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The WJ IV™ Core-Selective Evaluation Process Applied to Identification of a Specific Learning Disability

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Each of the WJ IV batteries contains a "core" set of tests that provides a representative survey of abilities measured by the battery. Examiners can selectively administer additional tests to provide greater breadth of measurement in an area of cognition or linguistic competency or in a domain of achievement. This Assessment Service Bulletin describes how to use the WJ IV in a core-selective evaluation process (C-SEP) for identification of a specific learning disability (SLD). The basic premise of the C-SEP model for SLD identification is that test selection and data analysis are proportional to problem complexity—based on the presenting problem or referral question and the evaluator's professional judgment in determining what tests to administer. Information provided in this bulletin can be used to support professional judgment in determining what tests, beyond the core tests, to administer in an evaluation. Test-to-cluster correlation tables support the validity of the C-SEP as a data-based model for diagnostic decision making.

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The WJ IV Core-Selective Evaluation Process Applied to Identification of a Specific Learning Disability

The *Woodcock-Johnson® IV* (WJ IV™; Schrank, McGrew, & Mather, 2014a) is a comprehensive psycho-educational assessment system consisting of 50 tests that are organized into three batteries: the *Woodcock-Johnson IV Tests of Cognitive Abilities* (WJ IV COG; Schrank, McGrew, & Mather, 2014b), the *Woodcock-Johnson IV Tests of Oral Language* (WJ IV OL; Schrank, Mather, & McGrew, 2014b), and the *Woodcock-Johnson IV Tests of Achievement* (WJ IV ACH; Schrank, Mather, & McGrew, 2014a). The WJ IV COG, WJ IV OL, and WJ IV ACH each include a set of four to seven "core" tests that creates a foundation for interpretation, including an analysis of relative strengths and weaknesses.

The WJ IV core tests provide some of the most useful information for a variety of assessment purposes. Each core test was selected to represent a broad theoretical construct as well as to be a sensitive and relevant indicator of learning problems. For ease of use, the core tests appear at the front of each test book. After an examiner has administered the core tests, he or she can administer one or more additional tests to enable further analysis of relative strengths and weaknesses. In addition, an evaluator may compare an examinee's performance on one test with his or her performance on a related test to better understand the nature of the examinee's learning problem.

In the WJ IV, cluster scores that represent broad factors, cognitive-linguistic competency, or specific areas of achievement can be obtained by administering additional tests. Because cluster scores represent greater breadth of measurement and show higher reliabilities than test scores, cluster scores are typically preferred when establishing the presence and severity of a disability. Professional judgment plays a key role in determining which additional tests, if any, an examiner should administer. Knowledge of the relationship between a particular cognitive or oral language test and area of achievement contributes to professional judgment as well as data-based decision making in test selection (see Appendices A, B, and C). In some cases, administration and interpretation of the core tests alone provides the level of information that is needed to address a referral question. In other cases, administration of tests beyond the core set provides greater breadth of interpretation and may yield information that is important to understanding the nature of, and responding to, a referral question.

This bulletin contains guidelines for use and interpretation of the WJ IV core tests. It serves as a resource to help examiners determine which, if any, additional tests to selectively administer, based on a student's performance on the core tests. The core test interpretive information included in this bulletin is synthesized from a broad array of psychometric and related neurocognitive research that supports the use of clinical judgment to determine whether additional tests should be administered. Because the

WJ IV measures such a wide array of cognitive, oral language, and achievement abilities, the core-selective evaluation process (C-SEP) described in this bulletin is appropriate for many different types of referral questions; however, it is particularly well-suited to the identification of learning needs and determination of a specific learning disability[1] (SLD).

A Guide to the WJ IV Core-Selective Evaluation Process

The C-SEP assists examiners in selectively administering WJ IV tests in addition to the core tests in the WJ IV COG, OL, and ACH to enable a more in-depth analysis of one or more areas of cognition, oral language, or achievement. Following are guidelines regarding use of the C-SEP with each of the three WJ IV batteries.

WJ IV COG Core Tests and Selective Testing Guidance

The WJ IV COG includes 18 tests for measuring broad and narrow cognitive abilities and related aspects of cognitive functioning. The Standard Battery includes Tests 1 through 10; the Extended Battery includes Tests 11 through 18. Three cognitive composites are available: General Intellectual Ability (GIA), Brief Intellectual Ability, and the Fluid Reasoning-Comprehension-Knowledge (*Gf-Gc*) Composite. The WJ IV COG provides measures of seven contemporary broad Cattell-Horn-Carroll theory (CHC theory; see McGrew, LaForte, & Schrank, 2014) factors: Comprehension-Knowledge (*Gc*), Fluid Reasoning (*Gf*), Short-Term Working Memory (*Gwm*), Cognitive Processing Speed (*Gs*), Auditory Processing (*Ga*), Long-Term Retrieval (*Glr*), and Visual Processing (*Gv*). Additionally, several narrow CHC ability and other clinically useful clusters can be derived. These include Quantitative Reasoning (RQ), Number Facility (N), Perceptual Speed (P), and Cognitive Efficiency. When selected tests from the WJ IV OL also are administered with designated tests from the WJ IV COG, Auditory Memory Span (MS) and Vocabulary (VL/LD) clusters are available.

Tests 1 through 7 constitute the core tests in the WJ IV COG. Each of the core tests is a strong indicator of the respective CHC factors, is strongly related to general intelligence (*g*), is high or relatively high in cognitive complexity, and is relevant, or strongly related, to academic achievement (McGrew et al., 2014). Tests 1 through 7 also yield the GIA score and form the basis for the intra-cognitive variations procedure. Table 1 is a guide to the core-selective evaluation process when using the WJ IV COG.

[1] *Specific learning disability* means a disorder in one or more of the basic psychological processes involved in understanding or using spoken or written language that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not include learning problems that are primarily the result of visual, hearing, or motor disabilities; intellectual disability; emotional disturbance; or environmental, cultural, or economic disadvantage (adapted from IDEA, 2004; 20 U.S.C. §1401 [30]).

Table 1.
WJ IV COG Core-Selective Evaluation Process Guide

WJ IV COG Core Test	Selectively Administered Test	Ability or Process Measured	Cluster Obtained
Test 1: Oral Vocabulary		Knowledge of words and word meanings	
	COG Test 8: General Information	Level of background knowledge	Comprehension-Knowledge (*Gc*)
	OL Test 1: Picture Vocabulary	Level of language development	Vocabulary (VL); Comprehension-Knowledge–Extended when COG Test 8: General Information also is administered
	ACH Test 18: Science	Verbal knowledge in science	Academic Knowledge cluster when ACH Test 19: Social Studies and ACH Test 20: Humanities also are administered*
	ACH Test 19: Social Studies	Verbal knowledge in social studies	Academic Knowledge cluster when ACH Test 18: Science and ACH Test 20: Humanities also are administered*
	ACH Test 20: Humanities	Verbal knowledge in the humanities	Academic Knowledge cluster when ACH Test 18: Science and ACH Test 19: Social Studies also are administered*
Test 2: Number Series		Quantitative reasoning	
	COG Test 9: Concept Formation	Verbal inductive reasoning	Fluid Reasoning (*Gf*)
	COG Test 15: Analysis-Synthesis	Algorithmic deductive reasoning	Fluid Reasoning–Extended when COG Test 9: Concept Formation also is administered
	ACH Test 5: Calculation	Foundational math facts and operations	
	ACH Test 10: Math Facts Fluency	Fluency with basic math facts and operations	
	COG Test 11: Number-Pattern Matching	Number processing speed	
	COG Test 17: Pair Cancellation	Attentional control	
	COG Test 10: Numbers Reversed	Complex working memory capacity with number sequences	

Table 1. *(cont.)*
WJ IV COG Core-Selective Evaluation Process Guide

WJ IV COG Core Test	Selectively Administered Test	Ability or Process Measured	Cluster Obtained
Test 3: Verbal Attention		Temporary storage of verbal information and cue-dependent search function in working memory	
	COG Test 10: Numbers Reversed	Complex working memory capacity with number sequences	Short-Term Working Memory (*Gwm*)
	COG Test 16: Object-Number Sequencing	Assembly of new structures out of information maintained in working memory	Short-Term Working Memory–Extended when COG Test 10: Numbers Reversed also is administered
	COG Test 18: Memory for Words	Capacity of working memory when complex processing is not required	Auditory Memory Span (MS) cluster when OL Test 5: Sentence Repetition also is administered*
	OL Test 6: Understanding Directions	Working memory capacity in receptive language	
	OL Test 5: Sentence Repetition	Capacity of working memory for expressive language when complex processing is not required	Auditory Memory Span (MS) cluster when COG Test 18: Memory for Words also is administered*
Test 4: Letter-Pattern Matching		Orthographic (letter-pattern) visual perceptual discrimination ability under timed conditions	
	COG Test 11: Number-Pattern Matching	Orthographic (number-pattern) visual perceptual discrimination ability under timed conditions	Perceptual Speed (P)
	COG Test 17: Pair Cancellation	Visual perceptual attention under timed conditions	Cognitive Processing Speed (*Gs*)
	ACH Test 9: Sentence Reading Fluency	Impact of processing speed on reading rate	Academic Fluency cluster when ACH Test 10: Math Facts Fluency and ACH Test 11: Sentence Writing Fluency also are administered*
	ACH Test 10: Math Facts Fluency	Impact of processing speed on fundamental mathematics calculation facility	Academic Fluency cluster when ACH Test 9: Sentence Reading Fluency and ACH Test 11: Sentence Writing Fluency also are administered*
	ACH Test 11: Sentence Writing Fluency	Impact of processing speed on writing facility	Academic Fluency cluster when ACH Test 9: Sentence Reading Fluency and ACH Test 10: Math Facts Fluency also are administered*
	ACH Test 15: Word Reading Fluency	Impact of processing speed on reading rate	Reading Rate cluster when ACH Test 9: Sentence Reading Fluency also is administered*

Table 1. *(cont.)*
WJ IV COG Core-Selective Evaluation Process Guide

WJ IV COG Core Test	Selectively Administered Test	Ability or Process Measured	Cluster Obtained
Test 5: Phonological Processing		Word activation, fluency of word access, and word reconstruction via phonological codes	
	COG Test 12: Nonword Repetition	Phonemic sensitivity and phonological short-term memory capacity	Auditory Processing (*Ga*)
	OL Test 7: Sound Blending	Ability to blend sounds together to form words	Phonetic Coding (PC) cluster when OL Test 3: Segmentation also is administered*
	OL Test 3: Segmentation	Ability to break apart the sounds within a word	Phonetic Coding (PC) cluster when OL Test 7: Sound Blending also is administered*
Test 6: Story Recall		Ability to construct meaning-based mental representations, consolidate memories, and reconstruct details from orally imparted discourse	
	COG Test 13: Visual-Auditory Learning	Visual-auditory paired encoding in the learning phase; identification and word retrieval in the response phase	Long-Term Retrieval (*Glr*)
	OL Test 2: Oral Comprehension	Comprehension of orally imparted discourse	
	OL Test 6: Understanding Directions	Working memory capacity in receptive language	
	COG Test 3: Verbal Attention	Temporary storage of verbal information and cue-dependent search function in working memory	
	COG Test 8: General Information	Level of background knowledge	
	ACH Test 12: Reading Recall	Ability to construct meaning-based mental representations, consolidate memories, and reconstruct details from reading	
Test 7: Visualization		Size and shape perception, part-to-whole analysis, and the ability to transform two- and three-dimensional images	
	COG Test 14: Picture Recognition	Recognition of previously presented visual stimuli from images or icons held in the visual cache	Visual Processing (*Gv*)

*Core test is not included in the comparative cluster.

