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Addressing Referral Concerns Through Selective Testing

Dawn Flanagan, PhD
Barbara Read, PhD

Selective testing *refers to the process of choosing tests, clusters, and discrepancy options from the WJ III® (or any collection of tests) that best address referral concerns. Because the WJ III constitutes a comprehensive collection of interrelated tools that may be used to address a variety of assessment needs, it is necessary to understand how to differentially select tools from this battery in response to referral concerns. This bulletin describes the steps and associated foundational sources of knowledge, including relevant theory and research, that underlie the WJ III test selection process.*

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Addressing Referral Concerns Through Selective Testing

Description of Selective Testing

The WJ III cognitive and achievement batteries are a multifaceted assessment system that can provide examiners with a rich array of diagnostic options. Efficient use of this system requires skill in selective testing. *Selective testing* refers to the process of choosing tests, clusters, and discrepancy options from the WJ III (or any collection of tests) that best address referral concerns. Because the *WJ III Tests of Cognitive Abilities* (WJ III COG) and the *WJ III Tests of Achievement* (WJ III ACH) constitute a collection of interrelated tools that help to meet a variety of assessment needs, it is necessary to understand how to select the appropriate tool(s) to effectively address the presenting problem(s). A physician selects specific diagnostic tests or techniques to respond to the concerns and presenting problems of a patient. In similar fashion, a practitioner needs to select the specific tests or clusters from the WJ III that address the unique concerns of a referral. Just as a physician would not find it prudent or effective to use every diagnostic technique available for every patient, so it is unlikely that a practitioner would find it necessary, practical, or helpful to use every WJ III test, cluster, and discrepancy option for every referral.

The more information that is available about specific referral concerns; about an individual's educational, medical, and familial background; levels of functioning; emotional behavioral status; and so forth, the more effective the test selection process will be. If little information is known about an individual, an examiner might administer more tests than necessary. Likewise, when little information is available, generating a priori hypotheses is difficult, if not impossible. If examiners find that they frequently administer all WJ III tests or frequently administer the same tests to all examinees, then the referral process is not informing test selection and therefore needs improvement. Examiners who use this "one-size-fits-all" approach may not understand the process of selective testing or realize the benefits of the approach. This bulletin highlights the types of information that are necessary to inform the test selection process and provides practitioners with selective testing guidelines to help them choose only the WJ III tests, clusters, and discrepancy options that are germane to a given referral.

Benefits of Selective Testing

Selective testing with the WJ III (a) promotes efficient time management within the assessment process, (b) allows an evaluation plan to be individualized and driven by specific referral concerns, (c) encourages a priori exploration of hypotheses, (d) significantly reduces or eliminates unnecessary redundancy in assessment, and (e) circumvents any tendency to assess abilities that are unrelated to the referral concerns or presenting problem. To realize these benefits, however, it is necessary to engage in a series of as many as nine steps, each of which requires an understanding of specific, foundational sources of knowledge underlying the selective testing process.

Selective Testing Organizational Flowchart

Figure 1 presents an effective organizational sequence of nine steps that begins with the initial referral and ends with an interpretation and decision-making process. The later steps in the flowchart (i.e., steps 7–9) involve analyzing and synthesizing all available data to make important decisions regarding the need for (a) placement in special education programs, (b) modification in regular education programs, (c) special accommodations, (d) educational (or other) interventions, and (e) strategy use. Although not exhaustive, the preceding list represents common decisions that an evaluation team must regularly make. These decisions are more easily made with information derived from a battery of tests tailored to the individual.

Before engaging in selective testing with the WJ III, examiners should incorporate information from several sources, including (a) the referral; (b) the examinee; (c) teachers, parents, and others familiar with the examinee; (d) the multidisciplinary team; (e) available instruments; (f) available discrepancy options; and (g) relevant research. Incorporating all sources of relevant knowledge can be achieved effectively by following the steps outlined in Figure 1. The section that follows describes the steps and associated foundational sources of knowledge that underlie the test selection process.

Foundational Sources of Knowledge That Inform Test Selection: Step-by-Step Description

Step 1: The Referral

A case manager or team leader is typically designated to oversee and coordinate the formal referral process for a subject. As indicated in Figure 1, Step 1 of the selective testing process involves evaluating referral information to determine whether an individualized evaluation using standardized tests is necessary. The referral, therefore, represents the first foundational source of knowledge needed to inform the test selection process. When individualized evaluation is deemed necessary, data are gathered from multiple sources to gain a better understanding of referral concerns.

Step 2: Gathering Data to Elucidate Referral Information and Inform Test Selection

Step 2 of the selective testing process involves gathering information from an array of sources using direct interviews, checklists, questionnaires, response to interventions, and the like to gain a better understanding of specific referral concerns. Information may be gathered from the examinee, parents, teachers, and others who know the examinee well. Knowledge from the examinee and knowledge from others familiar with the examinee are especially important for appropriate test selection.

The Examinee

Responding to referrals related to academic difficulties often requires obtaining knowledge about an individual's rate of learning, progress in skill development, and general levels of learning strengths and weaknesses. This knowledge can be obtained through such means as classroom observations, work samples, and examinee interviews. In addition, an educational records review may provide related knowledge from previous evaluations, such as levels of functioning or developmental/instructional zones, or eligibility for specialized programs or services. The more knowledge that is gathered about the examinee, the more focused and time-efficient the selected battery of tests will be.

