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Dyslexia and the Speech Pathologist

Jane Roitsch

Abstract

Dyslexia is a complex condition. Timely identification of this disorder is imperative to its optimal management. Students benefit most when the skill sets of specialists trained to recognize markers and characteristics of dyslexia are effectively utilized. This chapter provides a real-life case study describing the process by which a student with a language literacy disorder such as dyslexia was assessed by a speech-language pathologist (SLP). Supporting literature is embedded throughout the case study to enhance learning and support the decisions made by the SLP. The role that the SLP can take in working with students with language literacy disorders such as dyslexia is also discussed. Therefore, the aims of this chapter are threefold: to (a) provide guidance for SLPs who may work with students with language literacy disorders such as dyslexia; (b) educate parents of children, with language literacy disorders such as dyslexia, about SLPs; and (c) support teachers and educational professionals by providing information about professionals who can serve as a resource for students.

Keywords: speech pathologist, speech therapist, assessment

1. Introduction

Dyslexia is a neurological learning disability that impairs a person's ability to read. Estimates suggest that dyslexia is a condition that affects nearly 13% of school-aged children in the United States [1] and more than 10% of populations worldwide [1, 2]. Although not a comprehensive list, the following characteristics are commonly associated with dyslexia [1]:

- Difficulty with the development of phonological awareness and phonological processing skills.

- Difficulty in accurately decoding nonsense or unfamiliar words.

- Difficulty in reading single words in isolation.

- Inaccurate and labored oral reading.

- Lack of reading fluency.

- Various degrees of learning the names of letters and their associated sounds.

- Difficulty with learning to spell.

- Difficulty in word finding and rapid naming.

- Variable difficulty with aspects of written composition.

- Variable degrees of difficulty with reading comprehension.

Vocabulary limitations, poor phonological awareness, and comprehension problems often associated with reading challenges such as dyslexia can become more pronounced in elementary school when the students begin to read to learn [3, 4]. Often, when higher cognitive-level reading processes are required, (i.e., not only reading words but retaining and applying information from what they have read), reading difficulties such as dyslexia often become more apparent as students progress in school. During these developmental years, the effects that reading challenges have on students with dyslexia can be quite apparent. The long-reaching effects of weak reading skills can be devastating. The impact of dyslexia on an individual can lead to poor self-esteem and limited awareness of social, emotional, and academic deficits [5]. Effective identification of dyslexia helps students, parents, and educators to manage the disorder, establish support, and reduce the impact of the condition.

Most students are diagnosed with dyslexia by an educational psychologist following referral from a teacher or other educational professional. It has been well-recognized that reading specialists and special educators provide critical support to students with dyslexia. Often lesser known is that differential assessment and management of language literacy disorders such as dyslexia can be supported by multiple disciplines, such as speech-language pathology or speech therapy [6]. The following section provides insight into the utility of the speech-language pathologist (SLP) in the identification and management of such students.

2. Speech-language pathology and dyslexia

The position statement of the American Speech-Language-Hearing Association (ASHA) states that SLPs "play a critical and direct role in the development of literacy for children and adolescents with communication disorders" and "make a contribution to the literacy efforts of a school district or community on behalf of other children and adolescents" [7]. In order to effectively and appropriately perform these roles, ASHA emphasizes the need for collaboration with written language development experts and those with expertise in each student's specific situation(s) [7]. ASHA states that SLPs are uniquely trained in "normal and disordered language acquisition, and their clinical experience in developing individualized programs for children and adolescents, prepare them to assume a variety of roles related to the development of reading and writing. Appropriate roles and responsibilities for SLPs include, but are not limited to (a) preventing written language problems by fostering language acquisition and emergent literacy; (b) identifying children at risk for reading and writing problems; (c) assessing reading and writing; (d) providing intervention and documenting outcomes for reading and writing; and (e) assuming other roles, such as providing assistance to general education teachers, parents, and students; advocating for effective literacy practices; and advancing the knowledge base" [7].