Test 1: Oral Vocabulary

COG Test 1: Oral Vocabulary is a test of Comprehension-Knowledge (*Gc*) that measures knowledge of words and word meanings (Schrank, Decker, & Garruto, 2016) using two subtests: Synonyms and Antonyms. The combined score on this test measures a student's lexical knowledge (i.e., vocabulary knowledge) and language development (i.e., general development of spoken language skills that do not require reading ability).

Individuals with expansive vocabularies will often make synonym and antonym associations from known stimulus words more or less directly and automatically (Martin, 1998). As words become increasingly unfamiliar, these individuals will often attempt an answer by parsing or segmenting the stimulus word into any recognizable phonological, orthographic, or morphological units (van Orden & Goldinger, 1994, 1996) for clues to support an information search using working memory. In contrast, individuals with limited vocabularies are less likely to make direct and automatic synonym and antonym associations and may (or may not) attempt an answer using reasoning; the level of effort observed may provide a clue to their controlled language processing efficacy or acquired knowledge of word-learning strategies.

Low performance on COG Test 1: Oral Vocabulary also may suggest a need to explore further, via additional assessment, the student's levels of background knowledge, object vocabulary knowledge, and academic knowledge. COG Test 8: General Information provides a measure of background knowledge—the level of general knowledge that a student brings to the learning situation (Schrank et al., 2016). Background knowledge is extremely important because the integration of prior knowledge with new information is the basis for constructing the higher-order cognitive representations required for learning (Hannon & Daneman, 2014; Oberauer, Süß, Wilhelm, & Wittman, 2008). When combined as a composite, COG Test 1: Oral Vocabulary and COG Test 8: General Information form the Comprehension-Knowledge (*Gc*) cluster, which broadly measures comprehension of words and general object knowledge (Schrank et al., 2016).

OL Test 1: Picture Vocabulary often can provide an additional perspective on language development when COG Test 1: Oral Vocabulary performance is low. OL Test 1: Picture Vocabulary is primarily a language development task because, in contrast to COG Test 1: Oral Vocabulary, the stimulus material does not involve orthography (i.e., word identification cannot be accessed via reading; Carroll, 1993). The identification of objects in OL Test 1: Picture Vocabulary involves making connections to previously learned information related to features present in the stimulus picture. As such, this test can provide useful information when a student may be able to infer information about the function of the object but is unable to identify the name of the object (e.g., the student possesses a broad level of object knowledge but lacks the specific vocabulary knowledge). OL Test 1: Picture Vocabulary combines with COG Test 1: Oral Vocabulary to create the Vocabulary cluster, a composite measure of knowledge of words, word meanings, and object names. When COG Test 1: Oral Vocabulary, COG Test 8: General Information, and OL Test 1: Picture Vocabulary are administered, the Comprehension-Knowledge–Extended cluster is obtained, which measures comprehension of words and general knowledge, including knowledge of object names. For some individuals, the Comprehension-Knowledge–Extended cluster may be a more broadly preferable index of crystalized intelligence when a higher performance on OL Test 1: Picture Vocabulary offsets some of the effects of a lower performance on COG Test 1: Oral Vocabulary (Schrank et al., 2016).

Vocabulary knowledge is critically important to school success (Anderson & Nagy, 1991, 1992). The academic knowledge tests in the WJ IV ACH (ACH Test 18: Science, ACH Test 19: Social Studies, ACH Test 20: Humanities) can be administered to provide additional information about the relationship of an individual's level of vocabulary knowledge to achievement in specific curricular areas.

Test 2: Number Series

COG Test 2: Number Series is a test of Fluid Reasoning (*Gf*) that measures the ability to identify and apply an analog or rule to complete a numerical sequence (Schrank et al., 2016) and is designed to measure a student's quantitative reasoning ability. The Number Series task is cognitively complex (Holzman, Pellegrino, & Glaser, 1983) and requires the application and knowledge of foundational math facts and arithmetic operations (Geary, 1990; Geary & Brown, 1991), including addition, subtraction, multiplication, and/or division.

In COG Test 2: Number Series, general sequential (deductive) reasoning is the cognitive process required to determine the analog or rule that solves the task, and inductive reasoning is the process required to determine the value that completes the numeric analogy. However, performance limitations on Test 2: Number Series also may be due to the level and integrities of other cognitive functions, including retrieval of counting sequences and/or math facts from semantic memory (Temple, 1991), cognitive processing speed, working memory capacity, and attentional abilities. Therefore, low performance on Test 2: Number Series may suggest a need to further evaluate aspects of a student's reasoning abilities. COG Test 9: Concept Formation, which is based on principles of language-based inductive reasoning (Schrank et al., 2016), may be administered to provide a measure of controlled learning. Test 2: Number Series and Test 9: Concept Formation combine to form the Fluid Reasoning (*Gf*) cluster, defined broadly as a measure of quantitative and verbal reasoning (Schrank et al., 2016). As such, the verbal nature of Test 9: Concept Formation can be contrasted with the quantitative reasoning required in Test 2: Number Series. In addition, COG Test 15: Analysis-Synthesis can be administered to evaluate algorithmic deductive reasoning (Schrank et al., 2016). When all three tests are administered, the Fluid Reasoning–Extended cluster is obtained, providing a broad measure of quantitative, algorithmic, and verbal reasoning (Schrank et al., 2016).

Performance deficits in COG Test 2: Number Series may suggest the need for further evaluation in areas beyond reasoning abilities. Considerations may include the student's foundational knowledge in mathematics, math facts fluency, cognitive processing speed, complex working memory capacity, and attentional control. Foundational math facts and arithmetic operations can be evaluated with ACH Test 5: Calculation, and fluency with basic mathematics operations can be assessed with ACH Test 10: Math Facts Fluency. COG Test 11: Number-Pattern Matching can help evaluate the influence of cognitive processing speed and the facility of number chunking mechanisms in the narrow focus of attention (Schrank et al., 2016), and COG Test 17: Pair Cancellation can help access issues with attentional control. Finally, complex working memory capacity can be evaluated with COG Test 10: Numbers Reversed.

Test 3: Verbal Attention

COG Test 3: Verbal Attention is a test of Short-Term Working Memory (*Gwm*) that measures temporary storage of verbal information and the cue-dependent search function in primary memory (Schrank et al., 2016). This test represents the Unsworth and Engle (2007a, 2007b) dual-component model of working memory capacity in which information is maintained in primary memory through the controlled allocation of

attention, and a focus of attention is retrieved through a cue-dependent search process. Successful performance on Test 3: Verbal Attention requires the student to maintain focused attention and/or to retrieve information that has been momentarily displaced from attention (Shipstead, Lindsey, Marshall, & Engle, 2014). The cued recall questions tap the real-time updating function of an individual's working memory (Bunting, Cowan, & Saults, 2006; Dahlin, Stigsdotter Neely, Larsson, Bäckman, & Nyberg, 2008; Miyake et al., 2000). Kosslyn, Alpert, and Thompson (1995) suggested that this "information-lookup" process plays a critical role in working memory.

Low performance on COG Test 3: Verbal Attention may suggest a need to explore other facets of working memory. COG Test 10: Numbers Reversed is a complex memory span task (Daneman & Carpenter, 1980) that measures the ability to temporarily store and recode orally presented information. When combined, Test 3: Verbal Attention and Test 10: Numbers Reversed create the Short-Term Working Memory (*Gwm*) cluster, which measures both the cue-dependent search and recoding functions from temporary stores of verbal and numeric information in primary memory (Schrank et al., 2016). Additionally, COG Test 16: Object-Number Sequencing measures the ability to assemble new cognitive structures out of the information maintained in working memory (Schrank et al., 2016). When combined with Test 3: Verbal Attention and Test 10: Numbers Reversed, the Short-Term Working Memory–Extended cluster is created; this cluster measures the cue-dependent search, recoding, and assembly functions from temporary stores of verbal and numeric information in primary memory (Schrank et al., 2016).

COG Test 18: Memory for Words is a running memory span task that provides a direct measure of the absolute capacity of working memory when complex processing is not required (Broadway & Engle, 2010; Bunting et al., 2006). When COG Test 18: Memory for Words is administered with OL Test 5: Sentence Repetition, a measure of working memory capacity in expressive language for which complex processing is not required, an Auditory Memory Span cluster is provided. Finally, OL Test 6: Understanding Directions is a scaffold measure of working memory in the context of language processing. Although the initial items solely measure the functional integrity of receptive language memory span, other more complex items involve more thinking ability and reflect the influence of the processing demands required for rearranging or reordering an orally imparted sequence of directions.

Test 4: Letter-Pattern Matching

COG Test 4: Letter-Pattern Matching is a test of Cognitive Processing Speed (*Gs*) that measures orthographic visual perceptual discrimination ability under timed conditions (Schrank et al., 2016). Stated more simply, Test 4: Letter-Pattern Matching is a measure of perceptual speed. The Letter-Pattern Matching task is facilitated by well-developed sublexical orthographic recognition and chunking efficiencies, which allow an individual to recognize a pattern as a single chunk for comparison with other letter strings, rather than attempting to hold a string of letters in primary memory while searching for a match. Rapid recognition and subvocal processing of orthographic chunks of information is thought to play a critical role in the development of automatic word recognition skill, which supports the development of reading fluency (Apel, 2009) and reading speed (O'Brien, Wolf, Miller, Lovett, & Morris, 2011). Some individuals with dyslexia show deficits on tasks that require rapid detection of letter position (Cornelissen & Hansen, 1998; Cornelissen, Hansen, Hutton, Evangelinou, & Stein, 1998; Katz, 1977; Pammer, Lavis, Hansen, & Cornelissen, 2004). Limitations in letter-pattern recognition also may be related to an overreliance on phonological processing rather than orthographic knowledge when spelling (Cornelissen, Bradley, Fowler, & Stein, 1994).

An observed limitation in COG Test 4: Letter-Pattern Matching should be followed with additional testing to parse the specific nature of the processing speed problem. COG Test 11: Number-Pattern Matching measures numeric visual perceptual discrimination ability under timed conditions and is the numeric counterpart to COG Test 4: Letter-Pattern Matching. When combined, these two tests create the Perceptual Speed (P) cluster, which measures orthographic visual perceptual discrimination ability under timed conditions (Schrank et al., 2016). Contrasting performance on these two tests can reveal a greater difficulty with numeric versus letter-pattern processing. Additionally or alternatively, COG Test 17: Pair Cancellation may be administered. Pair Cancellation measures speeded visual perceptual attention (Schrank et al., 2016), an aspect of cognitive control that is responsible for preferential concentration on stimuli of relative importance (Andrewes, 2001) and vigilance (Bunge, Mackey, & Whitaker, 2009; Posner & DiGirolamo, 2000). Good cognitive control—or vigilance—is required for tasks when prior knowledge alone is insufficient to meet task demands, such as when learning something new (Schrank & Wendling, manuscript in preparation).

Limitations in processing or perceptual speed may impact fluency with academic tasks; this relationship may be observed by assessing performance on ACH Test 9: Sentence Reading Fluency, ACH Test 10: Math Facts Fluency, or ACH Test 11: Sentence Writing Fluency. Limitations in orthographic visual perceptual discrimination ability also may influence reading speed and may be reflected in poor performance on ACH Test 15: Word Reading Fluency.

