconceptions items (see Table 1). Examining the data descriptively, our analysis reveals low levels of misconceptions with regards to students with dyslexia, intelligence, and with people outgrowing dyslexia. We found that the participants held moderate levels of misconceptions for situations such as "Students with dyslexia seeing things backwards" and "Early interventions can prevent dyslexia". We found that participants held elevated levels of misconceptions for "Repetition is an effective way to teach students with dyslexia" and "Students with dyslexia also have behavior problems" (see Table 1). It is worth noting that in our analysis we found four participants who indicated that they had special education teaching responsibilities yet held multiple misconceptions of dyslexia.

Table 1. Means and Standard Deviations of Participant's Responses to Our Myth and Misconception Items

Survey Item	M	SD
Students with dyslexia score lower on intelligence tests.	1.83	.77
People outgrow dyslexia.	1.88	.65

Physical exercise can lower levels of dyslexia.	2.24	.86
Dyslexia is diagnosed by observing learners reversing letter and numbers.	2.34	.96
Students with dyslexia see things backwards.	2.55	1.07
If a student is diagnosed with dyslexia they will have an IEP.	2.64	1.24
Early interventions can prevent dyslexia.	2.86	1.14
Medical professionals should be relied upon to properly diagnose dyslexia.	2.97	1.26
Dyslexia is more common in males than females.	3.02	.84
Repetition is effective way to teach students with dyslexia.	3.43	.85
Students with dyslexia also have behavior problems.	3.58	1.04

4.3 Defining Dyslexia

Our second guiding research question was, "How do teacher define dyslexia and what is the quality and accuracy of their definition?" To answer this question, we examined the participants' responses to our item asking them to define dyslexia in their own words. We then coded their responses as numbers between 0 and 4. The definitions we coded as 0 conveyed no understanding of dyslexia or conveyed common misconceptions of dyslexia such as, "issues with reading some letters backwards". We coded responses as 1 if the participant's definition conveyed one accurate aspect of dyslexia such as, "the brain's ability to decode words or phrases". We assigned a coding of 2 to the participant's definitions that conveyed an additional aspect of understanding of dyslexia, but still contained inaccuracies, for example, "... a learning disability in which someone struggles with phonics, written, and oral language processing skills." Definitions we assigned a coding of 3, conveyed an understanding of most aspects of dyslexia and no inaccuracies such as, "... a learning disability that affects the way students process sound that aid in decoding… Students with this disability struggle to process sound and correlate those sounds to written symbols used in reading." If we had assigned a coding of 4 the definition would have conveyed an expert understanding of dyslexia such as, "... a specific learning disability that is neurobiological in origin… characterized by difficulties with accurate and/or fluent word recognition and by poor spelling decoding abilities."

A majority of the participants' definitions reflected no (57%) or very limited (30%) understanding of dyslexia (see Table 2). We found few responses (9%) that conveyed multiple aspects of dyslexia, but still contained misconceptions. Only a single response (2%) conveyed a comprehensive definition of dyslexia with no inaccuracies. Similarly, we found only a single response (2%) that conveyed expert knowledge of dyslexia. It should be noted that this participant's response was an exact match (word for

word) for a definition found on the International Dyslexia Association's website.

Table 2. Participants' Definitions of Dyslexia

Code	Representative Response	Percent
0 - no understanding or misconceptions	*"It deals with student having issues reading some letters backwards; therefore, hindering abilities to read correctly."*	57%
1 - one aspect of dyslexia	*"The brain's ability to decode words/phrases."*	30%
2 - partial understanding	*"Dyslexia is a learning disability in which someone struggles with phonics, written, and oral language processing skills."*	9%
3 - understanding of most aspects	*"Dyslexia is a learning disability that affects reading due to the way students process sound that aid in decoding. Phonemic awareness is affected which is sound related. Students with this disability struggle to process sound and correlate those sounds to written symbols used in reading."*	2%
4 - expert understanding	*"Dyslexia a specific learning disability that is neurobiological in origin (it is the underdevelopment of certain brain areas). It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities."* (Note: this definition is word for word the same as the definition provided at: https://dyslexiaida.org/definition-of-dyslexia/)	2%

4.4 Knowledge, Practices, and Misconceptions

Our third guiding research question was, "What are the relationships among the teachers' perceived knowledge and practices for teaching students with dyslexia and their myths and misconceptions of dyslexia?" To answer this question, we calculated the Pearson's correlation to determine the relationship among items measuring knowledge and preparation and the composite score for myths and misconceptions of dyslexia. Our analysis revealed seven significant correlations. Four correlations were significant at $p < .01$ and three correlations were significant at $p < .05$ (see Table 3).