As students with dyslexia are often characterized as having appropriate language comprehension skills but poor reading abilities, it stands to reason identification of

dyslexia in children and adolescents can be aided by literacy and language assessments from SLPs (i.e., professionals uniquely trained in the assessment and management of expressive and receptive language and speech skills). As will be seen, the role that the SLP can play in assessment and treatment planning for students with language literacy disorders such as dyslexia can be a crucial and pivotal one.

3. Case study

3.1 Methodology

For this chapter, a single-participant case report style was employed. This research methodology is often selected when a work seeks to answer a descriptive or explanatory research question. The question this chapter aims to answer is, "What can a trained SLP do to provide assessment and intervention for students with language literacy disorders such as dyslexia?"

Selection of a case study method is not without limitations. Certainly, generalization of John's outcomes cannot be made to all students with dyslexia and reporting of a single study lacks the rigor of a blinded, systematic, multiple-subject research project. Further, the student selected, the instruments used, and the outcomes reported are at the discretion of the SLP and this author.

However, because a case study report allows for in-depth explanations that are not provided by other methods (e.g., qualitative research designs with multiple participants), John's story is able to be told. A case study design also allows for a real-world context, such as John's to be provided. Thus, the benefits of a case study research design lie in its ability to study real-world situations and address important research questions [8].

3.1.1 Ethical considerations

John's mother consented for his participation in the initial assessment at the SLP's clinic on a university campus in the United States. She also consented for the use of his assessment, outcomes, and history to be included in this work. The author is a professor at the clinic where the SLP works and was granted access to his case study by his mother who consented and the SLP who provided the reporting results. The Human Subject and Institutional Review Board at the university agreed that the author did not need to submit materials for approval, since this case study chapter is one case study in a book chapter and thus does not meet the federal definition of "generalizable." Had this chapter involved a large-scale case study project involving multiple cases, research approval may have been required. All identifying markers were removed and his name was changed to preserve anonymity. His age was also changed by a month.

3.2 Participant

John[1] is a 8-year-, 9-month-old English-speaking male brought for a speech and language assessment by his parents who expressed concerns with his language and literacy abilities. He attends third grade at a local elementary school. John works hard in school, but struggles academically, especially with reading. Specifically, John often writes with letter reversals, omits or substitutes basic sight words when reading aloud, and skips punctuation. **Legible handwriting, appropriate use of**

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[1] Name changed.

punctuation, omitting words and reversals of letters in writing can be characteristics of dyslexia [9].

John's birth history and hearing screening history are unremarkable. The first indications of John's language challenges were noted at the age of 3. He reportedly was able to combine up to three words yet had a lexicon of only about 45 words. He scored below average in expressive language (SS = 80) on The Preschool Language Scale-5 (PLS-5) [10] and his total communication index score fell in the low average range (SS = 85). **Dyslexia has been linked to deficits in expressive and receptive language skills** [11].

When John was in second grade, his academic performance warranted psychoeducational testing by the school's educational psychologist. Overall, John's cognitive functioning was noted higher than average on the Wechsler Intelligence Scale for Children—Fifth Edition (WISC-V; [12]). **Students with dyslexia do not typically test below average on intelligence tests** [13].

On the Wechsler Individual Achievement Test—Third Edition (WIAT-III) [14], John demonstrated strong mathematic abilities. However, his comprehension, sight word reading, phonetic decoding, and written expression were below average. **The presence of early speech sound disorders has been shown to be related to poor phonemic skills and spelling at the age of 5½ and difficulty with reading words at the age of 8** [15].

Although John's listening comprehension was above average range in receptive vocabulary, his oral discourse comprehension score was in the lower average range, indicating possible processing problems. **Weaknesses in semantics, syntax, and oral expression have been shown to contribute to reading difficulties in children with dyslexia** [16].

Presently, John receives speech-language pathology and reading specialist services at his school. The school SLP is targeting articulation of /r/ and /r/ blends in all positions of words in all contexts. **Articulation errors have been identified among students with dyslexia** [17].