Test 5: Phonological Processing

COG Test 5: Phonological Processing is primarily a test of Auditory Processing (*Ga*), but it is a complex test that is related to language development and includes speed of lexical access and word fluency variance as parameters of cognitive efficiency. Test 5: Phonological Processing measures word activation, fluency of word access, and word manipulation and reconstruction via phonological codes (Schrank et al., 2016). The test is based on a growing body of evidence that phonological codes are a route to word access (Leinenger, 2014) and the initial and primary way that a word accesses a semantic representation in working memory (Baddeley, 1979; Baddeley, Eldridge, & Lewis, 1981; Klatt, 1979; Levy, 1978; Lukatela & Turvey, 1994a, 1994b; McCusker, Hillinger, & Bias, 1981; Slowiaczek & Clifton, 1980). In addition, the reasoning and memory functions required to tap long-term phonological knowledge may represent an important link between primary (working) memory and long-term memory (Jones, Gobet, & Pine, 2007), suggesting that limited proficiency on Test 5: Phonological Processing is a red flag signaling the need for additional assessment.

Low performance on COG Test 5: Phonological Processing may be related to weaknesses in a wide variety of other phonological functions, and a number of tests in the WJ IV can provide an extended profile of these auditory-linguistic abilities. Likely the most diagnostically important of these is COG Test 12: Nonword Repetition, which measures phonemic sensitivity and phonological short-term working memory capacity (Schrank et al., 2016) in the form of memory for phonological sound patterns. When combined, Test 5: Phonological Processing and Test 12: Nonword Repetition create the Auditory Processing (*Ga*) cluster, which measures word activation, word access, and word restructuring via phonological codes as well as phonological sensitivity in working memory (Schrank et al., 2016). Test 12: Nonword Repetition is a useful follow-up to low performance on Test 5: Phonological Processing because many individuals who perform poorly on nonword repetition tasks also have difficulties learning the phonological form of language (Archibald & Gathercole, 2007) and learning new words (Edwards,

Beckman, & Munson, 2004; Gathercole, 2006; Michas & Henry, 1994), and it may be helpful for identification of students with, or at risk for, language impairments (Bishop, North, & Donlan, 1996; Coady & Evans, 2008; Conti-Ramsden, 2003; Conti-Ramsden, Botting, & Farragher, 2001; Conti-Ramsden & Hesketch, 2003; Dollaghan & Campbell, 1998; Ellis Weismer et al., 2000; Gray, 2003; Horohov & Oetting, 2004; Taylor, Lean, & Schwartz, 1989).

To determine whether an individual is able to accurately distinguish phonemes, blend sounds into words, or segment words into parts, examiners can administer OL Test 7: Sound Blending and OL Test 3: Segmentation. Test 7: Sound Blending measures the ability to blend sounds together to form words, a foundational phonological function that underlies the application of phonics to reading. Test 3: Segmentation measures the ability to break apart the sounds within a word, a foundational phonological function that underlies aspects of spelling. Together, these two tests constitute the Phonetic Coding cluster, a narrow ability of Auditory Processing, which measures the ability to recognize and process subtle differences between speech sounds (Mather & Jaffe, 2016).

Test 6: Story Recall

COG Test 6: Story Recall is a test of Long-Term Retrieval (*Glr*) that requires listening ability but primarily measures the ability to construct meaning-based mental representations, consolidate memories, and then reconstruct details from the memories that were constructed. In this test, attention to orally imparted details supports the formation of mental representations (storage) during the stimulus phase; the response phase requires reconstruction of the story details (retrieval) through meaningful memory.

Low scores on COG Test 6: Story Recall may be related to deficits in listening ability, background knowledge, the ability to create (consolidate) meaningful memories, or working memory capacity, all of which place limits on the volume of information that can be reconstructed into a coherent and connected representation of the objects, events, or situations in the story (van den Broek, 1989). To assess whether limited performance is due to memory consolidation abilities, examiners can administer COG Test 13: Visual-Auditory Learning, which measures visual-auditory paired associate encoding in the learning phase and identification and word retrieval in the response phase (Schrank et al., 2016). When combined, Test 6: Story Recall and Test 13: Visual-Auditory Learning create the Long-Term Retrieval (*Glr*) cluster, which measures the consolidation of semantic representations into secondary memory (Schrank et al., 2016).

Additionally, suspected deficits in listening ability and/or working memory capacity can be assessed with OL Test 2: Oral Comprehension, COG Test 3: Verbal Attention, and OL Test 6: Understanding Directions. Suspected deficits in background knowledge can be evaluated with COG Test 8: General Information.

Test 7: Visualization

COG Test 7: Visualization is a test of Visual Processing (*Gv*) that measures size and shape perception, part-to-whole analysis, and the ability to mentally transform two- and three-dimensional images (Schrank et al., 2016) using two subtests: Spatial Relations and Block Rotation. Test 7: Visualization may be related to the ability to construct internal visual representations, which is of fundamental importance across many cognitive domains and for the development of academic skills, including number sense (Gunderson, Ramirez, Beilock, & Levine, 2012) and reading comprehension (De Koning & van der Schoot, 2013). The ability to use mental imagery is important in upper-level math and science curricula, such as geometry, calculus, and physics (Mather & Jaffe, 2016).

Although low performance on COG Test 7: Visualization may be due to lack of exposure to spatially challenging activities (Newcombe, Uttal, & Sauter, 2013), it also may be related to limitations in passive storage of visual images in the visual cache (Baddeley & Hitch, 1974, 1994). COG Test 14: Picture Recognition is a visual memory task that measures the recognition of previously presented visual stimuli from images or icons held in the visual cache (Schrank et al., 2016). Together, Test 7: Visualization and Test 14: Picture Recognition create the Visual Processing (*Gv*) cluster, which measures visual-spatial analysis, formation of internal visual images, mental transformation strategies in working memory, and passive storage and recognition of images (Schrank et al., 2016).

WJ IV OL Core Tests and Selective Testing Guidance

The WJ IV OL includes 12 tests measuring aspects of receptive and expressive oral language. There are 9 tests in English and 3 in Spanish. The 3 Spanish tests are adaptations of OL Test 1: Picture Vocabulary, Test 2: Oral Comprehension, and Test 6: Understanding Directions. These 3 tests provide measures of Spanish oral language proficiency that can be compared and contrasted with performance on the corresponding English tests.

The WJ IV OL core tests represent different intercepts of cognitive and linguistic abilities. The first 2 core tests, Test 1: Picture Vocabulary and Test 2: Oral Comprehension, provide measures of expressive and receptive language that together create the Oral Language cluster. The latter 2 core tests, Test 3: Segmentation and Test 4: Rapid Picture Naming, provide measures of phonological manipulation and speed of lexical access. These 4 core tests form the basis for the intra-oral language variations procedure. Table 2 is a guide to the core-selective evaluation process when using the core tests in the WJ IV OL.

Table 2.
WJ IV OL Core-Selective Evaluation Process Guide

WJ IV OL Core Test	Selectively Administered Test	Ability or Process Measured	Cluster Obtained
Test 1: Picture Vocabulary		Knowledge of object concepts and associated expressive word-level vocabulary	
	OL Test 5: Sentence Repetition	Auditory memory span for connected oral discourse; accuracy of verbal repetition	Oral Expression
	COG Test 1: Oral Vocabulary	Knowledge of words and word meanings	Vocabulary
	COG Test 8: General Information	Level of background knowledge	Comprehension-Knowledge–Extended when COG Test 1: Oral Vocabulary also is administered
	ACH Test 17: Reading Vocabulary	Ability to access knowledge of words and word meanings from printed text	

Table 2. *(cont.)*
WJ IV OL Core-Selective Evaluation Process Guide

WJ IV OL Core Test	Selectively Administered Test	Ability or Process Measured	Cluster Obtained
Test 1: Picture Vocabulary *(cont.)*	ACH Test 18: Science	Verbal knowledge in science	Academic Knowledge cluster when ACH Test 19: Social Studies and ACH Test 20: Humanities also are administered*
	ACH Test 19: Social Studies	Verbal knowledge in social studies	Academic Knowledge cluster when ACH Test 18: Science and ACH Test 20: Humanities also are administered*
	ACH Test 20: Humanities	Verbal knowledge in the humanities	Academic Knowledge cluster when ACH Test 18: Science and ACH Test 19: Social Studies also are administered*
Test 2: Oral Comprehension		Comprehension level for orally imparted discourse	Oral Language when OL Test 1: Picture Vocabulary also is administered
	OL Test 6: Understanding Directions	Attention, listening ability, and working memory capacity in language processing	Listening Comprehension; Broad Oral Language when OL Test 1: Picture Vocabulary also is administered
	ACH Test 4: Passage Comprehension	Comprehension level during reading	
Test 3: Segmentation		Breaking words into segments	
	OL Test 7: Sound Blending	Blending sounds into words	Phonetic Coding
	OL Test 9: Sound Awareness	Rhyming and deletion	
	COG Test 5: Phonological Processing	Word activation, fluency of word access, and word reconstruction via phonological codes	Auditory Processing when COG Test 12: Nonword Repetition also is administered*
	COG Test 12: Nonword Repetition	Phonological short-term working memory, sensitivity, and capacity	Auditory Processing when COG Test 5: Phonological Processing also is administered*
	ACH Test 1: Letter-Word Identification	Reading decoding skills	
	ACH Test 3: Spelling	Knowledge of details of word forms	
	ACH Test 16: Spelling of Sounds	Phonologically mediated spelling	
Test 4: Rapid Picture Naming		Speed of producing names for pictured objects	
	OL Test 8: Retrieval Fluency	Automaticity of retrieval and oral production of examples of a semantic category	Speed of Lexical Access
	OL Test 1: Picture Vocabulary	Knowledge of object concepts and associated expressive word-level vocabulary	
	ACH Test 8: Oral Reading	Fluency of oral reading	

Table 2. *(cont.)*
WJ IV OL Core-Selective Evaluation Process Guide

WJ IV OL Core Test	Selectively Administered Test	Ability or Process Measured	Cluster Obtained
Test 4: Rapid Picture Naming *(cont.)*	COG Test 4: Letter-Pattern Matching	Orthographic (letter-pattern) visual perceptual discrimination ability under timed conditions	Cognitive Processing Speed when COG Test 17: Pair Cancellation also is administered*
	COG Test 17: Pair Cancellation	Symbolic visual perceptual discrimination ability requiring cognitive control under timed conditions	Cognitive Processing Speed when COG Test 4: Letter-Pattern Matching also is administered*

*Core test is not included in the comparative cluster.

Test 1: Picture Vocabulary

OL Test 1: Picture Vocabulary is a test of Comprehension-Knowledge (*Gc*) and oral language development (LD) that measures knowledge of object concepts and associated expressive word-level vocabulary. Object recognition relies on a previously developed concept of what the picture represents—an acquired object construct (Martin, 2009; Murphy, 2002). When a connection is made between the pictured object and the object concept, the semantic activation helps retrieve the object's name. Cognitive psychologists use the term *re-identification* to describe the process wherein names are retrieved from object recognition. That is, the object must have been previously associated with a concept—and the concept with a name.

In contrast to COG Test 1: Oral Vocabulary, in OL Test 1: Picture Vocabulary, word retrieval is stimulated by picture recognition, not by other words. When COG Test 1: Oral Vocabulary also is administered, the Vocabulary cluster is available, which measures knowledge of object names and words and their meanings (Schrank et al., 2016). When OL Test 5: Sentence Repetition also is administered, the Oral Expression cluster is available. This cluster measures expressive language proficiency at the single-word and connected discourse levels.