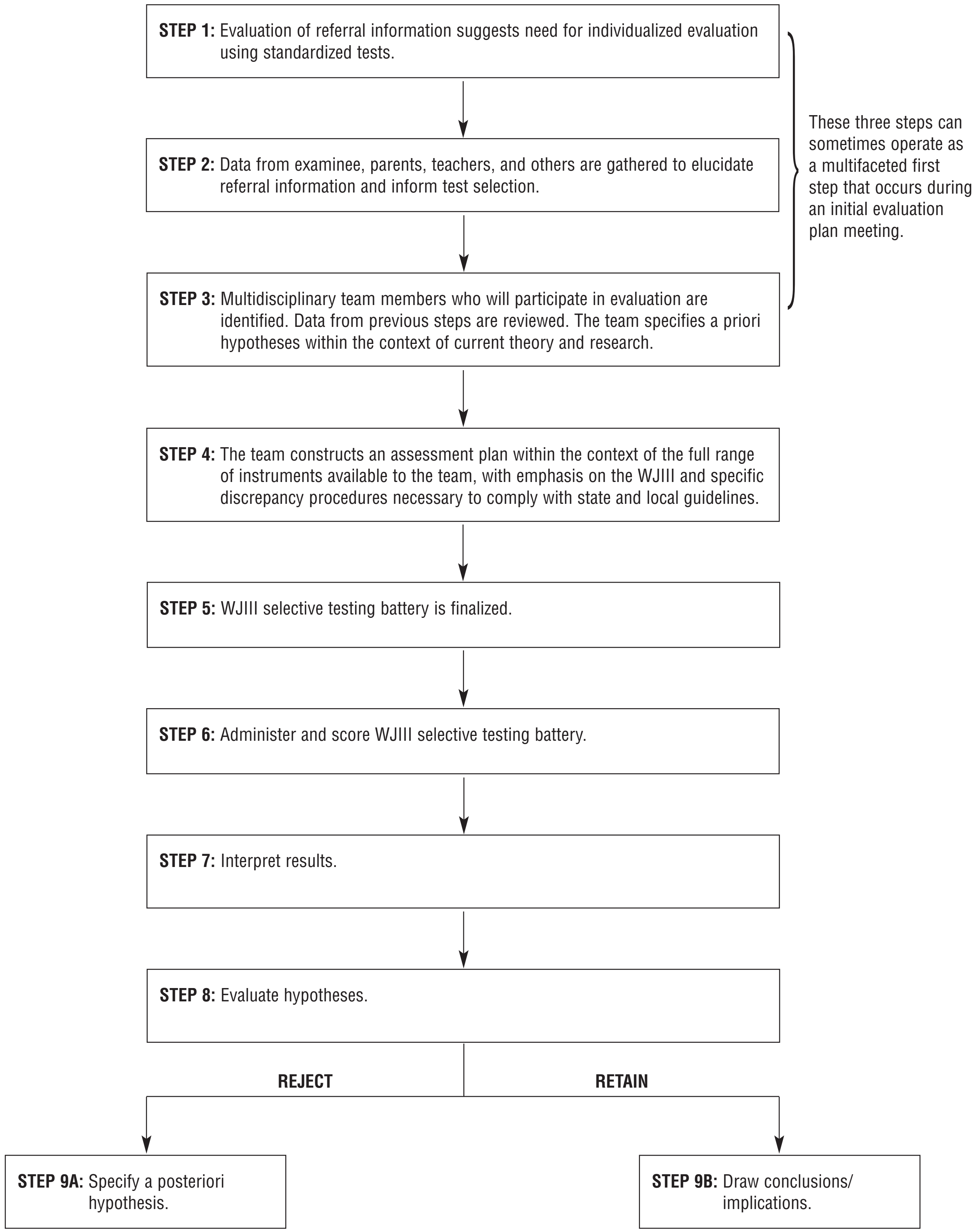

Figure 1.
Selective testing organizational flowchart.

Teachers, Parents, and Others Familiar With the Examinee

Seeking information from those who know the examinee well is just as important as gathering knowledge from the examinee. Gathering background information (e.g., educational, medical, familial) from parents and teachers through face-to-face interviews, informal checklists, and behavior rating scales also guides test selection. For example, if an individual's background suggests that he or she has trouble retaining information over time, the examiner would likely select measures of Long-Term Retrieval, Short-Term Memory, Working Memory, and Delayed Recall to test hypotheses with regard to memory functions.

Step 3: Specification of A Priori Hypotheses Within the Context of Current Theory and Research

At this step in the test selection process, the multidisciplinary team is assembled. The team meets to specify a priori hypotheses that will be tested using a selected battery of tests. Use of an a priori approach "forces consideration of research and theory because the clinician is operating on the basis of research and theory when the hypothesis is drawn" (Kamphaus, 1993, p. 167). By combining case history data and current information with knowledge of Cattell-Horn-Carroll (CHC) theory and research, as well as with information from other fields (e.g., the field of learning disabilities), defensible connections between academic achievement and cognitive functioning can be made. For example, when an individual presents with reading difficulties, the information gathered in Steps 1 and 2, in conjunction with information specific to the referral (e.g., literature on reading disabilities, information on the relationship between cognitive ability and reading achievement), will help the practitioner identify the referred individual's most salient abilities requiring measurement.

Table 1 presents a number of factors that are strongly related to reading achievement. For example, *Ga* is related to Phonetic Coding Analysis and Phonetic Coding Synthesis, *Gc* to Lexical Knowledge, General Information, and Language Development, *Glr* to Naming Facility or Rapid Automatized Naming, and so on. This table also specifies the WJ III tests (indicated by their numbers in the WJ III battery) that are purported to measure these abilities (e.g., inductive reasoning is measured by Test 5: Concept Formation). On the basis of this information, the practitioner can logically assume that if an individual has cognitive impairments that are related to specific reading difficulties, those impairments will probably manifest on the tests that purport to measure those cognitive abilities. It is important to keep in mind, however, that the relationships between certain cognitive abilities and academic skills vary according to age. For example, assessing the abilities of a first-grade student referred for reading difficulties will result in selection of a battery of tests that is different from one that would be appropriate for an eighth-grade student referred for reading difficulties. Not only are the curriculum demands for reading skills different across age and grade, but the cognitive abilities and processes typically employed in the reading process differ as a function of age and grade (see Floyd, Shaver, & McGrew, 2003).

Also important to remember is that interpretation of data from standardized tests is embedded in a broader conceptual framework for assessment that relies on the generation and testing of functional assumptions or hypotheses regarding expected, average performance (see Flanagan & Ortiz, 2001). In general, both a priori and a posteriori hypotheses (Steps 3 and 9A, respectively, in Figure 1) are incorporated into an interpretive approach to control for confirmatory bias, which can arise when, for example, only assumptions regarding dysfunction guide the assessment process. Only hypotheses specified a priori or a posteriori are tested and evaluated directly in light of

