

Understanding, Planning, and Conducting a Comprehensive Dysgraphia Evaluation

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Abstract

Writing involves the integration of various constructs and is one of the most complex, higher level language skills. At the most basic level, writing has been described as the simple act of using symbols to produce written letters and words. At the most complex level, writing is a complicated act of planning, organizing, writing and editing text. It requires the coordination of motor planning and motor execution in addition to the brain processes of verbal reasoning, phonology, orthography, organization, executive functioning, and language; all working together to constitute the functional writing system (Berninger & Wolf, 2009). A breakdown in any one of these areas can have a negative impact on writing ability. Understanding the area of weakness is pertinent for providing appropriate assessment and intervention.

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The lack of focus on writing has resulted in the elimination of explicit instruction for the writing process, which has likely hindered all children but especially the children who struggle with the skill (Chung & Patel, 2015). Data from the 2011 National Assessment of Educational Progress, the nation's report card, found that only 27%-28% of students in

eighth and twelfth grades scored at or above proficiency on writing assessments, leaving nearly 70% of students below proficient. Lack of explicit instruction in writing, coupled with the increased use of technology (e.g., texting, emailing, etc.), has likely contributed to the high rates of underachievement. In addition to the generally low writing performance linked to a lack of explicit instruction across students, some students have a severe writing disability known as *dysgraphia*, which further compromises their academic performance. Within the past couple of years, a focus on more targeted assessment practices has increased attention on the identification of dysgraphia. Consequently, the purpose of this article is to define and describe characteristics of dysgraphia and review steps for a comprehensive dysgraphia evaluation. The use of the *WJ IV Tests of Achievement* (WJ IV ACH; Schrank, Mather, & McGrew, 2014), *Woodcock Munoz Language Survey, Third Edition* (WMLS III; Woodcock, Alvarado, Ruef, & Schrank, 2017), the *DeCoste Writing Protocol* (DeCoste, 2014), the *McMaster Handwriting Assessment Protocol 3rd edition* (Pollock, Lockhart, Boehm, et al., 2018), *Test of Handwriting Skills Revised* (THS-R; Milone, 2007), *Test of Orthographic Competence* (TOC; Mather, Roberts, Hammill, & Allen, 2008), *Process Assessment of the Learner, Second Edi-*

tion (PAL-II; Berninger, 2007), and informal measures for assessing handwriting rate and legibility will be highlighted as part of a comprehensive dysgraphia evaluation.

In addition to those highlighted in this article, other tests can be used to supplement areas within a dysgraphia evaluation such as the *Wechsler Individual Achievement Test – Third Edition* (WIAT-III; Wechsler, 2009) or the *Kaufman Test of Educational Achievement, Third Edition* (KTEA-3; Kaufman & Kaufman, 2014).

What is Dysgraphia?

Definition and Characteristics

Dysgraphia is defined as a language-based, neurological, written language disorder manifested by illegible and/or inefficient handwriting due to difficulty with letter formation (Texas Dyslexia Handbook, 2019). The difficulty is the result of deficits in graphomotor function (hand movements used for writing), language skills (finding, retrieving, and producing letters at the sub-word level), and/or storing and retrieving orthographic codes (letter forms). Secondary consequences of dysgraphia include problems with spelling and written expression (Berninger, 2015; Texas Dyslexia Handbook, 2019). Further, the writing difficulty is not solely due to the lack of

Table 1: Characteristics of Dysgraphia

Warning Signs of Dysgraphia

- Poorly formed and variably shaped letters
- Excessive erasures and cross-outs
- Poor spacing between letters and words
- Letter and number reversals beyond early stages of writing
- Awkward, inconsistent pencil grip
- Heavy pressure and hand fatigue
- Slow writing and copying with legible or illegible handwriting
- **Additional consequences of dysgraphia include: Difficulty with spelling, problems with written expression, and low self-esteem.

Adapted from: Texas Dyslexia Handbook, 2018 & Andrews & Lombarino, 2014

instruction and is not associated with other developmental or neurological conditions that involve motor impairment, thus requiring exclusionary factors be ruled out as the primary cause for writing difficulty (Chung & Patel, 2015; Lee, 2019; Texas Dyslexia Handbook, 2018). As dyslexia and dysgraphia both involve language development, comorbidity often exists between the two, although this is not always the case. According to Chung and Patel (2015), studies have shown that between 30%-47% of children with writing problems also have reading problems.