Low performance on OL Test 1: Picture Vocabulary may be related to deficits in background knowledge, language development, or acquired academic knowledge. Level of background knowledge also can be assessed with COG Test 8: General Information. If performance on both tests is low, a student will have difficulties constructing the necessary higher-order cognitive representations for learning (Hannon & Daneman, 2014; Oberauer, Süß, Wilhelm, & Wittman, 2008). When OL Test 1: Picture Vocabulary is administered with COG Test 1: Oral Vocabulary and COG Test 8: General information, the Comprehension-Knowledge–Extended cluster is available, which measures comprehension of words and general object knowledge, including knowledge of object names (Schrank et al., 2016). This broad *Gc* cluster may be particularly important to include in an evaluation because research indicates significant relationships among levels of vocabulary, background knowledge, and reading comprehension (Anderson & Pearson, 1984; Baumann & Kame'enui, 1991; Mather & Wendling, 2015). The role of oral vocabulary knowledge on reading can be assessed by comparing performance on OL Test 1: Picture Vocabulary with that on ACH Test 17: Reading Vocabulary (Mather & Wendling, 2014c). Additionally, limitations in academic knowledge, as measured by ACH Test 18: Science, ACH Test 19: Social Studies, and ACH Test 20: Humanities, all of which also require conceptual understandings, may be related to low performance on OL Test 1: Picture Vocabulary.

Test 2: Oral Comprehension

OL Test 2: Oral Comprehension is a cognitively complex online listening comprehension task that requires linguistic integration of orally presented syntactic and semantic information (Brown & Hagoort, 1999; Caplan, 1992; Gernsbacher, 1990). In CHC theory, Test 2: Oral Comprehension is a measure of Comprehension-Knowledge (*Gc*) and listening ability. The task requires formation of mental representations based on word meaning and case roles within sentences, as well as across sentences, in connected discourse. Because the narrative is orally imparted, the listener is aided in dividing the discourse into meaningful segments by prosodic information. Complex cognitive processing is required to determine the correct sense or meaning of the target word in the context of discourse (Gazzaniga, Ivry, & Mangun, 1998). Semantic or syntactic limitations may impact performance on Test 2: Oral Comprehension.

OL Test 2: Oral Comprehension is a measure of comprehension level for orally imparted discourse, such as classroom instruction. A comparison can be made between an individual's scores on OL Test 2: Oral Comprehension and ACH Test 4: Passage Comprehension. A significant difference between scores on the two tests can help evaluators assess whether comprehension is better when information is presented orally or when reading (Mather & Wendling, 2015).

Language processing on OL Test 2: Oral Comprehension may be affected by limitations in attention, listening ability, and working memory capacity (Mather & Wendling, 2015), which may be assessed with OL Test 6: Understanding Directions. This test requires listening and mapping a series of sequential directions onto the mental structure under construction and maintaining the sequence in working memory until a new directive changes the sequence (Gernsbacher, 1990, 1991, 1997).

Test 3: Segmentation

OL Test 3: Segmentation measures the skill of breaking words into parts or sounds, including the extraction of linguistic features such as placement and manner of articulating consonants (Schrank & Wendling, 2015). Segmentation is one of the most widely used phonological manipulation tasks (Kilpatrick, 2015). In the WJ IV, Test 3: Segmentation yields the highest correlations with the Auditory Processing (*Ga*) factor of CHC theory (McGrew et al., 2014).

Limitations in phonological awareness, coding, or manipulation can affect performance on OL Test 3: Segmentation and should be followed with additional assessment. OL Test 7: Sound Blending measures the ability to synthesize phonetic information, an important prerequisite to reading competence. Test 3: Segmentation and Test 7: Sound Blending combine to form the Phonetic Coding cluster, which represents a narrow ability of Auditory Processing. OL Test 9: Sound Awareness is a brief screening measure for phonological awareness that is suitable for children in grades K through 3 and for older individuals with deficits in phonological awareness. A broad-based measure of overall cognitive-linguistic processing abilities that includes phonologically driven word access, word fluency, and word manipulation skills can be obtained with COG Test 5: Phonological Processing. Phonological short-term working memory, sensitivity, and capacity can be assessed with COG Test 12: Nonword Repetition. Together, the WJ IV COG Phonological Processing and Nonword Repetition tests create the Auditory Processing cluster.

Poor segmentation skills may be related to difficulties in reading and spelling, as the student may have difficulty putting sounds together in the correct order when spelling words (Mather & Wendling, 2015). Examiners can compare performance on OL Test 3:

Segmentation with performance on ACH Test 1: Letter-Word Identification to evaluate the role of word segmentation skills on reading decoding (Mather & Wendling, 2014c). If performance on OL Test 3: Segmentation is low and spelling difficulties are observed on ACH Test 3: Spelling, ACH Test 16: Spelling of Sounds can be administered. To correctly spell the nonwords on ACH Test 16: Spelling of Sounds, an individual must have good letter-sound knowledge and phoneme segmentation skills (Kilpatrick, 2015). An error analysis on Test 16: Spelling of Sounds may be particularly valuable to determine whether errors are due primarily to an inability to segment words or to a lack of sensitivity to common English spelling patterns (Mather & Wendling, 2015).

Test 4: Rapid Picture Naming

OL Test 4: Rapid Picture Naming measures naming speed, the ability to name quickly a number of highly familiar visual stimuli, such as digits, letters, objects, or colors, presented on one page (Wolf & Bowers, 1999). The terms *naming speed* and *rapid automatized naming* (RAN) are both used in the literature to describe continuous naming speed, often interchangeably. The critical element of a naming speed task is that the stimuli are highly familiar and presented in a group (on a page), not one by one (Wolf & Bowers, 1999). Naming speed may measure the efficiency of visual-verbal links in primary (working) memory (Wiens, 2005).

One of many cognitive processes underlying skilled word recognition (Scarborough, 1998; Stanovich, 1992), naming speed is strongly related to reading development (Cutting & Denckla, 2001; Kirby, Parrila, & Pfeiffer, 2003; Lepola, Poskiparta, Laakkonen, & Niemi, 2005; Lervåg & Hulme, 2009; Manis, Doi, & Bhadha, 2000; Norton & Wolf, 2012; Powell, Stainthorp, Stuart, Garwood, & Quinlan, 2007), reading disabilities, and developmental dyslexia (Brizzolara et al., 2006; Felton, Naylor, & Wood, 1990; Georgiou & Parrila, 2013). Naming speed also has implications for reading comprehension (Arnell, Joanisse, Klein, Busseri, & Tannock, 2009; Georgiou, Das, & Hayward, 2008; Kirby et al., 2003). Naming speed tasks such as OL Test 4: Rapid Picture Naming can be used to identify children at risk for reading failure (Badian, 1993; Good & Kaminski, 2002; Kirby, Georgiou, Martinussen, & Parrila, 2010; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004).

Performance on OL Test 4: Rapid Picture Naming can be compared with that on OL Test 8: Retrieval Fluency, which requires fluent retrieval and oral production of words in a semantic category. It is not a confrontational naming speed task. However, low performance on both tests is indicative of limitations in speed of word access. Together, both tests compose the Speed of Lexical Access cluster, a measure of speeded retrieval ability (*Gr*). Performance on OL Test 4: Rapid Picture Naming also can be compared with performance on OL Test 1: Picture Vocabulary. If performance on Test 1: Picture Vocabulary is also low, any observed limitations in performance on Test 4: Rapid Picture Naming may be related to lack of knowledge of object names. A comparison of performance on OL Test 4: Rapid Picture Naming and ACH Test 8: Oral Reading can determine whether limitations in rapid naming are related to any reading fluency difficulties (Mather & Wendling, 2014c).

Naming speed may be a manifestation of the speed at which cognitive processing occurs (Kail & Hall, 1994; Kail, Hall, & Caskey, 1999). Administering COG Test 4: Letter-Pattern Matching and COG Test 17: Pair Cancellation will provide the Cognitive Processing Speed (*Gs*) cluster, a measure of orthographic and symbolic visual perceptual discrimination ability and attentional control under timed conditions (Schrank et al., 2016), for comparative purposes.

WJ IV ACH Core Tests and Selective Testing Guidance

The WJ IV ACH includes 20 tests for measuring different aspects of reading, mathematics, written language, and academic knowledge. The Standard Battery includes Tests 1 through 11 and the Extended Battery includes Tests 12 through 20. The Standard Battery includes the most commonly administered tests. The Extended Battery includes tests that provide greater depth of coverage in reading, mathematics, and writing and also includes the academic knowledge tests (Test 18: Science, Test 19: Social Studies, and Test 20: Humanities).

Tests 1 through 6 constitute the core tests in the WJ IV ACH. There are two tests measuring skills and applications for reading, two tests measuring skills and applications for mathematics, and two tests measuring skills and applications for writing. The six core tests yield the Reading, Mathematics, and Written Language clusters. Because none of the core tests are timed, the three derived clusters do not reflect the influence of fluency with tasks in the respective academic domain. Table 3 is a guide to the core-selective evaluation process when using the core tests in the WJ IV ACH.

Table 3.
WJ IV ACH Core-Selective Evaluation Process Guide

WJ IV ACH Core Test	Selectively Administered Test	Ability or Process Measured	Cluster Obtained
Test 1: Letter-Word Identification		Reading decoding skills	
	ACH Test 7: Word Attack	Knowledge of typical correspondences between spelling units and speech sounds	Basic Reading Skills
	OL Test 3: Segmentation	Breaking words into segments	Phonetic Coding when OL Test 7: Sound Blending also is administered*
	OL Test 7: Sound Blending	Blending sounds into words	Phonetic Coding when OL Test 3: Segmentation also is administered*
	COG Test 5: Phonological Processing	Word activation, fluency of word access, and word reconstruction via phonological codes	
	COG Test 1: Oral Vocabulary	Level of vocabulary knowledge	
	OL Test 1: Picture Vocabulary	Knowledge of object concepts and associated expressive word-level vocabulary	
	ACH Test 8: Oral Reading	Reading decoding, automaticity with reading, and prosody in connected oral reading	Reading Fluency when ACH Test 9: Sentence Reading Fluency also is administered*
	ACH Test 9: Sentence Reading Fluency	Silent reading speed, automaticity, and comprehension	Reading Fluency when ACH Test 8: Oral Reading also is administered; Reading Rate when ACH Test 15: Word Reading Fluency also is administered*
	ACH Test 15: Word Reading Fluency	Speeded semantic access and decision making from printed text	Reading Rate when ACH Test 9: Sentence Reading Fluency also is administered*

Table 3. *(cont.)*
WJ IV ACH Core-Selective Evaluation Process Guide

WJ IV ACH Core Test	Selectively Administered Test	Ability or Process Measured	Cluster Obtained
Test 2: Applied Problems		Mathematics problem solving through the application of knowledge, insight, or quantitative reasoning	
	ACH Test 13: Number Matrices	Quantitative reasoning and solution checking	Math Problem Solving
	COG Test 2: Number Series	Quantitative reasoning	
	ACH Test 5: Calculation	Ability to perform a variety of math calculation problems	Mathematics
	OL Test 2: Oral Comprehension	Comprehension level for orally imparted discourse	
	COG Test 7: Visualization	Size and shape perception, part-to-whole analysis, and the ability to transform two- and three-dimensional images	
Test 3: Spelling		Knowledge of orthographic details of word forms	
	ACH Test 16: Spelling of Sounds	Knowledge of the sound patterns of word forms	Phoneme-Grapheme Knowledge when ACH Test 7: Word Attack also is administered*
	ACH Test 7: Word Attack	Knowledge of typical correspondences between spelling units and speech sounds	Phoneme-Grapheme Knowledge when ACH Test 16: Spelling of Sounds also is administered*
Test 4: Passage Comprehension		Understanding of printed text during the process of reading	
	ACH Test 12: Reading Recall	Consolidation (encoding) and recall of meaningful material from silent reading	Reading Comprehension
	ACH Test 17: Reading Vocabulary	Comprehension of words and their meanings	Reading Comprehension–Extended when ACH Test 4: Passage Comprehension and ACH Test 12: Reading Recall also are administered
Test 5: Calculation		Ability to perform a variety of math calculation problems	
	ACH Test 10: Math Facts Fluency	Automaticity with retrieval and application of basic math facts	Math Calculation Skills
Test 6: Writing Samples		Ability to convey meaning at the discourse level of written language	
	ACH Test 11: Sentence Writing Fluency	Fluency of combining words into phrases	Written Expression
	ACH Test 14: Editing	Sensitivity to punctuation, capitalization, spelling, and usage errors in written text	Basic Writing Skills when ACH Test 3: Spelling also is administered*

*Core test is not included in the comparative cluster.