Table 1.
Summary of Relationship Between CHC Cognitive Abilities and Achievement

CHC Ability	Reading Achievement [relevant WJ III tests]	Math Achievement [relevant WJ III tests]	Writing Achievement [relevant WJ III tests]
Gf	Inductive [5] and general sequential reasoning [15] abilities play a moderate role in reading comprehension.	**Inductive [5] and general sequential reasoning [15] abilities are consistently very important at all ages.**	Inductive [5] and general sequential reasoning [15] abilities are related to basic writing skills primarily during the elementary school years (i.e., age 6–13) and consistently related to written expression at all ages.
Gc	**Language development [1], lexical knowledge [1], and listening ability are important at all ages. These abilities become increasingly important with age.**	**Language development [1], lexical knowledge [1], and listening ability are important at all ages. These abilities become increasingly important with age.**	**Language development, lexical knowledge, and general information [11] are important primarily after age 7. These abilities become increasingly important with age.**
Gsm	Memory span [17] is important especially when evaluated **within the context of working memory [7, 9].**	Memory span [17] is important especially when evaluated **within the context of working memory [7, 9].**	Memory span [17] is important for writing (especially for spelling skills), whereas working memory has shown relationships with advanced writing skills (e.g., written expression).
Gv		May be important primarily for higher-level or advanced mathematics (e.g., geometry, calculus) [3, 13, 19].	
Ga	**Phonetic coding [4, 8] or phonological awareness/processing is very important during the elementary school years.**		**Phonetic coding [4, 8] or phonological awareness/processing is very important during the elementary school years for both basic writing skills and written expression (primarily before age 11).**
Glr	**Naming facility [18] or rapid automatic naming is very important during the elementary school years.** Associative memory [2,10] may be somewhat important at select ages (e.g., age 6).		Naming facility [18] or rapid automatic naming has demonstrated relationships with written expression, primarily the fluency aspect of writing.
Gs	**Perceptual speed [6] abilities are important during all school years, particularly the elementary school years.**	**Perceptual speed [6] abilities are important during all school years, particularly the elementary school years.**	**Perceptual speed [6] abilities are important during all school years for basic writing and are related to all ages for written expression.**

Note. The absence of comments for a particular CHC ability and achievement area (e.g., *Ga* and mathematics) indicates that the research reviewed either did not report any significant relationship between the respective CHC ability and the achievement area, or that if significant findings were reported, they were weak and applied only to a limited number of studies. Comments in **bold** represent the CHC abilities that showed the strongest and most consistent relationship with the respective achievement domain. Numbers in brackets correspond to the individual WJ III tests listed in Table 2 of this bulletin. The information in this table is adapted from *The achievement test desk reference (ATDR): Comprehensive assessment of learning disabilities* (p. **XXX**), by Flanagan, Ortiz, Alfonso, and Mascolo, 2002, Boston: Allyn & Bacon. Copyright 2002 by Allyn & Bacon. Adapted with permission.

the data; opinion, conjecture, and suspicion are not. Therefore, only hypotheses based on presumptions of normalcy can be construed as either supported or refuted by the data; opinion cannot. Consequently, unless or until the data suggest otherwise, the null hypothesis that performance is within the normal or average limits of functioning must not be rejected, no matter how much the examiner's belief may be to the contrary. Moreover, when the null hypothesis is rejected, the examiner can be certain only that the data do not support the notion that performance is normal or average and that performance is probably outside the normal limits of functioning. This alternative hypothesis does not provide de facto support for the presence of a disability but rather only statistical evidence that suggests functioning cannot be considered normal.

The reasons why such performance has been found to deviate significantly from the norm may be determined by reexamination of the data gathered in Steps 1–3 (e.g., school records, work samples, observations, diagnostic interviews). It is beyond the scope of this bulletin to fully explain test interpretation within the context of a hypothesis-driven framework. The reader is referred to Flanagan and Ortiz (2001) for a comprehensive discussion of this topic.

Step 4: Multidisciplinary Team Constructs an Assessment Plan

It is essential that the case manager and other members of the multidisciplinary team are aware of one another's roles in the evaluation of the subject. Because more than one professional will meet with and evaluate the subject, knowing which skills, abilities, and processes are to be measured by which professionals is necessary to inform the test selection process. For example, if a speech-language pathologist will administer comprehensive tests of phonological processing and rapid automatized naming (RAN), then it is probably not necessary for a school psychologist to administer either the WJ III *Ga* tests or the Rapid Picture Naming test, because such tests may yield redundant information. Examiners should select tests that will provide unique information. Notwithstanding, it may sometimes be desirable for two different examiners to evaluate the same or similar traits. For example, a language specialist, a reading specialist, and a school psychologist each may plan to assess phonological processing in a young child referred for reading difficulties. However, each of these professionals may have planned to use different instruments that measure different aspects of phonological processing or, alternatively, different instruments that measure similar aspects of phonological processing in different ways. Understanding the assessment instruments that other professionals use and the range of abilities and processes the tests measure can help examiners choose a battery that eliminates redundancy and is time efficient and referral relevant. The following section focuses on the tests, clusters, and discrepancy options that comprise the WJ III.

WJ III Tests

The WJ III contains 42 tests, each measuring a specific narrow ability (or abilities) within the CHC framework. It is important for practitioners to become familiar with these tests, particularly with regard to the presumed ability construct(s) that underlies them. Table 2 presents the 42 tests of the WJ III by battery (i.e., cognitive and achievement), along with the abilities that are measured by each test as reported by the test authors (Woodcock, McGrew, & Mather, 2001a, 2001b). The WJ III tests are combined in various ways to form cognitive ability, academic ability, cognitive performance, and clinical clusters. Individual test reliabilities vary considerably across tests and by age and grade (McGrew & Woodcock, 2001). Therefore, individual test interpretation should be conducted judiciously and cautiously, and deference should be given to cluster-level interpretation.

WJ III Clusters

The WJ III clusters typically are comprised of two or more individual tests, each measuring a different aspect of a broad CHC ability. Because the WJ III has as many clusters as individual tests, it is critical that examiners have a firm understanding of the clusters' psychometric properties and intended uses (see Floyd et al., 2003). In general, the WJ III clusters are highly reliable (i.e., median reliabilities are generally at or above .9 across age and grade). Table 3 provides a list of all the clusters that can be obtained using the WJ III COG and the WJ III ACH and the individual tests that comprise the clusters.