In his most recent report card, John received passing grades in all areas except reading. His classroom teachers stated that he is not a fluent reader and his comprehension of written text seems inconsistent based upon the given task and its requirements. He also has reported difficulty with word recall and story event sequencing and challenges with spelling and decoding. **Persons with dyslexia often demonstrate inaccurate word recognition and comprehension, poor spelling and difficulty with decoding** [18]. John receives classroom accommodations and is allowed to read aloud in a quiet area during reading tasks**.**

His teacher and parents state that John is aware of his reading difficulties, and this increases his anxiety and impedes his academic performance. **Children with dyslexia may demonstrate low self-esteem and anxiety, among other feelings because they must work harder in school to keep up with their classmates,** [17]. The SLP determined they needed to assess his language skills in-depth.

4. Assessment

4.1 John's speech-language pathology assessment

The tests that the SLP selected for use with John were (1) tests within the discipline's scope of practice and that (2) utilized both formal and informal measures. Specifically, the SLP selected the Comprehensive Test of Phonological Processing— Second Edition (CTOPP-2) [19], Test of Word Reading Efficiency—Second Edition (TOWRE-2) [20], the Test of Integrated Language and Literacy Skills (TILLS; [21]),

the TILLS Student Language Scale (SLS Questionnaire; [21]), the AIMSweb Spelling and Reading Maze Curriculum Based Measures [22], the Gray Oral Reading Test—Fifth Edition (GORT-5) [23], a morphological awareness probe, and a writing sample.

The International Dyslexia Association (IDA) suggests the following areas be examined to ensure a comprehensive educational dyslexia assessment: Phonological awareness, phonological/language-based memory, rapid automatic naming, receptive vocabulary, phonics and de-coding abilities, decoding of both reading and nonsense words, oral reading fluency, spelling and writing of single words, sentences, paragraphs [1].

4.1.1 Comprehensive Test of Phonological Processing Second Edition (CTOPP-2)

The CTOPP-2 assesses phonological processing skills [19]. As noted previously, phonological processing skills underlie word reading efficiency and deficits in these skills are a key characteristic of language literacy disorders such as dyslexia [3]. Often identified as a fundamental building block of reading, phonological awareness is the ability to attend, reflect on, or manipulate speech sounds in words. Phonological memory is the ability to encode and store phonological information (i.e., speech sounds) [24]. Rapid symbolic naming refers to the ability to quickly name a series of letters, numbers, familiar objects, or colors [25]. Therefore, the SLP opted to employ three subtests to determine John's phonological awareness, phonological memory, and rapid symbolic naming abilities. **Results revealed John scored two standard deviations or more below the mean on all three subtests, scoring lowest on the phonological memory subtest.**

4.1.2 Test of Word Reading Efficiency: Second Edition (TOWRE-2)

The TOWRE-2 includes the subtests of sight word efficiency and phonemic decoding efficiency to determine the ability to pronounce printed words [20]. It has been suggested that persons with reading difficulties have more challenges retaining sight words in memory than readers without difficulties [26]. Additionally, phonemic decoding has been shown to be challenging for students with language literacy disorders such as dyslexia [27]. Thus, the TOWRE-2 subtests lend information about a reading efficiency at the word-level. Word reading efficiency leads to effective reading comprehension and reading ability.

For each subtest, John was instructed to read as many words as he could from the list, as quickly and accurately as possible in 45 seconds. He was permitted to skip words he did not know by saying "pass." He correctly read 42 sight words and 11 pseudowords. He made errors on eight other pseudowords. For the sight word efficiency subtest, John received a scaled score of 77, placing him at the 6th percentile. For the phonemic decoding efficiency subtest, he received a scaled score of 74, placing him at the 4th percentile. His total word reading efficiency index (i.e., a combination of both the sight word and phonemic decoding efficiency tests) was a scaled score of 74, placing him at the 4th percentile. **In sum, his performance on these subtests was significantly below average.**

4.1.3 The Test of Integrated Language and Literacy Skills (TILLS)

The TILLS is an assessment of oral and written language and literacy abilities from the single-sound level to discourse level and is used to (1) identify a language/literacy disorder, (2) describe patterns of strengths and weakness, and (3) track changes over time [21]. To minimize fatigue and optimize time (as John was going to have numerous assessments to complete during his comprehensive

evaluation), the SLP selected subtests that would provide the core, sound/word composite, and written language composite scores.