Test 1: Letter-Word Identification

ACH Test 1: Letter-Word Identification measures reading decoding and reading readiness skills (Mather & Wendling, 2015). Well-learned letters and words are accessed from the mental lexicon by means of automatic retrieval (Ashcraft, 2002), although activating and outputting representations of the sound patterns of words involves the phonological lexicon (Coltheart, 1978). "Most skilled oral reading and word recognition consists of identifying letters from a visual stimulus, using those letters to activate visual word forms stored in memory, and then accessing the pronunciation associated with the visual word form" (Caplan, 1992, p. 167). There appear to be two processes involved in skilled word identification: whole word recognition and phonological mediation (Humphreys & Evett, 1985). For unfamiliar words, individuals with good phonics skills can attempt an answer by parsing or segmenting the stimulus word into recognizable phonological units (van Orden & Goldinger, 1994, 1996) and attempting a pronunciation as a whole word.

Low performance on this test can be a function of limited phonics, word segmentation, sound blending skills, phonological mediation, or oral vocabulary, or a combination of deficits. Phonics skills can be assessed with ACH Test 7: Word Attack, which measures knowledge of the typical correspondences between spelling units and speech sounds (Caplan, 1992), aspects of phonological and orthographic coding (Mather & Wendling, 2015). Test 1: Letter-Word Identification and Test 7: Word Attack combine to form the Basic Reading Skills cluster. Word segmentation skills can be assessed with OL Test 3: Segmentation; blending skills can be assessed with OL Test 7: Sound Blending; phonological mediation skills can be assessed with COG Test 5: Phonological Processing. Examiners can compare a student's performance on ACH Test 1: Letter-Word Identification with COG Test 1: Oral Vocabulary and/or OL Test 1: Picture Vocabulary to determine whether any low performance is related to limitations in vocabulary knowledge.

Additional assessment of oral reading skills can be obtained by administering ACH Test 8: Oral Reading. This test measures decoding skills, fluency and automaticity with reading, and prosody (reading with appropriate expression; Mather & Wendling, 2015). Performance on ACH Test 8: Oral Reading can be compared and contrasted with performance on ACH Test 9: Sentence Reading Fluency, which measures reading speed and automaticity. Test 9: Sentence Reading Fluency also measures the ability to comprehend simple sentences quickly. Together, Test 8: Oral Reading and Test 9: Sentence Reading Fluency yield the Reading Fluency cluster. A related test to be considered for selective testing is ACH Test 15: Word Reading Fluency, which measures speeded semantic access and decision making from printed text.

Test 2: Applied Problems

ACH Test 2: Applied Problems is a cognitively complex test that measures a combination of mathematics knowledge and quantitative reasoning. This test requires the construction of mental models (Johnson-Laird, Byrne, & Schaeken, 1992) to solve problems through the application of insight or quantitative reasoning. Solutions to the problems require access to an interplay of cognitive processes and the calculation abilities that depend on them (Ashcraft, 1995). In addition, many Test 2: Applied Problems items involve language comprehension, and tasks are sometimes performed mentally using visualization skills in working memory. Because the test is highly complex, limitations in performance can be due to difficulties in mathematics calculation ability (compare with ACH Test 5: Calculation), quantitative reasoning, visualization ability (compare with COG Test 7: Visualization), or oral language comprehension (compare with OL Test 2: Oral Comprehension).

Observed limitations in ACH Test 2: Applied Problems can be followed with administration of ACH Test 13: Number Matrices, a measure of quantitative reasoning. Both tests require the application of knowledge and foundational math facts and arithmetic operations (Geary, 1990; Geary & Brown, 1991) to the solution of conceptual and matrix math problems. Together, Test 2: Applied Problems and Test 13: Number Matrices create the Math Problem Solving cluster. A related test also for consideration is COG Test 2: Number Series. Number Matrices and Number Series tasks differ in one important way. The Number Matrices solutions must work horizontally and vertically, providing the opportunity for an individual to check his or her first solution. Individuals who do not check whether a solution works both ways also may not verify their answers or assumptions in classroom or other work performance. If performance on both Test 13: Number Matrices and Test 2: Number Series is low, any observed limitations also may be due to the level and integrities of related cognitive functions, including retrieval of counting sequences and/or math facts from semantic memory (Temple, 1991), quantitative reasoning ability, cognitive processing speed, working memory capacity, or attentional control.

Test 3: Spelling

ACH Test 3: Spelling measures knowledge of the orthographic details of word forms contained in the mental lexicon (Gazzaniga et al., 1998). This test often involves mapping phonology to orthographic representations of words "either by mapping whole-word phonology into whole-word orthography (if the word is contained in the lexicon), or by translating phonemic segments into graphemic units" (Caplan, 1992, p. 214). Low performance may be related to lack of knowledge of the underlying sounds of the target words. Low performance also may be due to lack of knowledge of spellings for phonetically irregular words. A careful analysis of errors can result in differential implications for instruction or intervention.

Any suspected problems involving mapping word sounds onto spellings can be further assessed with ACH Test 16: Spelling of Sounds, which measures knowledge of the sound patterns of word forms. This test specifically targets phonologically mediated spelling (Caplan, 1992) because the correct orthographic segment(s) is based directly on the spoken elements that compose the stimulus. Test 16: Spelling of Sounds provides information on letter-sound knowledge and phonological segmentation in spelling (Kilpatrick, 2015). This test is particularly useful when ACH Test 7: Word Attack also is administered to provide information about phonological and orthographic coding in the Phoneme-Grapheme Knowledge cluster.

Test 4: Passage Comprehension

ACH Test 4: Passage Comprehension is an online comprehension task (Ashcraft, 2002; Gernsbacher, 1990) that measures the ability to understand what is being read *during* the process of reading. As the individual reads, he or she constructs the meaning of the passage based on prior knowledge. As more elements are added to the passage, they also are added to the structure held in working memory via a process called *mapping*, a central feature of cognition (Ashcraft, 2002). Each item is solved by inference (Klin, 1995), the process by which the reader determines the referents of words and ideas, draws connections between concepts (bridging; Clark, 1977), and derives a conclusion from the passage.

The WJ IV includes another form of a reading comprehension task in ACH Test 12: Reading Recall. This test differs from Test 4: Passage Comprehension in working memory requirements. Reading Recall is a more complex working memory task than

Passage Comprehension, requiring storage in the context of processing (Unsworth, 2016). Test 12: Reading Recall measures the development and consolidation of mental representations from textual material. The recall or retelling phase of each story merely provides a test of whether encoding (e.g., storage of story elements) has occurred during the reading phase. Although both tests require working memory, the Reading Recall task involves the development and consolidation of semantic memories, referred to as meaningful memory in CHC theory. When combined, Test 4: Passage Comprehension and Test 12: Reading Recall yield the Reading Comprehension cluster.

Greater breadth of reading comprehension assessment can be obtained by administering ACH Test 17: Reading Vocabulary, which combines vocabulary knowledge and reading comprehension. Comprehension is achieved when the visual form of the word is connected to a concept in the mental lexicon, either by means of semantic access and activation (Caplan, 1992) or phonological mediation, wherein the meanings of words are internally cued by one or more component sounds (van Orden, 1987; van Orden, Johnston, & Hale, 1988). When Test 17: Reading Vocabulary is administered with Test 4: Passage Comprehension and Test 12: Reading Recall, the Reading Comprehension–Extended cluster is available, which measures a broad spectrum of reading comprehension skills, including understanding of text during the process of reading, memory consolidation and retrieval from reading material, and knowledge of words and their meanings in isolation.

Test 5: Calculation

ACH Test 5: Calculation measures access to and application of mathematical calculation knowledge ranging from simple addition and subtraction to complex calculus. This test measures the ability to perform math calculations that are a foundation to complex math reasoning and problem solving (Mather & Wendling, 2015). Limitations in performance on Test 5: Calculation may be related to lack of knowledge or automaticity with basic math facts. ACH Test 10: Math Facts Fluency is a timed measure of automaticity with basic math facts. Limited fluency with basic math facts may be suggestive of a specific math disability (Schrank & Wendling, manuscript in preparation). When combined, Test 5: Calculation and Test 10: Math Facts Fluency yield the Math Calculation Skills cluster.

Test 6: Writing Samples

ACH Test 6: Writing Samples measures the ability to convey meaning at the discourse level of written language. It requires retrieval of word meanings and syntactic information (i.e., knowledge of how words are combined into sentences). Generation of acceptable sentences involves ideational fluency and the application of the psycholinguistic rules of grammar, particularly phrase structure. In several items, the student must make bridging inferences in working memory to integrate the initial and final sentences into a well-formed passage. These items require planning or tailoring the target sentence to the lexical and semantic information or style that is conveyed in other portions of the sample (Ferreira, 1996).

A recommended follow-up selective test for consideration is ACH Test 11: Sentence Writing Fluency. This test requires speeded formation of constituent structures, or fluency of combining words into phrases. Automaticity of sentence writing fluency performance is likely to be aided by mapping semantics directly onto orthography (Caplan, 1992). Individuals who rely on a phonological route to spelling may take more time in task completion, resulting in lower scores. Another useful supplemental test for consideration is ACH Test 14: Editing, which measures sensitivity to punctuation, capitalization, spelling, and usage errors in written text. This test produces the Basic

Writing Skills cluster when ACH Test 3: Spelling also is administered. It may be helpful to compare the Basic Writing Skills cluster with the Written Expression cluster to more accurately determine the nature of any writing difficulties.

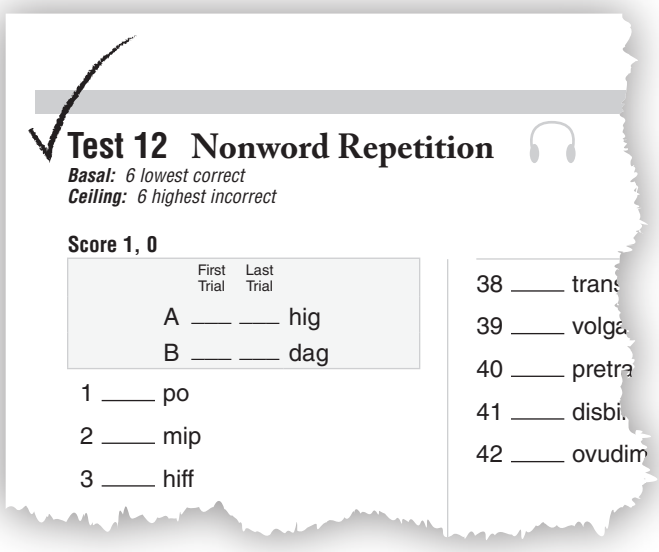
Using Clinical Judgment to Select Additional Tests to Administer

One practical design objective of the WJ IV was to position the core tests at the beginning of each test battery to facilitate interpretation. When the core tests are administered, key comparative procedures are automated by the online scoring and reporting program and the *WJ IV Interpretation and Instructional Interventions Program*™ (WIIIP®; Schrank & Wendling, 2015). Although beginning an assessment with the WJ IV core tests is not the only approach to administering the WJ IV, it represents a time-efficient method that provides a defined starting point with several options that can provide increasingly greater levels of interpretive depth and breadth. Information obtained before testing, during testing, and upon review of a Score Report can provide support for selection of supplemental tests to administer.