Available Discrepancy Options on the WJ III

A variety of discrepancy procedures are offered on the WJ III. A quantitative analysis of an individual's discrepancies may aid in understanding his or her unique learning strengths and weaknesses. There are two types of discrepancy procedures in the WJ III:

Table 2.
Abilities Underlying WJ III Cognitive and Achievement Tests

Tests	CHC Broad Ability—Narrow Ability
WJ III Tests of Cognitive Abilities	
Test 1: Verbal Comprehension	*Gc* Lexical Knowledge—language development
Test 2: Visual-Auditory Learning	*Glr* Associative Memory—ideational fluency
Test 3: Spatial Relations	*Gv* Visualization—spatial relations
Test 4: Sound Blending	*Ga* Phonetic Coding—synthesis
Test 5: Concept Formation	*Gf* Induction
Test 6: Visual Matching	*Gs* Perceptual Speed
Test 7: Numbers Reversed	*Gsm* Working Memory
Test 8: Incomplete Words	*Ga* Phonetic Coding—analysis
Test 9: Auditory Working Memory	*Gsm* Working Memory
Test 10: Visual-Auditory Learning–Delayed	*Glr* Associative Memory
Test 11: General Information	*Gc* General (verbal) Information
Test 12: Retrieval Fluency	*Glr* Ideational Fluency
Test 13: Picture Recognition	*Gv* Visual Memory
Test 14: Auditory Attention	*Ga* Speech-Sound Discrimination—resistance to auditory stimulus distortion
Test 15: Analysis-Synthesis	*Gf* General Sequential Reasoning
Test 16: Decision Speed	*Gs* Semantic Processing Speed
Test 17: Memory for Words	*Gsm* Memory Span
Test 18: Rapid Picture Naming	*Glr* Naming Facility
Test 19: Planning	*Gv* Spatial Scanning; *Gf* General Sequential Reasoning
Test 20: Pair Cancellation	*Gs* Attention and Concentration
WJ III Tests of Achievement	
Test 1: Letter-Word Identification	*Grw* Reading Decoding; *Ga* Phonetic Coding—analysis; synthesis; letter/sound knowledge
Test 2: Reading Fluency	*Grw* Reading Comprehension—speed and rate (automaticity)
Test 3: Story Recall	*Gc* Language Development—listening ability
Test 4: Understanding Directions	*Gc* Listening Ability—language development
Test 5: Calculation	*Gq* Mathematics Achievement
Test 6: Math Fluency	*Gs* Number Facility
Test 7: Spelling	*Grw* Spelling Ability
Test 8: Writing Fluency	Writing Speed
Test 9: Passage Comprehension	*Gc* Lexical Knowledge; *Grw* Reading Comprehension
Test 10: Applied Problems	*Gq* Quantitative Reasoning—mathematics achievement; knowledge of mathematics
Test 11: Writing Samples	*Grw* Writing Ability
Test 12: Story Recall–Delayed	*Glr* Meaningful Memory
Test 13: Word Attack	*Grw* Reading Decoding; *Ga* Phonetic Coding—analysis; synthesis; letter/sound knowledge
Test 14: Picture Vocabulary	*Gc* Language Development—lexical knowledge
Test 15: Oral Comprehension	*Gc* Listening Ability
Test 16: Editing	*Gc* Language Development; *Grw* English Usage Knowledge
Test 17: Reading Vocabulary	*Gc* Language Development; *Grw* Reading Comprehension
Test 18: Quantitative Concepts	*Gq* Knowledge of Mathematics—quantitative reasoning
Test 19: Academic Knowledge	*General* General information—science information; cultural information; geography achievement
Test 20: Spelling of Sounds	*Grw* Spelling Ability; Phonetic Coding—analysis; orthographic coding
Test 21: Sound Awareness	*Ga* Phonetic Coding—analysis; synthesis
Test 22: Punctuation & Capitalization	*Grw* English Usage Knowledge

Table 3.
Tests Comprising WJ III Cognitive and Achievement Clusters

Battery Cluster Category/Cluster	**Tests Comprising Cluster**[a]
WJ III Tests of Cognitive Abilities	
Intellectual Ability	
General Intellectual Ability–Standard	1 through 7
General Intellectual Ability–Extended	1 through 7 and 11 through 17
Brief Intellectual Ability	1, 5, 6
Cognitive Performance Model	
Verbal Ability–Standard	1
Verbal Ability–Extended	1, 11
Thinking Ability–Standard	2 through 5
Thinking Ability–Extended	2 through 5 and 12 through 15
Cognitive Efficiency–Standard	6, 7
Cognitive Efficiency–Extended	6, 7, 16, 17
CHC Broad Ability	
Comprehension-Knowledge (*Gc*)	1, 11
Long-Term Retrieval (*Glr*)	2, 12
Visual-Spatial Thinking (*Gv*)	3, 13
Auditory Processing (*Ga*)	4, 14
Fluid Reasoning (*Gf*)	5, 15
Processing Speed (*Gs*)	6, 16
Short-Term Memory (*Gsm*)	7, 17
Clinical	
Phonemic Awareness	4, 8
Working Memory	7, 9
Broad Attention	7, 9, 14, 20
Cognitive Fluency	12, 16, 18
Executive Processes	5, 19, 20
Delayed Recall	10 (and 12: Story-Recall Recall–Delayed from WJ III ACH)
Knowledge	11 (and 19: Academic Knowledge from WJ III ACH)
WJ III Tests of Achievement	
Reading	
Broad Reading	1, 2, 9
Basic Reading Skills	1, 13
Reading Comprehension	9, 17
Oral Language	
Oral Language–Standard	3, 4
Oral Language–Extended	3, 4, 14, 15
Listening Comprehension	4, 15
Oral Expression	3, 14
Math	
Broad Math	5, 6, 10
Math Calculation Skills	5, 6
Math Reasoning	10, 18
Written Language	
Broad Written Language	7, 8, 11
Basic Writing Skills	7, 16
Written Expression	8, 11

Table 3. *(Continued)*
Tests Comprising WJ III Cognitive and Achievement Clusters

Battery Cluster Category/Cluster	**Tests Comprising Cluster**[a]
Other	
Academic Knowledge	19
Phoneme/Grapheme Knowledge	13, 20
Academic Skills	1, 5, 7
Academic Fluency	2, 6, 8
Academic Applications	9, 10, 11
Total Achievement	1, 2, and 5 through 11

[a]Numbers correspond to the individual tests listed in Table 2.

intra-ability and ability/achievement. Each procedure offers a number of different options. Therefore, practitioners should identify a priori the tests to administer to allow for the use of certain discrepancy options. A priori selection of discrepancy procedures is necessary because it (a) circumvents any tendency to search for significant findings in the absence of clear, logical, or otherwise empirically supported links to the presenting problem(s) and (b) controls for Type II errors (e.g., finding significance where none exists) that result when a correction is not made for multiple comparisons. The two types of discrepancy procedures offered in the WJ III are briefly described below.