We found a significant relationship between "I have no idea what to do to support students with dyslexia" (reverse coded) and "I effectively teach students with dyslexia to maximize their learning" (r

= .51, p <.01) and "I have formally studied the science of reading" (r = .33, p< .05). Interpreted, our results suggest that as participants' perceptions of being able to support students with dyslexia increase, their perceptions of the level to which they have formally studied the science of reading and their perceptions of their effectiveness in teaching students with dyslexia, to maximize their learning, also increases (see Table 3).

We found a significant relationship between "Teaching students with dyslexia is not my job" (reverse coded), "Students with dyslexia should be taught like all other students" (reverse coded) (r = .33, p < .05), and "I would like to have more education about how to better teach students with dyslexia" (r = .33, p < .05). These results indicate that the more a teacher feels that teaching students with dyslexia is their job, the more a teacher feels students with dyslexia should be taught differently and the more teachers would like to have more education on how to teach students with dyslexia.

We found a significant relationship between "I effectively teach students with dyslexia to maximize their learning" and "I have formally studied the science of reading" (r = .43, p < .01). Indicating that as a teacher's perceptions of effectively teaching a student with dyslexia increases, their perception of the level to which they have studied the science of reading also increases.

We found a significant relationship between the average composite score for myths and misconceptions of dyslexia and "I have no idea what to do to support students with dyslexia" (reverse coded) (r = .60, p < .01) and "Students with dyslexia should be taught like all other students" (reverse coded) (r = .35, p < .01). Indicating that as the participant's average composite score for myths and misconceptions of dyslexia increases, the more they feel that they know how to support students with dyslexia and the less they feel that students with dyslexia should be taught like all other students.

Table 3. Correlation among Perceptions, Practices and Knowledge of Dyslexia

	Teaching students with dyslexia is not my job.	Students with dyslexia should be taught like all other students.	I effectively teach students with dyslexia to maximize their learning.	I have formally studied the science of reading.	I would like to have more education about how to better teach students with dyslexia.	Average Composite Score for Myths and Misconceptions of Dyslexia
I have no idea what to do to support students with dyslexia.	.03	.06	.51**	.33*	-.01	.60**

Teaching students with dyslexia is not my job.	.33*	-.16	.00	.33*	.24
Students with dyslexia should be taught like all other students.		-.14	-.08	.06	.35**
I effectively teach students with dyslexia to maximize their learning.			.43**	-.00	.20
I have formally studied the science of reading.				-.09	.25
I would like to have more education about how to better teach students with dyslexia.					.08

* $p < .05$, ** $p < .01$.

To determine if there were differences in perceptions, practices, and misconceptions of dyslexia among teachers working in rural, suburban, and urban settings, we conducted an ANOVA using school location as the factor. We found a significant difference for preparation to teach students with dyslexia ($F(2, 56) = 3.60$, $p<.05$), with our pair-wise comparison revealing a significant difference ($p = .03$) between urban ($M = 4$, $SD = .82$) and suburban teachers ($M = 2.8$, $SD = .92$). Our analysis suggests that teachers in urban environments, have a higher level of perceived effectiveness to teach students with dyslexia

and maximize their learning than teachers in suburban environments.

4.5 Different Grade Levels

Our fourth guiding research question was, "Are there differences in perceptions, knowledge of, and attitudes toward dyslexia among teachers at different grade levels or teachers from different content areas?" To answer this question, we ran an independent-samples t-test to compare the participants perceived knowledge of the science of reading, their perceptions of the level to which they have formally studied the science of reading, their perceptions of effectively teaching students with dyslexia in order to maximize their learning, and the average composite score for myths and misconceptions of dyslexia between elementary, middle, and high school level teachers. We found a significant difference between elementary (n = 33, M = 3.53, SD = .49) and high school (n = 7, M = 3.11, SD = .26) teachers in the average composite score for myths and misconceptions of dyslexia; t (38) = 2.17, p = .04. Our results indicate that, on average, the elementary teachers had higher levels of accurate understanding of dyslexia than their high school teaching peers.