Information Obtained Before Testing

Interpretation of the WJ IV requires a higher level of competence than simply administering and scoring the tests. Experienced and highly skilled clinicians use information provided by the referral question, consultations with teachers and parents, and knowledge of what the WJ IV measures to help determine—*a-priori*—what domains of cognitive-linguistic ability or academic achievement to assess beyond the information provided by the core tests. Each battery of tests includes a Selective Testing Table in the Test Book for this purpose. Prior to an initial testing session, many experienced examiners prepare a Test Record with a student's name, sex, and date of birth, and, in the process of completing the identifying information on the Test Record, consult the Selective Testing Table to determine the initial tests to administer. Then, many examiners place a checkmark (✓) in front of or behind the test name in the Test Record for each test to be administered (see Figure 1). This simple cue allows the examiner to more fully focus attention on the student during the assessment process.

Figure 1.
Portion of a Test Record for COG Test 12: Nonword Repetition showing use of the checkmark cue.



Knowledge of contemporary CHC theory, the relationships between certain cognitive-linguistic competencies, and areas of academic achievement is particularly helpful when conducting an evaluation. Some helpful resources include the *Essentials of WJ IV Cognitive Abilities Assessment* (Schrank, Decker, & Garruto, 2016), *Woodcock-Johnson IV: Reports, Recommendations, and Strategies* (Mather & Jaffe, 2016), *Essentials of WJ IV Tests of Achievement* (Mather & Wendling, 2015), and the *Woodcock-Johnson IV Technical Manual* (McGrew, LaForte, & Schrank, 2014).

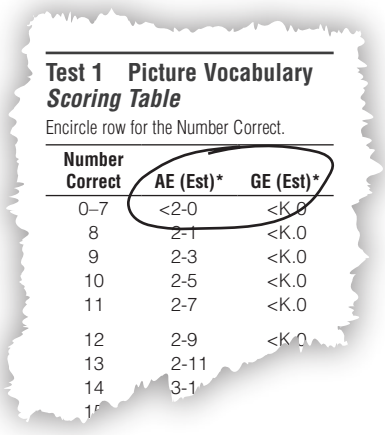
Tables 1, 2, and 3 of this bulletin present a summary of what each core test measures and what other tests might be administered to obtain additional information about the nature of a perceived problem and areas of relative strength or weakness. Some of the additional tests, when administered with the related core test, will yield a score at the cluster level. Other tests will yield test-level supplemental information related to the ability or process that can be used for interpretive purposes. If professional judgment suggests a need to explore a cognitive or learning problem in greater depth, these tables can be used as a guide to support decision making, prior to testing, about possible additional tests to administer.

Information Obtained During Testing

Administering the core tests often yields the most essential information in the least amount of testing time. This includes the examiner's observations of the examinee's responses to the tasks requiring different cognitive processes. Any performance deficit or clinical observation obtained during administration of the core tests can prompt an examiner to administer one or more supplemental tests to obtain a cluster score or obtain additional information.

One procedure used by many experienced evaluators is to consult the table of estimated age- and grade-equivalent scores provided for each test on the Test Record. This can be done after each test is completed and following calculation of the raw score. Examiners will typically have knowledge of a student's current grade placement or chronological age and can use that information to obtain an immediate comparison with the normative group age-equivalent (AE) and grade-equivalent (GE) scores on the Test Record. The estimated normative AE and GE scores can be used to inform an initial clinical impression about whether the student's performance is within an expected range of ability for his or her age or grade. Figure 2 shows a portion of the Test Record Scoring Table for Test 1: Picture Vocabulary from the WJ IV OL.

Figure 2.
Portion of Scoring Table for WJ IV OL Test 1: Picture Vocabulary showing estimated age- and grade-equivalent scores.



Test 1 Picture Vocabulary
Scoring Table
Encircle row for the Number Correct.

Number Correct	AE (Est)*	GE (Est)*
0–7	<2-0	<K.0
8	2-1	<K.0
9	2-3	<K.0
10	2-5	<K.0
11	2-7	<K.0
12	2-9	<K.0
13	2-11	
14	3-1	
15		

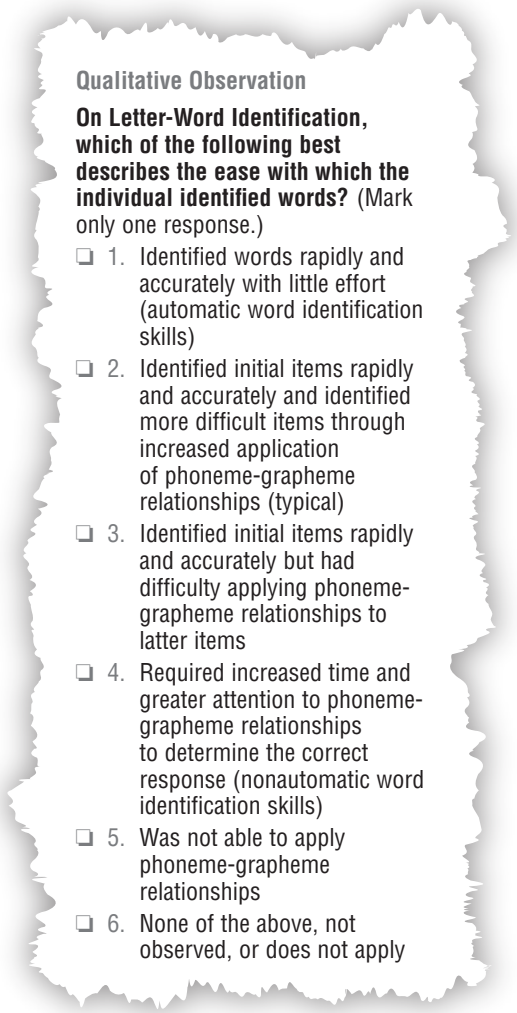
Cognitive, linguistic, and academic abilities increase more rapidly in the preadolescent years and some abilities grow more rapidly than others. Grade equivalents, in particular, are not standards of performance. The range of abilities in any grade is typically very wide and increases along with grade level. In addition, because curricula can differ from one school, state, or region to another, the nationally obtained grade equivalents provided in the Test Record may differ from local standards. Experienced clinicians typically develop their own referents for any initial comparisons made based on the Test Record Scoring Table. Considering all of these caveats, however, many evaluators make a mental note of an obtained AE or GE that appears noticeably lower than either (a) the scores obtained on other core tests in the battery or (b) the student's actual age or grade placement using the following guidelines:

- More than 1 year below chronological age or grade placement for students in grades 1 through 3
- More than 1.5 years below chronological age or grade placement for students in grades 4 and 5
- More than 2 to 3 years below chronological age or grade placement for students in grades 6 through 8
- More than 4 to 5 years below chronological age or grade placement for students in grades 9 through 12

Using these broad suggested guidelines, any noticeable disparities in performance from the normative sample might suggest a need for administration of additional tests in a cognitive-linguistic domain or area of achievement, depending on the purpose of the evaluation. The benefit of using the Scoring Tables provided in the Test Record is that an experienced clinician can use information obtained *during the assessment* to make on-the-spot decisions about any additional tests to administer in the same testing session by referring to the Selective Testing Table in the Test Book.

In the WJ IV ACH, examiners also can use the Qualitative Observation checklists that are associated with each of the core tests to help describe any clinical impressions based on the examinee's test performance. These checklists are designed to capture and document additional qualitative impressions that can assist in test interpretation. In addition, the process of completing the checklist can focus the examiner's attention on the quality of the individual's performance. Each checklist includes a response option that uses the word *typical* and is designed to include a wide variety of observable behaviors for the individual's age or grade level. Selected response options that are outside the typical range of behavior can suggest a need for additional testing in the achievement area being assessed. Figure 3 on page 24 shows the Qualitative Observation checklist for ACH Test 1: Letter-Word Identification.

Figure 3.
Qualitative Observation checklist from WJ IV ACH Test 1: Letter-Word Identification.



Qualitative Observation

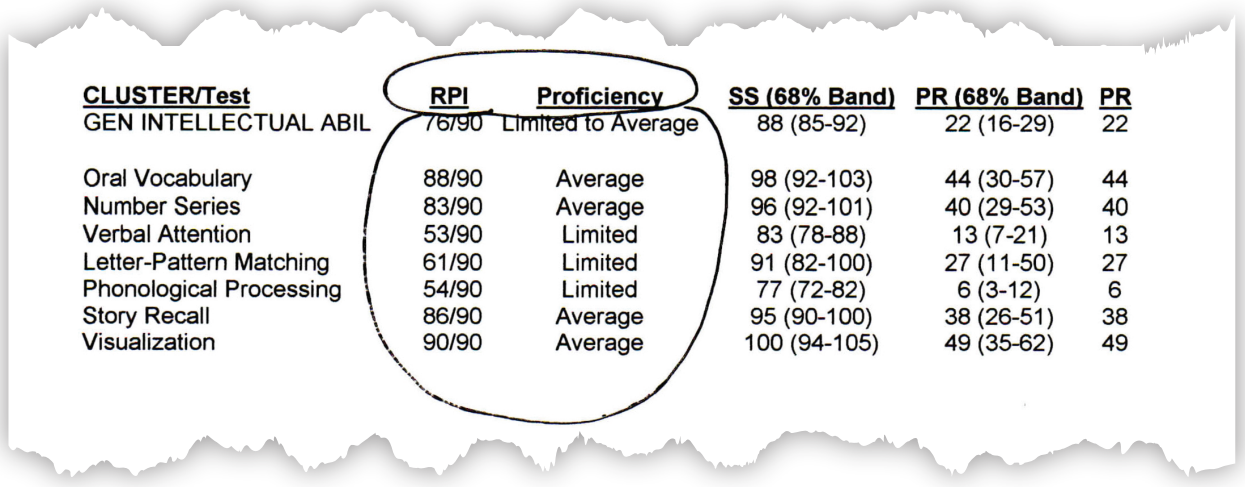
On Letter-Word Identification, which of the following best describes the ease with which the individual identified words? (Mark only one response.)

- ❑ 1. Identified words rapidly and accurately with little effort (automatic word identification skills)
- ❑ 2. Identified initial items rapidly and accurately and identified more difficult items through increased application of phoneme-grapheme relationships (typical)
- ❑ 3. Identified initial items rapidly and accurately but had difficulty applying phoneme-grapheme relationships to latter items
- ❑ 4. Required increased time and greater attention to phoneme-grapheme relationships to determine the correct response (nonautomatic word identification skills)
- ❑ 5. Was not able to apply phoneme-grapheme relationships
- ❑ 6. None of the above, not observed, or does not apply

Information Obtained From an Initial Score Report

Many examiners schedule a block of time for an initial assessment (such as a core test assessment) and follow up with a second session when additional testing is needed. WJ IV Score Reports may be used subsequent to an initial testing session without additional charge. Administering the core tests in the initial assessment session and then producing an initial score report provides the examiner with the opportunity to review the derived scores and use that information to determine what additional tests, if any, to administer. There are three types of information contained within a score report that can provide valuable information for this purpose: (a) standard scores and/or percentile ranks; (b) proficiency levels and/or relative proficiency index (RPI) scores; and (c) the intra-cognitive, intra-oral language, and intra-achievement variation procedures. All of this information should be considered in a review of a score report. Figure 4 is a portion of a WJ IV Score Report with column heads for the proficiency levels and RPI scores encircled for emphasis.

Figure 4.
Portion of a WJ IV Score Report showing RPI and proficiency columns.