A. Intra-Ability Discrepancies. There are three different intra-ability discrepancy options that can yield unique information about an individual's cognitive and academic profiles: Intra-cognitive, intra-achievement, and intra-individual. These discrepancy options provide (a) information that may assist in clinical diagnosis and instructional planning, (b) quantitative support for observed strengths and weaknesses, (c) an understanding of the types of tasks that will be especially easy or difficult for an individual, and (d) data that may be used to corroborate the finding of a learning disability (LD). Each intra-ability discrepancy option is described in detail in Table 4.

B. Ability/Achievement Discrepancies. Ability/achievement discrepancies are calculated to determine whether an individual's achievement is significantly discrepant from that which was predicted from either his or her global cognitive ability performance or oral language performance, depending on the discrepancy option selected. There are three different ability/achievement discrepancy options: General Intellectual Ability (GIA)/achievement, predicted achievement/achievement, and oral language ability/achievement. These ability/achievement discrepancy options are beneficial in that they provide information that may be useful to demonstrate whether an individual is achieving academically at a level commensurate with his or her current level of associated cognitive (or language) abilities. According to current research, another benefit—specific to the Oral Language Ability/Achievement Discrepancy score—is that use of oral language as a predictor of reading and written language achievement (rather than a full-scale score) is clinically preferable in the LD determination process (see Mather & Schrank, 2001, for a discussion). Oral language ability/achievement discrepancies can be helpful in distinguishing individuals with difficulties in reading and writing despite adequate oral language from those whose academic achievement is consistent with their oral language abilities. This distinction has important instructional implications. A significant discrepancy between average or better-than-average oral-language skills and weak academic skills suggests the need to focus on the development of academic skills. Consistency between an individual's below-average oral-language and academic skills (i.e., poor academic achievement *and* poor

Table 4.
Intra-Ability Discrepancy Options

Discrepancy Option and Description	Clusters That Need to Be Administered
Intra-cognitive Allows for a comparison between predicted and actual cognitive ability performance where predicted performance is based on the examinee's average performance in all other cognitive areas.	Intra-cognitive discrepancies can be calculated on seven CHC cognitive clusters: **CHC Clusters/Extended Battery Option** Comprehension-Knowledge (*Gc*) Long-Term Retrieval (*Glr*) Visual-Spatial Thinking (*Gv*) Auditory-Processing (*Ga*) Fluid Reasoning (*Gf*) Processing-Speed (*Gs*) Short-Term Memory (*Gsm*) {Phonemic Awareness}[a] {Working Memory}[b] *or* on the cognitive performance clusters: **Cognitive Performance Cluster/Standard or Extended Battery Option** Verbal Ability Thinking Ability Cognitive Efficiency
Intra-achievement Allows for a comparison between predicted and actual academic achievement, where predicted achievement is based on the examinee's average performance in all other achievement areas.	Intra-achievement discrepancies can be calculated on four broad curricular areas: **Standard Battery Option** Broad Reading Broad Math Broad Written Language Oral Language–Standard *or* on nine specific areas of academic performance: **Extended Battery Option** Basic Reading Skills Reading Comprehension Math Calculation Skills Math Reasoning Basic Writing Skills Written Expression Oral Expression Listening Comprehension Academic Knowledge
Intra-individual Allows for simultaneous comparisons among all cognitive and academic abilities. Each cognitive ability and achievement area of interest is compared with the average of all other abilities in the comparison.	Intra-individual discrepancies can be evaluated through four different options, depending on how many clusters have been administered: **Standard Cognitive/Standard Achievement** Verbal Ability, Thinking Ability, Cognitive Efficiency, Broad Reading, Broad Math, Broad Written Language, Oral Language–Standard **Standard Cognitive/Extended Achievement** Verbal Ability, Thinking Ability, Cognitive Efficiency, Basic Reading Skills, Reading Comprehension, Math Calculation Skills, Math Reasoning, Basic Writing Skills, Written Expression, Oral Expression, Listening Comprehension, Academic Knowledge **Extended Cognitive/Standard Achievement** Comprehension-Knowledge, Long-Term Retrieval, Visual-Spatial Thinking, Auditory Processing, Fluid Reasoning, Processing Speed, Short-Term Memory, (Phonemic Awareness, Working Memory)[c], Broad Reading, Broad Math, Broad Written Language, Oral Language–Standard **Extended Cognitive/Extended Achievement** Comprehension-Knowledge, Long-Term Retrieval, Visual-Spatial Thinking, Auditory Processing, Fluid Reasoning, Processing Speed, Short-Term Memory (Phonemic Awareness, Working Memory)[c], Basic Reading Skills, Reading Comprehension, Math Calculation Skills, Math Reasoning, Basic Writing Skills, Written Expression, Oral Expression, Listening Comprehension, Academic Knowledge

[a]Phonemic Awareness is not required for calculation of intra-cognitive discrepancies. The Phonemic Awareness score is not included in the "Other" score calculated for the other clusters. The Phonemic Awareness score is compared with the same "Other" score as Auditory Processing (*Ga*).

[b]Working Memory is not required for calculation of intra-cognitive discrepancies. The Working Memory score is not included in the "Other" score calculated for the other clusters. The Working Memory score is compared with the same "Other" score as Short-Term Memory (*Gsm*).

[c]When the subtests that comprise the Phonemic Awareness and Working Memory clusters are administered, these clusters are included in the intra-individual analysis.

oral-language achievement) suggests that instructional recommendations should be directed toward developing all skills within the context of a comprehensive language-based instructional program (Mather & Jaffe, 2002; Mather & Schrank, 2001). Each ability/achievement discrepancy option is described in detail in Table 5.

It is clear from the information presented in Tables 2–5 that the WJ III is a comprehensive instrument that offers a variety of tests, clusters, and discrepancy options. Information about the WJ III, as well as other instruments that may be considered necessary to address referral concerns, represents an expansive foundational source of knowledge that is critical for effective test selection.