4.6 Coursework and Professional Development

Our fifth guiding research question was, "Is there a relationship between coursework or professional development in dyslexia and teachers' perceptions, knowledge, and attitudes toward dyslexia?" To answer this question, we calculated the Pearson's correlation to determine the relationship among items associated with the number of college credit hours and hours of professional development that focused on teaching students with learning disabilities, including dyslexia. Our analysis revealed two significant correlations. One correlation was significant at $p < .01$ and one correlation was significant at $p < .05$ (see Table 4).

We found a significant relationship between participant's average composite score for correct perceptions of myths and misconceptions and their perception of their level of knowledge regarding the science of reading (r = .37, $p < .01$). Our finding indicates that as teachers perceive their knowledge of the science of reading to be higher, they hold less myths and misconceptions of dyslexia. We also found a significant relationship between the number of professional development hours that teachers have participated in that are focused on teaching students with learning disabilities, including dyslexia, and the number of college credit hours teachers have had, that were focused on teaching students with learning disabilities, including dyslexia (r=.30, p<.05). Our results indicate that as the number of college credit hours focused on teaching students with learning disabilities increased, the number of professional development hours taken that focused on teaching students with learning disabilities also increased (see Table 4).

Table 4. Correlations Among Misconceptions of Dyslexia, Professional Development, and Perceived Knowledge of the Science of Reading

	College credit hours in teaching students with learning disabilities, including dyslexia.	Professional development in teaching students with learning disabilities including dyslexia.	Perceived knowledge of the science of reading.
Composite Myths and Misconceptions	.17	.20	.37**
College credit hours in teaching students with learning disabilities, including dyslexia.		.30*	-.04
Professional Development hours in teaching students with learning disabilities including dyslexia			.09

* $p < .05$, ** $p < .01$.

4.7 Effective Methods for Teaching

Our sixth guiding research question was, "How do teachers perceive they should most effectively teach students with dyslexia?" To answer this question, we examined the participant's responses to our items asking them "What is the most effective method for teaching students with dyslexia?" and "What is your preferred approach for teaching students with dyslexia?" We then coded their responses as numbers between 0 and 4 based on the research for effective methods for teaching students with dyslexia. We coded responses that provided a method that is ineffective for teaching students with dyslexia or explicitly stated that they did not know a method to teach students with dyslexia as a 0 (see Table 5 for representative responses). We coded responses that provided a method that is somewhat effective as a 1. The responses that we assigned a code of 2, contained one or more aspects of an effective instruction approach, but did not contain a comprehensive method for teaching students with dyslexia. We assigned a code of 3, to responses that included either a specific effective method/program for teaching students with dyslexia or provided multiple effective methods but did not provide details of the method. We gave a code of 4 to responses that stated all pieces of an effective method for teaching students with dyslexia, and did not just state the name of an instructional approach for

teaching students with dyslexia.

Most participant's responses did not provide an effective method or explicitly stated that they did not know an effective method for teaching students with dyslexia (44%). A smaller percentage of participants (16%) provided responses reflective of an aspect of an effective method for teaching students with dyslexia. A larger percentage of participants (26%) provided responses that contained more than one element of an effective method for teaching students with dyslexia. The lowest percentage of participants (14%) listed multiple evidence based strategies for teaching students with dyslexia or provided responses reflective of effective intervention program. We found no responses, e.g., (0%) reflective of a comprehensive explanation of an effective approach for teaching students with dyslexia to maximize their learning (see Table 5).

Table 5. Participants' Perceptions of the Most Effective Method for Teaching Students with Dyslexia

Code	Representative Responses	Percent
0) Not effective or don't know	"I have no idea." "Not to rush, let them go at the own pace when mastering a skill." "I don't teach students with dyslexia"	44%
1) One element of a method that is somewhat effective	"Using multiple reading strategies" "Alphabet writing"	16%
2) One or more element of one of an effective method, but not complete	"Multisensory, systematic, explicit phonics instruction."	26%
3) Effective program stated but not described or most of the elements stated fit well with an effective treatment.	"So far the most effective method I have seen is Barton." "Students with dyslexia require teaching that includes a strong phonological awareness emphasis and explicit phonics instruction, combined with a focus on building reading comprehension and vocabulary. I do not believe that there is only one program or way to teach these students. Dyslexia is on a continuum and students with this learning disability fall all along it, so a one size fits all program will not work for all kids. However the strategies listed above will help students succeed when their individual strengths and weaknesses are addressed."	14%