John's identification core composite raw score of 17 was less than 34, which is the cut score for 8- to 11-year-olds. His score was consistent with having a language/literacy disorder. The sound/word composite evaluated John's intact morphological and phonological awareness abilities across writing, reading, and oral language tasks. John's sound/word raw composite score of 35 was considered low, and translates to a standard score of 69, which is three standard deviations below the mean, and **indicates a significant deficit at the sound/word level.** John scored within the average range on the nonword repetition and reading fluency subtests, but below average on the phonemic awareness, nonword reading, nonword spelling, and written expression-word subtests. **Deficits at the sound/word level are a defining characteristic of dyslexia.**

Two sentence/discourse subtests, the Listening Comprehension and Vocabulary Awareness subtests were administered. John achieved a standard score of 7 and a percentile rank of 14 in Listening Comprehension, indicating borderline average ability. On the Vocabulary Awareness subtest, John achieved a standard score of 6 and percentile rank of 8 (i.e., one standard deviation below the mean). On the written composite score, John achieved a standard score of 69 (i.e., three standard deviations below the mean), **indicating a significant written language deficit.**

4.1.4 The TILLS Student Language Scale (SLS Questionnaire)

The Student Language Scale (SLS) from the TILLS is used to screen for language/literacy disorders by asking parents and teachers to rate their perceptions of student ability. When teachers or parents rate more than two areas on items 1–8 as less than 5, SLS results indicate the student may have a language and/or literacy disorder [21].

Overall, parent and teacher ratings of John's language and literacy abilities were very similar, **indicating John is at risk for language and literacy deficits.** The homeroom teachers rated John below 5 in 7 out of 8 areas, the reading and writing teacher rated John below 5 in 6 out of 8 areas, and John's mother rated him below 5 in 8 out of 8 areas.

4.1.5 AIMSweb Spelling and Reading Maze Curriculum-Based Measures

4.1.5.1 The AIMSweb Spelling Benchmark

The AIMSweb Spelling Benchmark uses two cut scores to identify at-risk students and those in need of intervention. Students who score below the Tier 1 cut score (which is the 45th percentile) are considered at moderate risk; those who score below the Tier 2 cut score (which is the 15th percentile) are considered at severe risk. For John's third grade level, the Tier 1 cut score is 83 and the Tier 2 cut score is 55. John received a score of 56, placing him just above the Tier 2 cut score of 55, **indicating risk for spelling difficulties and the need for intervention.** John spelled two words correctly out of a total of 17 words, and he scored 56 out of 112 for correct letter sequences, determined by pairs of letters that are correctly sequenced within a word [22].

4.1.5.2 AIMSweb Reading Maze Benchmark

The AIMSweb Reading Maze Benchmark uses two cut scores to identify risk for reading comprehension deficits. Students who score below the Tier 1 cut

score (which again corresponds to the 45th percentile) are considered at moderate risk, and those who score below the Tier 2 cut score (which again corresponds to the 15th percentile) are considered at severe risk. For John's third grade level, the Tier 1 cut score is 11 and the Tier 2 cut score is 6. John received a score of 3.5, placing him below the Tier 2 cut score and **indicating significant risk for reading comprehension difficulties and the need for intervention.** John did not finish reading the passage within the time limit, leaving 31 mazes unanswered. **It is possible that the cognitive challenge of decoding at the word level inhibited John's reading rate and adversely affected his overall fluency and comprehension.**

4.1.6 GrayOral Reading Test: Fifth Edition (GORT-50)

The Gray Oral Reading Test (GORT-5) assesses rate, accuracy, fluency, and comprehension. Fluency and comprehension are combined to provide an oral reading index score. For this assessment, John's scaled scores of reading fluency (i.e., rate and accuracy) and comprehension were assessed. First, he was timed while reading short texts aloud, then each section of text was read out loud for John to answer questions [23].