As indicated in Figure 1, Steps 1–3 can sometimes operate as a multifaceted first step that occurs during an initial evaluation plan meeting. Whether these steps are combined

Table 5.
Ability/Achievement Discrepancy Options

Discrepancy Option and Description	WJ III Tests and Clusters That Need to Be Administered
GIA/Achievement Uses one of two global ability scores (i.e., GIA–Standard or GIA–Extended) to predict expected levels of performance across academic domains.	**GIA Standard/Achievement** Test 1: Verbal Comprehension Test 2: Visual-Auditory Learning Test 3: Spatial Relations Test 4: Sound Blending Test 5: Concept Formation Test 6: Visual Matching Test 7: Numbers Reversed Any achievement cluster **GIA Extended/Achievement** Cognitive Tests 1–7 Test 11: General Information Test 12: Retrieval Fluency Test 13: Picture Recognition Test 14: Auditory Attention Test 15: Analysis-Synthesis Test 16: Decision Speed Test 17: Memory for Words Any achievement cluster
Predicted Achievement/Achievement[a] Uses differentially weighted global ability scores to predict expected levels of performance across academic domains. Because this procedure deliberately maximizes prediction through weighting, an individual's predicted and actual achievement are highly correlated. As a result, high and low predicted achievement scores should theoretically correspond to high and low actual achievement scores, respectively, thereby resulting in nonsignificant discrepancies (or consistencies; see Flanagan, Ortiz, Alfonso, & Mascolo [2002] for an in-depth discussion).	Cognitive Tests 1–7
Oral Language Ability/Achievement Uses an oral-language ability score to predict expected levels of performance across academic domains. This new discrepancy option reflects the finding that many individuals with specific reading and writing disabilities demonstrate more "unexpected" underachievement than that which was predicted by their oral language ability.	**Oral Language–Extended** Achievement Test 3: Story Recall Achievement Test 4: Understanding Directions Achievement Test 14: Picture Vocabulary Achievement Test 15: Oral Comprehension Any achievement cluster

[a]When the difference between predicted and actual achievement is nonsignificant, as expected, and performance is in the deficient range of ability, clinical information regarding the impact of the subject's processing weaknesses on the learning of related skills can be documented—a necessary diagnostic criterion for establishing the presence of an LD when other abilities and processes are intact. However, this below-average predicted achievement/achievement consistency is often at odds with the procedural need that many school systems have for documenting a statistical discrepancy between ability and achievement for the purpose of LD determination. Examiners are cautioned that *clinical* profiles are not always interchangeable with the data needed for *procedural* documentation and decisions.

or carried out sequentially will likely depend on district procedures. However these steps are conducted, it is important to secure all relevant and necessary data, as specified in each step, to effectively inform test selection.

Step 5: Finalize Selective Testing Battery

At this phase in the test selection process, the presenting problem(s) should be reviewed in light of all available data to determine whether the selected battery is sufficient to address referral concerns and will yield data necessary to test the team's a priori hypotheses.

Steps 6 and 7: Administer, Score, and Interpret the Selective Testing Battery

With regard to administration and scoring, it is expected that practitioners will incorporate general testing considerations applicable to the use of standardized tests, as well as the specific guidelines provided in the manuals of any tests used in the assessment. Unlike the processes of administration and scoring, the test interpretation process will probably require more than just adhering to the guidelines, steps, or procedures outlined in an instrument's examiner's manual or technical manual. Test interpretation guidelines, if offered at all, frequently are vague and lack sufficient detail to allow practitioners to draw theoretically and psychometrically sound conclusions from the data. In fact, most intelligence batteries, including the WJ III, are published without an interpretive handbook or manual. As such, it is the examiner's responsibility to find and learn an interpretation method that is both theoretically sound and psychometrically defensible. One such method is the cross-battery approach to interpretation (see Flanagan & Ortiz, 2001; Flanagan, Ortiz, Alfonso, & Mascolo, 2002). It is expected that users of the WJ III and, more specifically, the selective testing process, will have knowledge of best practices in test interpretation and the relevant research base that supports those practices.

Step 8: Evaluate Hypotheses

Although the practitioner may suspect that an individual's reading difficulties are related to deficits in specific cognitive abilities (e.g., *Ga, Gc, Glr*), the a priori hypothesis remains null, specifying that expected performance on any ability test will be within normal limits. That is, the practitioner should assume that the data will reveal normal functioning and therefore should not abandon this assumption unless or until the data prove the contrary. This process is relatively straightforward, in that when the evaluative judgments indicate that functioning or performance is outside of normal limits, the null hypothesis is rejected in favor of the alternative hypothesis that functioning is, in fact, not within normal limits and instead is exceptional (high or low) in some way.

Step 9A: Reject A Priori Hypotheses and Specify A Posteriori Hypotheses

In the majority of cases, particularly those that include concerns about significant learning difficulties, measurement of an individual's abilities is likely to show one or more instances in which the null hypothesis cannot be retained, indicating that some performances are not within the normal limits of functioning. Disability determinations are based in part on performances that fall below the expected normal or average range, whereas gifted and talented determinations are based in part on performances that are above the expected normal or average range. In cases where the data suggest that the null hypothesis should be rejected, assessment becomes an iterative process (Flanagan & Ortiz, 2001).

When a priori hypotheses are not supported by the data, or when the data conflict or demonstrate inconsistencies, additional assessment may be warranted. The process of conducting additional assessment remains hypothesis driven. According to *The American Heritage Dictionary* (2004), *a posteriori* is defined as "Reasoning from particular facts to general principles; empirical." The use of a posteriori hypotheses involves inferring causes from effects (Kamphaus, 1993). A posteriori hypotheses are essentially identical to a priori hypotheses in that they specify that performance will be within the normal limits of functioning. A posteriori hypotheses differ from a priori hypotheses only with respect to the point at which they occur or are generated in the assessment process. A priori hypotheses are generated prior to the administration, scoring, and interpretation of the selective assessment. A posteriori hypotheses are generated following the interpretation of the initial data and also serve to reduce confirmatory bias. Again, knowledge of current theory and research guides the selection of measures that will be used to gather additional information and evaluate a posteriori hypotheses.

The recursive nature of the assessment process makes it clear that selective testing and interpretation are iterative processes that may require the collection of additional data (via the administration of additional skill and ability tests) to evaluate individual performance sufficiently. Moving from Step 9A back to Step 5 represents an iteration in the selective testing process and is necessary to "narrow down the possibilities" or reasons for the existence of a particular initial finding (Kamphaus, 1993, p. 166). This loop (from Step 9A to Step 5) continues until all hypotheses are evaluated sufficiently, thereby allowing practitioners to draw valid and useful conclusions from the data (Step 9B).

Step 9B: Retain A Priori Hypotheses and Draw Conclusions

When selective assessment data are evaluated according to the specified a priori hypotheses, there may be instances when functioning in all areas is observed to fall within normal limits, and thus, all a priori hypotheses are retained. There may also be instances when some or all of the a priori hypotheses were rejected and the practitioner is confident that the evaluation was sufficient to allow for drawing appropriate conclusions. In any case, if the selective assessment was organized in accordance with all previous steps, and if the assessment provided adequate representation of the abilities or constructs of interest, then further assessment with standardized testing is probably unwarranted, and practitioners should draw appropriate conclusions and present their findings in a psychological report.