4) Explanation of all pieces of an effective method.	No responses fit this criterion.	0%

Our analysis of the participants' responses to the most effective way to teach students with dyslexia, revealed a wide range of methods (see Table 6). We found most of the participants stated at least one approach. However, some of our participants indicated they had no idea how to teach students with dyslexia or perceived that they did not work with students with dyslexia. Of those who provided a method for teaching students with dyslexia, 70% of the participants gave at least on evidence-based practice in their response. Eight participants provided two evidence based practices, one participant provided three evidence based practices, and the responses of six participants contained at least one evidence based practice, but also included at least one ineffective practice. Our results indicate that most of the participants use (or would use) at least one recommended approach when teaching students with dyslexia, but they may also be incomplete in their instructional methods or engage in the use of ineffective practices in their instruction.

Table 6. Responses to Preferred Approach for Teaching Students with Dyslexia

Frequency	Definition/Method
10	Focus on phonemics
6	Multi-sensory activities
6	Specific programs
5	One on one
5	Small groups
2	Refer to a specialist
2	Practice reading
2	Modify assignments
2	Text to speech/speech to text
2	Verbal directions
1	Depends on the presenting problem of the student.
1	Monitor the student.
1	Give tools to success
1	Follow dyslexia specialist's guidelines.
1	Visual aids
1	Provide comfort in environment and make learning easier
1	Independently
1	Provide copies of notes
1	Grade more leniently

1	Question student
1	Peer tutoring
1	Repeat instructions
1	Multiple exposure
3	No idea on how to work with students with dyslexia
2	Have not had a child with dyslexia
1	Do not have an approach

5. Discussion and Implications

Building on the extant literature on teacher knowledge of dyslexia (e.g., Washburn, 2007; Washburn, Binks-Cantrell, & Joshi, 2014), teacher misconceptions of dyslexia (e.g., Williams & Lynch, 2010; Wadlington & Wadlington, 2005), and teacher knowledge of how to teach students with dyslexia (e.g., Bos, et al, 2001; Wadlington & Wadlington, 2005), we addressed some critical gaps in the literature. Specially, we examined inservice teachers across the disciplines. We sought to compare elementary level teachers to secondary teachers, and teachers in rural communities to those in suburban and urban communities. We also specifically examined the extent to which teachers held myths of dyslexia, their practices for teaching students with dyslexia, and their definitions of dyslexia. Our analysis revealed a number of important results to consider.

In our examination of the common misconceptions of dyslexia held by teachers, we found the participant held some of the common myths of dyslexia. We speculate part of the reason that the teachers continue to hold these misconceptions, is due to the selective engagement in professional development that may not include opportunities to learn more about dyslexia. It is also possible that some teachers are convinced they hold accurate knowledge of dyslexia which may be supported by other information sources, leading to reinforcement of their false beliefs. Delving deeper into why teachers continue to hold misconceptions of dyslexia and the potential influence of the misconceptions on their practices, is an important direction for future research. The implications of holding misconceptions is the potential for lack of learning support for students with dyslexia, due to application of false information and myths.

We found that many of the participants struggled to provide a comprehensive and accurate definition of dyslexia. The lack of accurate and comprehensive definitions may be reflective of the retention of myths of dyslexia. The retention of myths coupled with high priorities for teaching content may overshadow efforts to learn more about teaching students with dyslexia. The lack of knowledge attainment for teaching students with dyslexia may be reinforced by teachers perceiving that supporting students with learning disabilities is not their responsibility. The constrained knowledge of dyslexia may again, lead teachers to take ineffective or even inappropriate approaches to teaching students with dyslexia.