He received a scaled score of 6 for fluency and 7 for comprehension. The mean for each scaled score is 10, with a standard deviation of 3. **This indicates that John's reading fluency is below average.** John's comprehension score fell at the borderline/low average range. His oral reading index was 81, placing him in the 10th percentile, indicative of a below average performance. More specifically, John did not attempt to sound out words (i.e., he did not attempt to decode) but instead skipped over words as the difficulty of the story increased.

4.1.7 Probe of morphological awareness

Morphological awareness refers to the ability to identify morphemes (i.e., the base and any prefixes and suffixes) in words. Research shows that morphological awareness is related to word reading and spelling, vocabulary, and reading comprehension. Probes of morphological awareness often assess morphology and word order by asking for adding or removing word endings [28].

The SLP assessed John's awareness of morphemes in words, relations between words that have common morphemes, and his ability to apply this knowledge when spelling words. Specifically, the examiner said a word and then a sentence with a missing word at the end. John was asked to complete the sentence by making a new word from the word provided at the beginning. For example, the examiner said, "Skip. As he crossed the street, Paul _____." In this instance, the correct answer is "skipped." John answered 90% of the items correctly.

Next, he was asked to spell the complex word (base + suffix). When shown the spelling of the base word, he spelled 40% of the complex words correctly. However, when he was *not* shown the base word, he did not spell *any* of the complex words correctly. **The difference in spelling accuracy levels with and without the base indicates he can use the base to help him spell the complex words, but it unable to accurately generate the spelling of the base on his own.**

Given his performance, morphological awareness would appear to be a strength of John's oral language despite his difficulty in spelling when the base word was removed. John's dichotomy in ability is not an uncommon finding. **Researchers have found phonological challenges can limit the segmenting of affixes (i.e., word-endings) in students with dyslexia** [29].

4.1.8 Writing sample

The examiners prompted John to write an expository text about his favorite sport. The length of the text John submitted was short. Given 10 minutes, he wrote a three-sentence, 29-word paragraph, with an average of 9.8 words per sentence. John's sentence complexity was limited, including 1.3 clauses per sentence and only one compound sentence (using the conjunction "but"). John's writing sample provided basic organization and content as well as some key writing mechanic skills for his grade level. He effectively communicated the basics of the topic he selected, but his explanation lacked supporting details. No errors occurred in subject-verb agreement, capitalization, or punctuation. **Writing samples have been used to identify the specific strengths and weaknesses in persons with dyslexia and language impairment** [30].

Frequent spelling errors were more common with complex words (base + affix) than simple words (base word only). For instance, he spelled "baskle" for basically. This demonstrates that this word may be in his lexicon, but he is not able to spell it correctly likely due to phonological processing and morphological awareness deficits. Additionally, he substituted "b" for "p" as in "bast" for pass.

Overall, John's performance on the independent writing sample illustrated difficulties with syntax and spelling that are consistent with his performance on other tests. These difficulties at the sound, word, and sentence level may have contributed to briefness of the exposition, requiring increased cognitive load and appearing effortful.

4.1.9 Test results and recommendations

Results of testing indicate that John presented with a language/literacy disorder. John's profile is consistent with characteristics of dyslexia in that he tested significantly below average at the sound/word level, including on tests of phonological processing, word reading, and spelling.

The SLP recommended intensive and direct services for both oral and written language (literacy). Further, it was suggested that oral language services to be provided by an SLP, and written language services provided by an SLP and/or teacher or educator trained in evidence-based literacy intervention, with a focus on phonological and morphological, and orthographic abilities.

5. Future considerations and practice implications

To date, our understanding of dyslexia hypothesizes that it is a literacy disorder involving deficits in use and understanding of phonological systems such as decoding and encoding [18]. The interconnection between speech sounds, language production skills, and dyslexia has been suggested in research and practical situations. Indeed, deficits in the phonological systems of students provide an explanation for many students with dyslexia, such as John. Challenges in phonological awareness and their representations also appear to manifest long after language develops, creating ongoing disruptions for students with dyslexia [31].