Depending on the age of the student, dysgraphia manifests in a variety of ways. Given the normal development of handwriting (simple line drawing, scribbles, and letter formation), dysgraphia is seldom recognized before the first grade; instead, it tends to become more evident as the student's neurodevelopment progresses and academic demands increase (Chung & Patel, 2015). *Table 1* highlights warning signs of dysgraphia.

In addition to the importance of understanding the characteristics of dysgraphia, it's also important to recognize what does not constitute dysgraphia. Consequently, it is important that educational diagnosticians investigate a series of factors and rule them out as the primary cause of writing difficulty. According to the Texas Dyslexia Handbook (2018) and Berninger (2004), dysgraphia is not due to a developmental disability that has fine motor deficits (e.g., intellectual disability, cerebral palsy), is not secondary to a medical condition (e.g., brain trauma, significant head trauma, or meningitis), not evidenced by a damaged motor nervous system or coordination difficulties, and is not an impairment in spelling or written expression with typical handwriting (legible and rate).

Underlying Difficulties in Cognitive Processes Associated with Dysgraphia

The complexities involved in becoming an efficient writer make writing one of the most difficult skills to teach and learn. Success requires language development, fine motor skills, motivation, as well as several cognitive processes (Feifer, 2002). Breakdowns in language that can significantly impact a person's writing ability include the following: poor vocabulary and grammar, simplistic sentence structure, and lack of cohesive ties (Feifer, 2019). In addition to language, attention, engagement during extended periods of concentration, inhibition,

spatial production, sequential production, working memory, executive functions, auditory processing, processing speed, phonological processing, and orthographic processing are necessary components of effective writing. A breakdown in one or more of these areas could result in significant problems with the writing process. *Table 2* highlights the various cognitive processes that impact writing, along with possible deficits in each area.

Unexpectedness

According to Berninger (2004), developmental dysgraphia can be described as a specific dissociation in the functional writing system of individuals whose overall motor, sensory, language, cognitive, and social/emotional development is in the normal range for age. In other words, transcription skills (handwriting and spelling) are significantly underdeveloped compared to verbal reasoning and ability to generate ideas. Further, the deficient

Table 2. Underlying Difficulties in Cognitive Processes Associated with Writing

Cognitive Process	Description
Attention	Poor planning Poor self-monitoring Uneven tempo Erratic legibility Inconsistent spelling Lack of persistence
Working Memory	Poor word retrieval skills Loss of train of thought Poor spelling skills Poor elaboration of ideas Deterioration of continuous writing Poor grammar rules
Executive Functions	Poor organization and planning of ideas Difficulty self-monitoring Poor task initiation Difficulty sustaining ideas Impulsive or distracted Perseverates on a topic Difficulties with verbal word retrieval
Sequential Production	Letter reversals Poor connecting writing Lack of cohesiveness Organizational deficits
Spatial Production	Uneven spacing Poor spatial production Poor use of lines Organizational problems Poor margination Poor visualization
Processing Speed	Inefficient speed of writing Inefficient speed of copying
Phonological Processing	Inability to learn letters and sounds
Orthographic Processing	Inability to produce legible letters rapidly and with minimal conscious attention Inefficient memory for letters or symbol sequences

Adapted from Feifer, S. (2019).

transcription skills compromise the higher-level processes in written composition. It is important to understand that a student with dysgraphia may exhibit strengths in areas such as reading comprehension, listening comprehension, verbal ability, or math ability yet still have difficulty with writing and spelling. One single indicator should not be used to determine dysgraphia, instead a preponderance of data should be used that provide evidence for whether difficulties are unexpected (Dyslexia Handbook, 2018).

Steps for a Comprehensive Dysgraphia Evaluation

The assessment of dysgraphia is a multifaceted, targeted process that includes the collection, integration, and analysis of both formal and informal measures. A comprehensive assessment begins with gathering, organizing, and analyzing multiple sources of data, followed by planning and execution of a targeted, formal evaluation of writing skills. Lastly, all the data should be integrated and analyzed in reference to the

requirements of Section 504, special education policy, and the characteristics of dysgraphia.

Gathering, Organizing, and Analyzing Multiple Sources of Data

The collection and analysis of multiple sources of data is an integral part of a dysgraphia evaluation. Schools collect an abundance of data on students' academic performance to ensure all students are progressing in the curriculum. When a student is found to be struggling, such data should be organized and analyzed closely to determine specific causes of the struggle and whether additional, formal evaluation is warranted (Stephens-Pisecco, Schultz, Moon, & Holman, 2019). According to the Texas Dyslexia Handbook (2018), documentation of the specific characteristics should be collected during the data gathering phase of the dysgraphia assessment. *Table 3* provides a list of each characteristic of dysgraphia, along with suggested data sources.