The relationship we found among knowledge of practices, teaching, and misconceptions of dyslexia

reinforce the notion that misconceptions held by teachers likely influence their practices, and that teachers may overestimate their level of knowledge with dyslexia. Our finding of misconceptions held by some teachers with special education responsibilities, was of particular concern. These teachers are likely perceived to be the experts and relied upon to provide accurate knowledge of dyslexia and effective teaching practices. We also found differences in perceptions of effective approaches for teaching students with dyslexia by school location. These differences suggest that there may be different expectations, resources, knowledge, or experiences dedicated to teaching students with dyslexia depending on the location of the school. We posit that the differences by location are reflective of the potential variations in the distribution of responsibility or focus areas. Urban teachers may be assuming a greater level of obligation for teaching all of their students, a condition that may be more distributed among specialists in suburban settings. The differences in perceptions by location is an important direction for future research. The link between knowledge and comfort with practices teaching students with dyslexia, suggests that perceptions and teaching are inextricably linked and, therefore, should likely be addressed simultaneously.

Our finding of grade level differences in holding misconceptions and myths, is consistent with our anticipated results. We anticipated that the elementary teachers would hold more accurate knowledge because of the focus of their preparation programs, which typically emphasize the science of reading. Due to the likelihood that elementary teachers will support emerging or early readers, they may be more likely to have had additional professional development focused on the science of reading, including knowledge of dyslexia. Our results suggest that secondary teachers are likely in need of more professional development, specifically focused on knowledge of teaching students with dyslexia.

The relationships between accurate perceptions of dyslexia and perceived levels of knowledge of reading and between professional development focused on dyslexia and number of college courses associated with working with students with learning disabilities, suggests that knowledge seeking and knowledge of dyslexia are not necessarily aligned. Teachers may have taken multiple courses and professional development offerings focused on the science of reading and dyslexia, but may still retain some misconceptions of the condition. However, knowing specifically about the science of reading may be needed to increase accurate knowledge of dyslexia. This knowledge should come through coursework and professional development, but our data did not indicate this to be a significant relationship. Our data also suggests that there is a potential for people to over-calibrate their levels of knowledge of the science of reading, as some of our participants indicated high levels of knowledge but continued to hold myths and misconceptions of dyslexia. Furthermore, our data revealed no relationships between holding myths and misconceptions of dyslexia and course work or professional development on the science of reading. Thus, there may be a need to explicitly address the myths and misconceptions of dyslexia in course work and professional development in order to increase teachers' knowledge of the condition. Perhaps a needed direction for research is an exploration of the content of professional development offerings and college coursework related to working with students with

dyslexia, in order to determine what is being taught in these offerings.

In terms of teachers' perceptions of how to effectively teach students with dyslexia, we found about a third of our participants had no idea or provided a method that was not recognized as being an evidence-based practice, which indicates no knowledge of effective practices. The remaining responses were distributed between a single effective practice and recognition of evidence-based programs, which suggests emerging to moderate expert knowledge. Our analysis of the participants' preferences for teaching students with dyslexia resulted in similar distributions of knowledge and lists of effective practices. Our results again, reflect a need for explicit instruction in professional development and teacher preparation on how to teach students with dyslexia using evidence-based approaches.

6. Limitations and Future Research

The first limitation of our research is the sampling of participants. Our sample was rather small, but likely representative of the teachers' perceptions and practices for working with students with dyslexia. However, the smaller sample size limited our statistical power. This may have resulted in some instances of type II errors in which we failed to achieve significant outcomes when there may have been a difference. In our future research, we will attempt to gather data from more teachers to increase our sample size and the associated statistical power.

The second limitation of our study is related to our sampling as well. We drew our sample from a southern region of the United States. It may be possible that the results would be different in other regions or nationally. Future research should include efforts to gather data from teachers in multiple regions to determine if there are regional differences in teachers' perceptions and practices for working with students with dyslexia.

Our third limitation is the potential that the practices shared by the teachers are not reflective of the actual approaches that the teachers use to teach students with dyslexia. Although challenging, a potential and very revealing direction for future research, is to observe teachers teaching students with dyslexia to determine if they are implementing the practices that they share as their instructional approaches to teaching students with dyslexia.

7. Conclusion

Building upon the work of others, exploring facets of teacher knowledge, practices, misconceptions, and myths of dyslexia, we gathered a mixture of quantitative and qualitative data. Our results are consistent with expectations, but do provide a rather concerning trend of teachers holding many myths and misconceptions of dyslexia. They may be using these misconceptions to frame their teaching. The differences among grade levels and among school settings, suggest a potential difference in exposure, resources, and expectations. As we continue to learn more about dyslexia, there is justification for continuing to explore what teachers know about in regards to supporting the learning of students with dyslexia.

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