As previously noted, the sooner a student is identified with a language literacy disorder such as dyslexia, the better their long-term educational, mental, and emotional outcomes become. After dyslexia is suspected, a student is often referred by a teacher or learning specialist to an educational psychologist who can confirm a diagnosis of dyslexia. Because of the volume of students in the school systems, the chance for a student's language literacy disorder to be missed or at very least, not be

identified until later in their schooling, is a legitimate concern. The importance, then, of other skilled professionals such as SLPs to take an active role in assessing students at risk for language literacy disorders cannot be understated. With a background in language and literacy development, the SLP can serve as a valuable resource for students, parents, and educators alike. Such was the case for John, whose language literacy disorder was identified by an SLP well trained in assessment and treatment of students with language literacy disorders.

Based on phonological training and knowledge of all the subsystems of language, the SLP can serve as a valuable resource for identification and management of dyslexia in students. The use of formal assessments and information means (i.e., written and oral language samples), parent and teacher reports, and collaboration with reading specialists give insight into the unique needs of each student with dyslexia as well. Future research into the influence of other language subsystems such as semantics, syntax, and morphology may provide further insight into identification and treatment of dyslexia.

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References

[1] International Dyslexia Association. Dyslexia assessment: What is it and how can it help? 2020. Available from: https://dyslexiaida.org/dyslexia-assessment-what-is-it-and-how-can-it-help-2/ [Accessed: 12 August 2020]

[2] Sprenger-Charolles L, Siegel LS, Jimenez JE, Ziegler JC. Prevalence and reliability of phonological, surface, and mixed profiles in dyslexia: A review of studies conducted in languages varying in orthographic depth. Scientific Studies of Reading. 2011;**15**(6):498-521. DOI: 10.1080/10888438.2010.524463

[3] Pennington BF, Bishop DVM. Relations among speech, language, and reading disorders. Annual Review of Psychology. 2009;**60**:283-306. DOI: 10.1146/annurev.psych.60.110707.163548

[4] Chall JS. Literacy: Trends and explanations. Educational Research. 1983;**12**(9):3-8. DOI: 10.2307/1174721

[5] Polychroni F, Koukoura K, Anagnostou I. Academic self-concept, reading attitudes and approaches to learning of children with dyslexia: Do they differ from their peers? European Journal of Special Needs Education. 2006;**21**(4):415-430

[6] Viscomi C. The speech-language pathologist's role in diagnosing dyslexia. The ASHA Leader Live. 2018. Available from: https://leader.pubs.asha.org/do/10.1044/the-speech-language-pathologists-role-in-diagnosing-dyslexia/full/ [Accessed: 12 August 2020]

[7] American Speech-Language-Hearing Association. [Internet]. Roles and responsibilities of speech-language pathologists with respect to reading and writing in children and adolescents [Position Statement]. Available from: www.asha.org/policy [Accessed: 14 August 2020]

[8] Yin RK. A (very) brief refresher on the case study method. Applications of Case Study Research. 2012;**3**:3-20

[9] Rief S, Stern J. The Dyslexia Checklist a Practical Reference for Parents and Teachers. 1st ed. San Francisco, Calif: Jossey-Bass; 2010

[10] Zimmerman IL, Steiner VG, Pond RE. The Preschool Language Scale-5. San Antonio, TX: Pearson; 2011

[11] Nash HM, Hulme C, Gooch D, Snowling MJ. Preschool language profiles of children at family risk of dyslexia: Continuities with specific language impairment. Journal of Child Psychology and Psychiatry. 2013;**54**:958-968. DOI: 10.1111/jcpp.12091

[12] Wechsler D. Wechsler Intelligence Scale for Children. 5th ed. Bloomington: Pearson; 2014

[13] Das JP, Mishra RK, Kirby JR. Cognitive patterns of children with dyslexia: A comparison between groups with high and average nonverbal intelligence. Journal of Learning Disabilities. 1994;**27**(4):235-242. DOI: 10.1177/002221949402700405

[14] Wechsler D. Wechsler Individual Achievement Test. 3rd ed. San Antonio, TX: Pearson; 2009

[15] Hayiou-Thomas ME, Carroll JM, Leavett R, Hulme C, Snowling MJ. When does speech sound disorder matter for literacy? The role of disordered speech errors, co-occurring language impairment and family risk of dyslexia. Journal of Child Psychology and Psychiatry. 2017;**58**:197-205. DOI: 10.1111/jcpp.12648

[16] Xiao X-Y, Ho CS-H. Weaknesses in semantic, syntactic and oral language expression contribute to reading difficulties in Chinese dyslexic children.