CLUSTER/Test	RPI	Proficiency	SS (68% Band)	PR (68% Band)	PR
GEN INTELLECTUAL ABIL	76/90	Limited to Average	88 (85-92)	22 (16-29)	22
Oral Vocabulary	88/90	Average	98 (92-103)	44 (30-57)	44
Number Series	83/90	Average	96 (92-101)	40 (29-53)	40
Verbal Attention	53/90	Limited	83 (78-88)	13 (7-21)	13
Letter-Pattern Matching	61/90	Limited	91 (82-100)	27 (11-50)	27
Phonological Processing	54/90	Limited	77 (72-82)	6 (3-12)	6
Story Recall	86/90	Average	95 (90-100)	38 (26-51)	38
Visualization	90/90	Average	100 (94-105)	49 (35-62)	49

Standard scores and percentile ranks provide information about the individual's relative position among peers and can be useful for determining how common or rare the individual's ability level is within the general population. An obtained standard score below 90 (or a percentile rank below 25) suggests that the individual performed in the lowest quartile of the age or grade peer group nationally. Performance at that level often suggests a need for further assessment to determine whether the lower performance can be generalized to a broad area of cognition or achievement, as represented in a cluster score. Similarly, an obtained standard score above 110 (or a percentile rank above 75) suggests that the individual performed in the highest quartile.

The WJ IV proficiency levels describe an individual's ability with tasks relative to individuals of the same age. These terms have objective meaning because they are derived directly from task proficiency and are not obtained from the normalized distribution of standard scores. The associated RPI scores express performance as a ratio scale that compares the individual's relative task proficiency with that of the typical, or median, individual of the same age. A score report that flags an individual's test performance as "limited" or lower (or an RPI of about 67/90 or lower) can suggest a need to pursue additional testing to yield the related cluster score or provide additional comparative information. Similarly, a proficiency level of "advanced" (or an RPI of about 98/90 or higher) might guide a professional to pursue additional testing in a domain to establish a broad area of individual strength.

Review of Base Rate

The intra-cognitive, intra-oral language, and intra-achievement variation procedures provide an analysis of within-individual variability to derive a profile of relative strengths and weaknesses. In these variation procedures, one of the most important scores to consider is the discrepancy percentile rank (discrepancy PR) because it provides information on the base rate of any observed discrepancy. If the difference between an obtained and predicted score is a negative number (e.g., –14 standard score points), then the discrepancy PR directly indicates the percentage of the population who would obtain a difference of that magnitude or greater (the base rate). For example, a discrepancy PR of 1 on COG Test 5: Phonological Processing indicates that only 1% of the examinee's peer group had the same or larger difference score on this score comparison (the base

rate). Importantly, however, if the difference between the obtained and predicted score is a positive number (e.g., +23 standard score points), then the discrepancy PR must be subtracted from 100 to obtain the base rate. As an example, a discrepancy PR of 97 indicates that only 3% of the population would obtain a discrepancy between the predicted and obtained score of that magnitude or greater (i.e., 100 – 97 = 3). In clinical practice, professionals often make note of a discrepancy PR lower than 10 (for negative differences) or higher than 90 (for positive differences) as an indicator for possible additional assessment in a cognitive-linguistic domain or area of achievement. Figure 5 is a portion of a WJ IV Score Report with the discrepancy PR column head and scores encircled for emphasis.

Figure 5.
Portion of a WJ IV Score Report (Intra-Cognitive Variations Procedure) showing discrepancy PR encircled.

	STANDARD SCORES			DISCREPANCY		Interpretation at
VARIATIONS	Actual	Predicted	Difference	PR	SD	+ or - 1.50 SD (SEE)
Intra-Cognitive Variations						
Oral Vocabulary	98	90	8	74	+0.64	--
Number Series	96	91	5	68	+0.48	--
Verbal Attention	83	94	-11	18	-0.90	--
Letter-Pattern Matching	91	94	-3	39	-0.27	--
Phonological Processing	77	94	-17	6	-1.53	Weakness
Story Recall	95	94	1	56	+0.14	--
Visualization	100	92	8	70	+0.53	--

Use of these clinically derived guidelines conjointly allows the examiner to derive maximum benefit from the distinct levels of interpretive information available from the WJ IV. As described in each of the WJ IV examiner's manuals, each level of information provides a different interpretative perspective on student performance (Mather & Wendling, 2014a, 2014b, 2014c). Initial interpretation of the WJ IV results, as well as sound professional judgment, can reveal the need to assess additional areas of performance that can provide greater breadth and interpretative richness.

The C-SEP Model Applied to SLD Identification

The WJ IV core-selective evaluation process (C-SEP) is applicable to a wide variety of assessment purposes ranging from a survey of cognitive, linguistic, or academic abilities to an in-depth performance analysis for exploration of the parameters of a learning problem. When used within the context of trained professional judgment, the comprehensive nature of the WJ IV and the C-SEP evaluation model can yield information that is relevant to the identification of a specific learning disability (SLD) in any model that is allowed under the 2004 reauthorization of the federal Individuals with Disabilities Education Act (IDEA, 2004).

Assessment of intellectual development is specifically cited in the federal regulations for SLD determination even though school districts may opt out of the traditional ability/achievement discrepancy identification model. Use of the C-SEP enables examiners to derive the WJ IV General Intellectual Ability (GIA) score by administering the core

cognitive tests and to utilize a recommended GIA test score analysis to determine whether a student's intellectual level may be more appropriately defined by the *Gf-Gc* Composite.

When using a response to intervention (RTI) model for SLD identification, the federal regulations and guidance state that a comprehensive evaluation must be conducted and a team must consider, at a minimum, the relationship between achievement and intellectual level. The C-SEP model includes measurement of these constructs, and the WJ IV provides comparison procedures that can inform an understanding of the nature of this relationship.

The U.S. Department of Education Office of Special Education Programs (2006) issued guidance to clarify that a team may diagnose SLD when "the student exhibits a pattern of strengths and weaknesses in performance, achievement, or both, relative to age, State-approved grade-level standards, or intellectual development, that is determined by the group to be relevant to the identification of a specific learning disability, using appropriate assessments . . ." (p. 2). The C-SEP approach to SLD identification is an efficient, data-driven professional judgment process rooted in contemporary CHC theory and neurocognitive research. Specifically, the WJ IV core tests from the cognitive, oral language, and achievement batteries provide a foundation for a profile of abilities that allows a pattern of strengths and weaknesses to emerge. Additional tests can be administered on a selective basis to address the most salient questions in an SLD evaluation.

Consideration of Test and Cluster Score Reliabilities

Evaluators should be cognizant of test and cluster score reliabilities for any score that is used in making long-term decisions. The WJ IV test score reliabilities are sufficient to excellent for interpretation at the test level, for analysis of within-individual strengths and weaknesses, and for suggesting instructional recommendations. However, a single test score is not considered sufficient for making a generalization about a disorder in a basic psychological process or a performance deficit in a broad area of achievement. In most cases the related WJ IV cluster scores will provide higher reliabilities because they are composed of two or more tests. Because score reliability is a facet of validity, evaluators will want to ensure that any scores that are used to make broad generalizations or document the presence and severity of a disability possess a high degree of interpretive reliability. Typically reliabilities of around .90 or greater are deemed acceptable for decision-making purposes. Tables 4, 5, and 6 on pages 28 and 29 provide comparative median reliabilities for the core test and related cluster scores for the WJ IV COG, OL, and ACH (adapted from Schrank & Wendling, manuscript in preparation).

Table 4.
WJ IV COG Median Core Test and Corresponding Cluster Reliabilities

Core COG Test	Median Test Reliability	Corresponding Cluster	Median Cluster Reliability
Test 1: Oral Vocabulary	.89	Comprehension-Knowledge (*Gc*)	.93
		Comprehension-Knowledge–Ext*	.94
		Vocabulary*	.93
Test 2: Number Series	.91	Fluid Reasoning (*Gf*)	.94
		Fluid Reasoning–Ext	.94
		Quantitative Reasoning (RQ)	.94
Test 3: Verbal Attention	.86	Short-Term Working Memory (*Gwm*)	.91
		Short-Term Working Memory–Ext	.93
		Cognitive Efficiency–Ext	.95
Test 4: Letter-Pattern Matching	.91	Cognitive Processing Speed (*Gs*)	.94
		Perceptual Speed (P)	.93
		Cognitive Efficiency	.93
Test 5: Phonological Processing	.84	Auditory Processing (*Ga*)	.92
Test 6: Story Recall	.93	Long-Term Retrieval (*Glr*)	.97
Test 7: Visualization	.85	Visual Processing (*Gv*)	.86

*Requires WJ IV OL Test 1: Picture Vocabulary

Table 5.
WJ IV OL Median Core Test and Corresponding Cluster Reliabilities

Core OL Test	Median Test Reliability	Corresponding Cluster	Median Cluster Reliability
Test 1: Picture Vocabulary	.88	Oral Expression	.89
		Oral Language	.90
		Broad Oral Language	.92
		Vocabulary*	.93
Test 2: Oral Comprehension	.82	Listening Comprehension	.90
		Oral Language	.90
		Broad Oral Language	.92
Test 3: Segmentation	.94	Phonetic Coding (PC)	.95
Test 4: Rapid Picture Naming	.90	Speed of Lexical Access (LA)	.89

*Requires WJ IV COG Test 1: Oral Vocabulary

Table 6.
WJ IV ACH Median Core Test and Corresponding Cluster Reliabilities

Core ACH Test	Median Test Reliability	Corresponding Cluster	Median Cluster Reliability
Test 1: Letter-Word Identification	.94	Reading	.95
		Broad Reading	.97
		Basic Reading Skills	.95
Test 2: Applied Problems	.92	Mathematics	.96
		Broad Mathematics	.97
		Math Problem Solving	.95
Test 3: Spelling	.92	Written Language	.94
		Broad Written Language	.95
		Basic Writing Skills	.95
Test 4: Passage Comprehension	.89	Reading	.95
		Broad Reading	.97
		Reading Comprehension	.93
		Reading Comprehension–Ext	.96
Test 5: Calculation	.93	Mathematics	.96
		Broad Mathematics	.97
		Math Calculation Skills	.97
Test 6: Writing Samples	.90	Written Language	.94
		Broad Written Language	.95
		Written Expression	.92

Basic Steps of the WJ IV Core-Selective Evaluation Process

Using the referral question(s) to guide assessment, an examiner can begin the C-SEP by administering the core WJ IV COG, OL, and/or ACH tests. Information obtained before, during, and after testing can help guide the selective testing process. For example, an initial score report will yield a profile that may report relative strengths or weaknesses among the core tests. In some cases, when combined with additional forms of data collected, the core tests may provide sufficient data to rule out or determine the presence of an SLD. In other cases, additional testing may be warranted, and the core tests will serve as the foundation of any emergent strengths or weaknesses at the broad or narrow ability level.

Step 1: Measure Psychological (Cognitive) Processes

An initial assessment using tests that represent a wide array of cognitive-linguistic processes should be conducted to determine whether a disorder exists in one of the basic psychological processes, a salient feature of the SLD definition. Consequently, the first step of the C-SEP is to administer the seven WJ IV COG core tests (Tests 1 through 7).

Analysis of the WJ IV COG Core Tests. For each of the seven core tests administered, the evaluator should observe and analyze the student's performance. Information obtained prior to or during testing can suggest a need for additional assessment in a broad area of cognition. When reviewing the score report, if no relative strengths or weaknesses are displayed among all of the tests that measure aspects of the seven broad CHC abilities, there may be no reason to administer more cognitive

tests. If performance on a specific test is identified as a relative weakness, however, a possible processing weakness is suggested that evaluators may wish to explore further by administering another test that measures another aspect of the same broad ability or related cognitive process. For example, an identified weakness in COG Test 5: Phonological Processing may suggest that COG Test 12: Nonword Repetition should be administered to evaluate the broad ability of Auditory Processing (*Ga*) as a possible weakness (see Table 1). Alternatively or additionally, OL Test 3: Segmentation and/or OL Test 7: Sound Blending may be administered to determine the student's level of proficiency in word segmentation and blending skills. When administered together, these four tests yield a more in-depth assessment of auditory processing and phonological manipulation abilities.