Case Example

Although it is important that practitioners familiarize themselves thoroughly with the foundational sources of information that underlie the selective testing process, it is equally important that they understand how to apply this knowledge in practice. The following case example briefly illustrates how declarative knowledge (i.e., knowledge gained from various data sources as mentioned previously) and procedural knowledge (i.e., the organizational flowchart) are used concurrently in the test selection process to address specific referral concerns.

Case #1

Subject: Jason
Grade: 2.5

Step 1: Evaluation of Referral Information and Determination of Need for Standardized Testing

Jason's teacher expressed concern about his difficulties in the areas of reading and writing relative to his peers. Screening and interventions were conducted and monitored through various support levels within the framework of regular education services. Jason received reading and writing instruction that used research-based curricular materials and methods. After screening techniques conducted in first grade suggested the need to augment his instruction, Jason also received small-group tutorial instruction, 5 days per week, within his regular education program. Because of Jason's limited response to intervention, his classroom teacher presented Jason's case to the school's instructional support team—a non-special education team charged with addressing instructional and behavioral concerns for subjects prior to the more formalized special education process. A review of teacher concerns and Jason's intervention history resulted in the assignment of a case manager and the decision to proceed with a formal psychoeducational evaluation.

Step 2: Gathering Data to Elucidate Referral Information and Inform Test Selection

The case manager initiated the collection of referral information from Jason's teachers and parents. The case manager conducted a comprehensive file review to augment information collected from Jason's parents and teachers. Additional corroboration of referral concerns was obtained through collected work samples and classroom observations. The collected data suggested the following:

1. Jason's progress in reading and writing skills is considerably slower than expected for his age and grade, as well as for the level of instructional intensity that accompanied early intervention services.
2. Jason is struggling with sound/symbol associations and appears to have difficulty retaining phoneme/grapheme knowledge over time.
3. Jason's production of letters, words, and sentences in writing is slow and labored.
4. Jason appears to have difficulty recalling letter formations.
5. Jason's oral-language skills are judged by his teachers and parents to be average to above average for his age and grade.
6. Jason's mathematics skills are considered to be his academic strengths. His teachers noted that his thinking is conceptually sound and that he is progressing in both math and problem-solving activities at a level consistent with standards-based curriculum assessments.

Step 3: Specification of A Priori Hypotheses Within the Context of Current Theory and Research

A multidisciplinary evaluation and planning team was organized and met to review the preliminary data and referral concerns. The team generated the following hypotheses:

1. Jason's GIA is within normal limits relative to same-age peers.
2. Jason does not have any clinically meaningful weaknesses in his cognitive ability profile.

3. Jason's reading and writing skills are within normal limits relative to same-age peers.
4. Jason's phonemic awareness skills are within normal limits relative to same-age peers.
5. Jason's handwriting is within normal limits relative to same-age peers.
6. Jason's *Glr* (namely, associative memory) and *Gsm* (namely, working memory) are within normal limits relative to same-age peers.
7. Jason's oral language skills are within normal limits relative to same-age peers.
8. Jason's math skills are within normal limits relative to same-age peers.
9. Jason's level of academic achievement in all areas is consistent with his GIA.

It is important to note that the team generated hypotheses that were based on presumptions of normalcy. As mentioned above, stating hypotheses in the null form may minimize confirmatory bias. Unless the data (gathered from multiple sources) suggest otherwise, the team's hypotheses of normal functioning in all cognitive and academic domains should not be rejected, no matter how strong a belief to the contrary any team members may have.

Step 4: Multidisciplinary Team Constructs an Assessment Plan

Using Table 1 as a guide, the team selected tests and clusters from the WJ III based on their empirical relation to the skill and ability concerns articulated in the referral. In addition, test selection was guided by the type of discrepancy analyses that would be used after the assessment. For example, because the team was interested in Jason's cognitive strengths and weaknesses, it was necessary to administer WJ III tests 1–7 and 11–17, which allow for an intra-cognitive ability analysis (see Table 3). The tests selected by the team and a brief rationale for each selection are listed in Table 6.

Table 6.
Selected Tests for Jason

Cognitive Tests/Clusters	Rationale[a]	Approximate Time Investment
GIA–Extended	This includes all cognitive factors and the ability to compute both intra-cognitive discrepancies and GIA/achievement discrepancies.	45 minutes
Incomplete Words	Contributes to the Phonemic Awareness cluster (along with Test 4)	≤5 minutes
Auditory Working Memory	Contributes to the Working Memory cluster	≤5 minutes
Visual-Auditory Learning–Delayed	Provides information about durability of retention of new information over time—compared with performance on WJ III COG Test 2.	≤5 minutes
Rapid Picture Naming	RAN contributes to the Cognitive Fluency cluster (along with Tests 12 and 16).	≤5 minutes

Note. Total cognitive assessment: approximately 60 minutes

Academic Tests/Clusters	Rationale	Approximate Administration Investment
Broad Reading; Basic Skills; Reading Comprehension	Needed to assess reading comprehensively	15 minutes
Broad Written Language	Incorporates early spelling skills and diverse measures of Written Expression. The Written Expression cluster is embedded within Broad Written Language.	15 minutes
Spelling of Sounds	Contributes to the Phoneme-Grapheme Knowledge cluster along with Word Attack (Test 13)	≤5 minutes
Sound Awareness	Provides information related to an individual's ability to manipulate phonemes in words (i.e., rhyming, deleting, substituting, and reversing phonemes)	≤5 minutes

Total achievement assessment: approximately 40 minutes

[a]Research on reading disorders demonstrates consistently the need to assess phonemic awareness, cognitive fluency, rapid automatized naming, and the ability to recode information in working memory (see Table 5 of this bulletin).

Step 5: Finalize Selective Testing Battery

The team includes in the evaluation plan any other techniques and tools that can provide additional information about Jason's presenting problems. For example, the team may decide to select additional tests of RAN from another battery to augment the single measure provided by the WJ III (e.g., Rapid Picture Naming).