Dyslexia. 2014;**20**:74-98. DOI: 10.1002/dys.1460

[17] Al-Zoubi S, Al-Zoubi S. Prevalence of articulation errors among Jordanian gifted students with dyslexia. Journal for the Education of Gifted Young Scientists. 2020;**8**(1):533-547. DOI: 10.17478/jegys.682635

[18] Lyon GR, Shaywitz SE, Shaywitz BA. A definition of dyslexia. Annals of Dyslexia. 2003;**53**:1-14. DOI: 10.1007/s11881-003-0001-9

[19] Wagner RK, Torgesen JK, Rashotte CA, Pearson NA. Comprehensive Test of Phonological Processing-Second Edition (CTOPP-2); Austin, Tex: Pro-Ed; 2012. Available from http://www4.parinc.com/Products/Product.aspx?ProductID=CTOPP-2

[20] Torgesen JK, Rashotte CA, Wagner RK. TOWRE 2: Test of Word Reading Efficiency. Austin, Tex: Pro-Ed; 2012

[21] Nelson NW, Plante E, Helm-Estabrooks N, Hotz G. Test of Integrated Language and Literacy Skills. Baltimore, MD: Paul H. Brookes; 2016

[22] Shinn MR, Shinn MM. AIMSweb Training Workbook. Eden Prairie, MN: EdInformation, Inc; 2002

[23] Wiederholt JL, Bryant BR. Gray Oral Reading Tests—Fifth Edition (GORT-5). Austin, TX: Pro-Ed; 2012

[24] Perrachione TK, Ghosh SS, Ostrovskaya I, Gabrieli J, Kovelman I. Phonological working memory for words and nonwords in cerebral cortex. Journal of Speech, Language, and Hearing Research. 2017;**60**(7):1959-1979. DOI: 10.1044/2017_JSLHR-L-15-0446

[25] Vander Stappen C, Reybroeck MV. Phonological awareness and rapid automatized naming are independent phonological competencies with specific impacts on word reading and spelling: An intervention study. Frontiers in Psychology. 2018;**9**:320. DOI: 10.3389/fpsyg.2018.00320

[26] Casalis S, Colé P, Sopo D. Morphological awareness in developmental dyslexia. Annals of Dyslexia. 2004;**12**(9):114-138. DOI: 10.1007/s11881-004-0006-z

[27] Puranik CS, Lombardino LJ, Altmann LJ. Writing through retellings: An exploratory study of language-impaired and dyslexic populations. Reading and Writing. 2007;**20**:251-272. DOI: 10.1007/s11145-006-9030-1

[28] Ehri LC. Sight word learning in normal readers and dyslexics. In: Blackman BA, editor. Foundations of Reading Acquisition Dyslexia: Implications for Early Intervention. New York: Routledge; 2013

[29] Snowling MJ. Phonemic deficits in developmental dyslexia. Psychological Research Psychologische Forschung. 1981;**43**:219-234. DOI: 10.1007/BF00309831

[30] Bernstein SE, Flipse JL, Jin Y, Odegard TN. Word and sentence level tests of morphological awareness in reading. Reading and Writing. 2020;**33**:1591-1616. DOI: 10.1007/s11145-020-10024-6

[31] Alt M, Hogan T, Green S, Gray S, Cabbage K, Cowan N. Word learning deficits in children with dyslexia. Journal of Speech, Language, and Hearing Research. 2017;**60**(4):1012-1028. DOI: 10.1044/2016_JSLHR-L-16-0036