In addition to collecting data specific to writing ability, it is also important to obtain a full picture of the student's academic history to ensure that underachievement in the student suspected of having dysgraphia is not due to a lack of appropriate instruction in handwriting, spelling, or written expression. The data should also include historical information, and data collected from repeated assessments, parent information, and teacher information. Further, an informal interview with the student should be conducted to obtain the student's perspective on his/her struggle. *Table 4* includes a list of sources of data that should be collected to establish underachievement, rule-out of exclusionary factors as the primary cause of writing difficulty, identify the initial emergence of patterns of strengths and weaknesses, provide a clear understanding of the student's academic history, and determine what additional data is needed to determine whether the student has dysgraphia.

Building a Targeted Dysgraphia Assessment

Once all cumulative data has been collected, organized, and analyzed, a targeted assessment focusing on formal testing should be planned and conducted. The use of norm-referenced, standardized tests provides additional information regarding the student's writing performance in relation to same-age or grade peers. The results of formal assessment data should be integrated with the other sources of data and used to further validate areas of strengths and weaknesses (Stephens-Pisecco, Schultz,

Table 3. Data Sources for Dysgraphia Evaluation

Dysgraphia Characteristic	Data Sources
Slow or labored written work	Observations during writing assignments
Poor formation of letters	Work samples, informal evaluation, observation
Poor pencil grip	Observation, parent information, teacher information
Inadequate pressure during handwriting (too hard or too soft)	Work samples, observations, informal evaluation
Excessive erasures	Work samples, observations, informal evaluation
Poor spacing between letters and/or words	Work samples, informal evaluation
Inability to copy words accurately	Review class notes, work samples, observations, informal evaluations
Avoidance of written tasks	Observations; Parent information, teacher information
Inability to recall accurate orthographic patterns for words	Work samples, informal evaluations
Difficulty with visual-motor integrated sports or activities	Observations, parent information, teacher information

Adapted from Texas Dyslexia Handbook (2018)

Table 4. Multiple Sources of Data

Data Sources	
Vision & hearing screenings	Teacher reports of strengths & weaknesses
Parent information	Classroom observations
Writing assessments (timed and untimed)	Spelling tests
Work samples	Grades
Curriculum Based Measures (CBM)	Attendance records
Universal screener results	Progress monitoring data
State testing results	RTI data
Previous Full Individual Evaluation (FIE)	Speech & language assessment
Outside evaluations	Accommodations & interventions
Health records	Student interview

Adapted from Texas Dyslexia Handbook (2018)

Table 5. Areas for Evaluation of Dysgraphia

Academic Skills	Cognitive Processes	Possible Additional Areas
Letter formation	Orthographic Processing: Memory for letter or symbol sequences	Phonological awareness
Handwriting		Phonological memory
Word/sentence dictation (timed & untimed)		
Copying of text		Working memory
Written expression		Letter retrieval
Writing fluency (both accuracy & fluency)		Letter matching

Berninger & Wolf (2019); Texas Dyslexia Handbook (2018)

Table 6. Tests for Dysgraphia Evaluations

Test	Description
Woodcock Munoz Language Survey, Third Edition (WMLS III)	A norm-referenced, standardized assessment that assesses listening, speaking, reading, and writing.
Woodcock Johnson IV Tests of Achievement	A norm-referenced, standardized group of tests that assess all areas of academics (WJ IV ACH) (e.g., reading, writing, and math) (Schrank, Mather, & McGrew, 2014).
Comprehensive Test of Phonological Processing (C-TOPP)	A norm-referenced, standardized assessment that assesses phonological processing, working memory, and letter retrieval (Wagner, Torgeson, Rashotte, & Pearson, 2013).
DeCoste Writing Protocol	A formative assessment tool used to identify factors that affect an individual student's ability to produce writing. It does not purport to allow examiners to make normative comparisons. Rather, it is used to compare a child's individual performance across hand writing and keyboarding tasks, and to examine spelling performance and writing skills in order to make more informed decisions about instructional strategies and the appropriate use of technology to meet classroom demands (DeCoste, 2014).
McMaster Handwriting Assessment	Designed to look at the occupation of handwriting. It is not intended to provide a complete assessment of the performance components needed for effective and successful handwriting. Observations made during the completion of this protocol may indicate the need for further testing of underlying performance components (Pollock, & Lockhart, 2018).
Test of Handwriting Skills Revised (THS-R)	Assesses neurosensory integration skills involved in both manuscript and cursive writing, informing efforts to improve handwriting legibility (Milone, 2007).
Test of Orthographic Competence (TOC)	Evaluates student's mastery of conventions of written English that are integral to proficient reading and writing, among them letters, spelling, punctuation, abbreviations, and special symbols (Mather, Roberts, Hammill, & Allen, 2008).
Process Assessment of the Learner, 2nd Edition (PAL-II)	Evaluates the cognitive processes that are associated with reading and writing skills (Berninger, 2007)

Moon, & Holman, 2019). One such battery of tests that provides a comprehensive selection of tests useful when evaluating dysgraphia is the Woodcock Munoz Language Survey, Third Edition (WMLS III; Woodcock, Alvarado, Ruef, & Schrank, 2017).