Steps 6 and 7: Administer, Score, and Interpret the Selective Testing Battery

Through interpretation of all test results within the context of the information gathered throughout the referral process, the team reported the following findings:

1. Jason's cognitive performance suggested average GIA (GIA score: SS = 90).
2. Statistical and qualitative analysis of Jason's cognitive ability profile showed a dynamic pattern of cognitive strengths and weaknesses, as determined through both intra-individual (or person-relative) analysis (WJ III Compuscore® intra-cognitive ability analysis) and inter-individual (or population-relative) analysis:
   - Jason's performance revealed average abilities in verbal comprehension, word knowledge, and general information (Comprehension-Knowledge [SS = 95]; Visual-Spatial Thinking [SS = 109]) and in his ability to solve problems (Fluid Reasoning [SS = 98]).
   - Jason showed normative weaknesses in the following areas: (a) phonetic coding (Phonemic Awareness [SS = 80] and Auditory Processing [SS = 82]), (b) the ability to recode information in short-term memory and working memory (Short-term Memory [SS = 81] and Working Memory [SS = 83]), (c) the ability to learn new information and later retrieve it through association (Long-term Retrieval [SS = 81]), and (d) general cognitive speed and fluency (Processing Speed [SS = 84] and Cognitive Fluency [SS = 79]). Jason also exhibited a weakness in his ability to retain and recall new information over time, as evidenced by a significant negative *z*-score on Visual-Auditory Learning–Delayed Recall.
   - Jason demonstrated a normative weakness in RAN (Rapid Picture Naming [SS = 82]).
3. Jason demonstrated normative weaknesses in reading (Broad Reading [SS = 74]) and written language (Broad Written Language [SS = 83]). These data are consistent with referral concerns regarding Jason's rate of learning and his inefficiency with reading and writing tasks. Qualitative analysis of Jason's performance in academic skills also showed response patterns consistent with his processing difficulties in phonological abilities, memory/recall, and perceptual speed and efficiency. More specifically, on reading tasks, Jason often confused initial sounds in words and read connected text very slowly. On writing tasks, Jason attempted to sound out words but seemed unable to retain what he said long enough to write it. As a result, his verbal reproduction of a word was often inconsistent with the written product.
4. The instructional zones and Relative Proficiency Index (RPI) scores obtained for Jason's reading and writing skills suggested that his difficulties in these areas are qualitatively significant relative to grade-level demands (i.e., grade-level tasks are at or above his frustration/difficulty level).
5. Jason's reading and writing performance was not significantly different from the level of achievement predicted by his GIA.

Step 8: Evaluate Hypotheses

1. Jason's GIA is within normal limits relative to same-age peers.

   Decision: *Retain.* GIA was average.

2. Jason does not have any clinically meaningful relative weaknesses in his profile of cognitive abilities and processes.

   Decision: *Reject.* Normative weaknesses in *Glr, Gsm,* and *Gs* supported by observations and teacher reports.

3. Jason's reading and writing skills are within normal limits relative to same-age peers.

   Decision: *Reject.* Normative weaknesses in *Grw* supported by work samples, teacher reports, parent reports, observations, and informal evaluation.

4. Jason's phonemic awareness skills are within normal limits relative to same-age peers.

   Decision: *Reject.* Normative weakness in *Ga* and phonemic awareness cluster supported by observations and teacher reports.

5. Jason's handwriting is within normal limits relative to same-age peers.

   Decision: *Retain.* Handwriting was considered average based on observation and evaluation of work samples.

6. Jason's *Glr* (namely, associative memory) and *Gsm* (namely, working memory) are within normal limits relative to same-age peers.

   Decision: *Reject.* Normative weaknesses in *Glr* and *Gsm.*

7. Jason's oral language skills are within normal limits relative to same-age peers.

   Decision: *Retain.* Oral language was considered average based on observation, teacher and parent reports, and performance in *Gc.*

8. Jason's math skills are within normal limits relative to same-age peers.

   Decision: *Retain.* Mathematics was considered average based on teacher reports and evaluation of work samples.

9. Jason's level of academic achievement in all areas is consistent with his GIA.

   Decision: *Retain.* No significant differences were observed between Jason's actual and predicted achievement when GIA was used as the predictor in GIA/achievement discrepancy analysis.

Step 9: Draw Conclusions/Implications

Jason's standardized test results are consistent with both referral concerns and other data that were gathered throughout the assessment (e.g., information from parents and teachers, work sample analyses, classroom observations). Specifically, Jason's WJ III ACH reading and writing performance was significantly below that expected for an individual of his age and grade. Jason's reported struggle with sound/symbol associations is supported by his demonstrated weaknesses on the WJ III COG Phonemic Awareness and Auditory Processing clusters. Observations during the testing, coupled with classroom observations, also support Jason's reported difficulty with recalling letter formations. Jason's difficulty with retrieval of information was evidenced by his performance on the WJ III COG Long-Term Retrieval tests, including Rapid Picture Naming, Visual-Auditory Learning, and Visual-Auditory Learning–Delayed. Jason's difficulty with retrieval may be related in part to a general memory deficit, which impacts his ability to adequately encode and transform information. Jason's demonstrated weaknesses in Processing Speed and Cognitive Fluency are consistent with his reported slow and labored production of letters, words, and sentences. Given that test observations indicated that Jason demonstrates adequate manual dexterity (e.g., when completing paper-and-pencil tasks), his reported slow and labored production of letters, words, and sentences are more consistent with a processing speed difficulty rather than a psychomotor deficit.

In contrast to Jason's weaknesses in cognitive and academic abilities relative to same-age peers, he demonstrated average abilities in *Gc, Gf,* and *Gq* (math achievement). Nevertheless, his deficits appear to have significantly hindered his development of reading and writing skills. Furthermore, the absence of a significant GIA/achievement discrepancy is not surprising; his cognitive deficits attenuated his GIA, resulting in an expected consistency, rather than a discrepancy, between cognitive and academic performance. Specifically, an examination of Jason's performance on the cognitive ability clusters that comprise the GIA demonstrated a *below-average consistency* between specific cognitive abilities (namely, *Glr, Gsm, Gs,* and *Ga*) and reading and writing achievement within an otherwise normal ability profile (i.e., average *Gc, Gf,* and *Gv*). This finding is consistent with the "disorder in a basic psychological process" component of the federal definition of learning disability (see Flanagan et al., 2002, for a more detailed discussion). Although it is beyond the scope of this bulletin to discuss Jason's performance in detail with respect to differential diagnosis and treatment, it is clear that his *Gs* has had a global impact on his general memory and learning. That is, Jason's slow processing appears to significantly reduce his working memory capacity, which in turn results in difficulty acquiring new knowledge. Jason will benefit from instruction in the use of specific strategies (e.g., mnemonics and chunking) and from specific remedial interventions (e.g., phonemic awareness training).

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