When building a formal dysgraphia battery, it is important that the key characteristics of dysgraphia be assessed in areas where limited information is available. It is also important

that formal test data be viewed in relation with other data and that equal weight be placed on results. Further, interpretation beyond the standard score should be conducted (e.g., error analysis, observations of testing behavior and problem-solving techniques) to fully understand the student's performance. *Table 5* provides a list of academic skills and cognitive processes that should be assessed as part of a dysgraphia evaluation.

Test Instruments for Dysgraphia Evaluations

There are a number of formal and informal testing instruments available for evaluators to use as part of the dysgraphia assessment. The authors have highlighted a few available assessments that can be incorporated into a comprehensive dysgraphia evaluation. *Table 6* provides a list of the assessments, along with brief descriptions of each. Further, *Table 7*

Table 7. Dysgraphia Assessment Areas and Corresponding Measures

Area	Measure
Spelling	WMLS-III: Dictation WJIV ACH: Spelling, Spelling of Sounds TWS-5 TOC (Spelling Speed): Letter Choice, Word Scramble TOC (Spelling Accuracy): Sight Spelling, Word Choice PAL-II: Word Choice
Letter Formation: Legibility & Automaticity	McMaster Handwriting Assessment PAL-II: Alphabet Writing THS-R (minimal rate component)
Handwriting	McMaster Handwriting Assessment DeCoste Writing Protocol THS-R PAL-II: Handwriting Total Automatic Letter Legibility Composite, Handwriting Total Legibility Composite, Handwriting Total Time Composite
Words/Sentence Dictation	McMaster Handwriting Assessment DeCoste Writing Protocol THS-R (letters & words; no rate component)
Copying	McMaster Handwriting Assessment DeCoste Writing Protocol PAL-II: Sentence Copying, Paragraph Copying THS-R (no rate component)
Written Expression	WMLS-III: Written Language Expression WJIV ACH: Writing Samples, Sentence Writing Fluency PAL-II: Written Composition
Writing Fluency	WJIV ACH: Sentence Writing Fluency PAL-II: Compositional Fluency
Orthographic Processing	WJIV COG PAL-II: Orthographic Coding
Phonological Awareness	WJIV COG: Phonological Processing WJIV OL: Phonetic Coding CTOPP 2: Phonological Awareness
Phonological Memory	WJIV COG: Nonword Repetition CTOPP 2: Memory for Digits, Nonword Repetition
Working Memory	WJIV COG: Verbal Attention, Numbers Reversed
Letter Retrieval	Informal CTOPP 2: Rapid Letter Naming PAL-II: RAN
Letter Matching	WJIV COG: Letter Pattern Matching
Verbal Expression	WJIV OL: Picture Vocabulary, Sentence Repetition WMLS-III: Picture Vocabulary, Oral Language Expression
Listening Comprehension	WJIV OL: Oral Comprehension, Understanding Directions WMLS-III: Analogies, Oral Comprehension

provides a list of the characteristics of dysgraphia, accompanied with the name of the tests available to assess each area.

Data Integration and Analysis

Professionals conducting evaluations for the identification of dysgraphia will need to look beyond scores on standardized assessments alone and examine the student's classroom writing performance, educational history, and early language experiences to assist with determining handwriting, spelling, and written expression abilities and difficulties (Texas Dyslexia Handbook, 2018).

The ARD or Section 504 committee will determine if the data presents a pattern of evidence for the primary characteristics of dysgraphia that is unexpected for the student in relation to the student's other cognitive abilities and provision of effective classroom instruction.

Conclusion

Accurate and specific diagnostic data gathered through evaluation is crucial in order to develop appropriate supports and services for students. Understanding the characteristics of dysgraphia and the underlying cognitive constructs associated with the disorder enables assessment professionals to conduct a comprehensive evaluation to identify areas of weakness in the complex writing process, provide recommendations for explicit instruction, and improve student outcomes.

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