Additionally, if the reported standard score for one of the core cognitive tests is not average or above average (standard score >90), further exploration may be warranted through the utilization of selective testing procedures. If additional assessment of the cognitive ability is indicated, examiners can consult Table 1 of this bulletin to choose the appropriate test(s) to further investigate the possibility of a cognitive processing or ability deficit. Examiners may then produce an updated score report to further analyze the results and gain insight into the student's ability levels. The goal of this step is to establish whether the student's difficulties are related to weaknesses in an area of cognitive ability or processing. If further testing is conducted and the scores that contribute to a cluster standard score are significantly different from each other, the task demands of each test should be analyzed to help understand the difference in performance on each test. Such analysis might reveal important information regarding any limitations in a narrow aspect of cognitive processing and may have implications for intervention. Finally, triangulating the data collected from the cognitive assessment with the other forms of data collected and using professional judgment in the analysis process is pertinent for making conclusions regarding the student's performance (Schultz, Simpson, & Lynch, 2012).

Analysis of the GIA and the *Gf-Gc* Composite. Administration of the seven core cognitive tests serves two purposes in the C-SEP. The first purpose is to review the derived scores and proficiency levels for each component test to determine whether the results provide information that is relevant to a suspected learning disability. The second purpose is to calculate the GIA score to make a clinical determination of whether the obtained score is an adequate representation of the student's ability.

The GIA is a measure of psychometric *g* that is based on a wide-ranging spectrum of broad cognitive abilities and processes, including Comprehension-Knowledge (*Gc*), Fluid Reasoning (*Gf*), Short-Term Working Memory (*Gwm*), Cognitive Processing Speed (*Gs*), Auditory Processing (*Ga*), Long-Term Retrieval (*Glr*), and Visual Processing (*Gv*), which are defined by contemporary CHC theory. Each of the seven core cognitive tests was designed to have high loadings on the respective CHC factor and high general ability (*g*) loadings. Within the WJ IV, GIA is the best singular predictor—*across individuals*—of overall school achievement and other life outcomes that have some relationship to general intelligence (Schrank, McGrew, & Mather, 2015).

Each test included in the GIA score contributes a somewhat different weight to the calculation of GIA (i.e., the tests are differentially weighted). Most of the test weights remain stable across time; however, the contribution of Cognitive Processing Speed (*Gs*) to GIA decreases with age, whereas that of Visual Processing (*Gv*) slightly increases with age. Within the GIA, COG Test 1: Oral Vocabulary and COG Test 2: Number Series (the component *Gc* and *Gf* tests) represent a contribution of approximately 35% to the

aggregate score. The other approximately 65% of variance is contributed from tests that measure basic psychological processes. Table 7 displays the WJ IV COG test, CHC domains, and ranges of each test's GIA weights for ages 2 through 19.

Table 7.
Seven WJ IV COG Core Tests, CHC Domains, and Ranges of GIA Weights for Ages 2 Through 19

Test	CHC Domain	Ranges of GIA Weights for Ages 2–19
Test 1: Oral Vocabulary	Comprehension-Knowledge (*Gc*)	.16 to .18
Test 2: Number Series	Fluid Reasoning (*Gf*)	.17 to .18
Test 3: Verbal Attention	Short-Term Working Memory (*Gwm*)	.13 to .14
Test 4: Letter-Pattern Matching	Cognitive Processing Speed (*Gs*)	.10 to .17
Test 5: Phonological Processing	Auditory Processing (*Ga*)	.17 to .19
Test 6: Story Recall	Long-Term Retrieval (*Glr*)	.11 to .12
Test 7: Visualization	Visual Processing (*Gv*)	.07 to .12

A review of a student's performance on the WJ IV core cognitive tests will provide important clinical clues for determining whether additional cognitive tests should be administered. If no relative strengths or weaknesses among the core cognitive tests are observed and no test standard scores appear remarkably higher or lower than the GIA, evaluators can reasonably assume that the GIA score is a representative index of the student's overall intellectual ability. In such instances, no additional cognitive tests may need to be administered. In contrast, when markedly lower performance is observed on any of Tests 3 through 7 when compared with performance on Tests 1 and 2, evaluators should pursue additional cognitive testing in suspected areas of strengths or weaknesses (see Table 1) and administer the additional tests that compose the *Gf-Gc* Composite, COG Test 8: General Information and COG Test 9: Concept Formation.

The *Gf-Gc* Composite is often the best estimate of a student's intellectual level when a possible disability is reflected in performance on any of Tests 3 through 7 because the GIA score may be attenuated due to a limitation in cognitive processing. In contrast to the GIA, the constructs of Fluid Reasoning (*Gf*) and Comprehension-Knowledge (*Gc*) represent 100% of the contribution of the *Gf-Gc* Composite. The *Gf-Gc* Composite can be compared with all other cognitive, language, and achievement clusters in the WJ IV that are not primarily *Gf* or *Gc* to help specify the nature of an SLD. The importance of the *Gf*-Cc Composite to SLD evaluation is discussed more fully in Assessment Service Bulletin Number 3: *The WJ IV* Gf-Gc *Composite and Its Use in the Identification of Specific Learning Disabilities* (Schrank et al., 2015).

Administration of the first 10 tests in the WJ IV COG battery is considered a standard WJ IV COG administration protocol (Schrank et al., 2016). There are several interpretive advantages when administering Tests 1 through 10. First, all 10 tests are included in the intra-cognitive variations procedure to determine the presence and severity of any relative strengths and weaknesses at the test level. In addition, the Comprehension-Knowledge (*Gc*), Fluid Reasoning (*Gf*), Short-Term Working Memory (*Gwm*), and Cognitive Efficiency clusters are available (in addition to the GIA and *Gf-Gc* Composite) and are included in the same analysis of relative strengths and weaknesses. Very importantly, however, the Cognitive Efficiency and Short-Term Working Memory (*Gwm*) clusters are

compared with the *Gf-Gc* Composite, which draws attention to the possible presence of a cognitive efficiency or working memory deficit as an indicator of SLD.

Step 2: Measure and Consider Oral Language Abilities

Because language limitations may be related to difficulties in learning, the C-SEP model encourages exploration of language functions for a comprehensive assessment of SLD and can lead to a more precise conclusion and targeted intervention plan. An evaluation of a student's oral language abilities can be conducted to determine a student's levels of oral language proficiency and related cognitive-linguistic competencies, including any possible deficits in the ability to understand and use language in an academic context. Language mediates cognition and achievement and is critical to a student's ability to use executive functions in learning. Therefore, the second step of the C-SEP is to administer the four WJ IV OL core tests.

Analysis of the WJ IV OL Core Tests. Much like the process involved in analysis of the WJ IV COG core tests, administering the four WJ IV OL core tests is recommended as part of an initial SLD evaluation protocol. Upon analysis, if all of the scores fall within or above the average range of standard scores and the intra-oral language variations procedure does not suggest any oral language proficiency limitations, and if other information does not suggest additional assessment is necessary, the evaluator can assume that the core tests sufficiently survey oral language competency. In this case, there is likely no apparent reason to administer the noncore oral language tests. However, as with the cognitive evaluation process, if one of the core test standard scores falls below the average range, or if limitations in proficiency are revealed, there may be a need for additional assessment. Table 2 is a guide to additional WJ IV tests that may be related to observed performance limitations in the WJ IV OL core tests.

Most SLD identification models lean heavily toward a cognitive explanation of SLD; however, language abilities can be an important factor in a student's underachievement. Consequently, many of the WJ IV OL clusters (Oral Language, Vocabulary, Auditory Memory Span, Speed of Lexical Access, Phonetic Coding) can be included in the intra-cognitive variations procedure, producing a more comprehensive pattern of possible strengths and weaknesses among a broad array of cognitive-linguistic processes. Experienced clinicians will triangulate the data, comparing the results with the WJ IV COG and with other data, and use professional judgment in the analysis process when making conclusions regarding a student's oral language performance (Schultz et al., 2012).

Spanish-English Oral Language Proficiency and the Comparative Language Index. The WJ IV OL includes three tests of oral language proficiency in Spanish, which are parallel to the three English language tests that create the Oral Language, Broad Oral Language, and Listening Comprehension clusters; these clusters and tests are outlined in Table 8.

Table 8.
WJ IV OL English and Spanish Oral Language Clusters and Component Tests

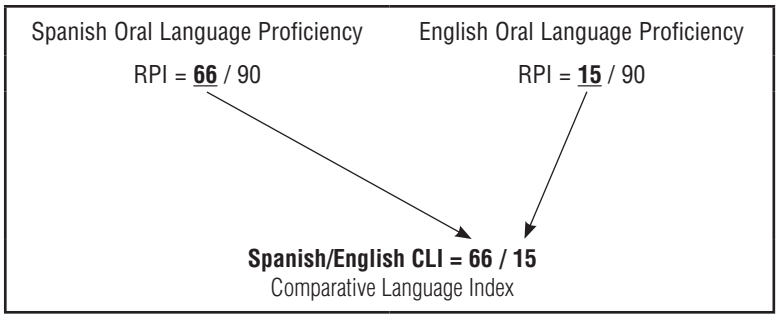
English Cluster	Spanish Cluster
Oral Language	*Lenguaje oral*
Test 1: Picture Vocabulary	Test 10: Vocabulario sobre dibujos
Test 2: Oral Comprehension	Test 11: Comprensión oral
Broad Oral Language	*Amplio lenguaje oral*
Test 1: Picture Vocabulary	Test 10: Vocabulario sobre dibujos
Test 2: Oral Comprehension	Test 11: Comprensión oral
Test 6: Understanding Directions	Test 12: Comprensión de indicaciones
Listening Comprehension	*Comprensión auditiva*
Test 2: Oral Comprehension	Test 11: Comprensión oral
Test 6: Understanding Directions	Test 12: Comprensión de indicaciones

The Spanish tests are included in the WJ IV OL so that assessment of oral language competency in both Spanish and English can be provided for Spanish-English bilingual individuals. In addition, because the Spanish tests are not translations of the parallel English tests, a direct comparison of relative oral language proficiency in the two languages can be made. The Spanish tests must be administered by an examiner who is proficient in Spanish, and the WJ IV OL Examiner's Manual includes a procedure for training an ancillary examiner to administer the Spanish tests under the aegis of a primary examiner.

For Spanish-English bilingual students, it is recommended that the comparative language assessment be the first step in an evaluation. Consequently, for Spanish-English bilingual students, comparative oral language proficiency assessment *precedes* administration of any cognitive tests to help determine the most appropriate language for administration of the cognitive evaluation. For students whose oral language proficiency is greater in Spanish than in English, cognitive ability assessment should be conducted in Spanish (i.e., not English). The WJ IV OL Test Record includes a useful Language Exposure and Use Questionnaire to help an evaluator determine whether a student's first language is not English and the extent to which the student has been exposed to English and other languages.

For Spanish-English bilingual students, the Comparative Language Index (CLI) provides a summary of oral language proficiency in Spanish versus English. The CLI is created by using the numerators of the Spanish and English RPI scores obtained for each cluster. The CLI consists of the Spanish RPI numerator presented first as a contrast to the English RPI numerator. For example, Katarina obtained a Lenguaje oral/Oral Language CLI of 66/15, which indicates that she performs the respective oral language tasks with 66% proficiency in Spanish as compared with 15% proficiency in English. These scores suggest that although Katarina's Spanish oral language proficiency is limited, her English oral language proficiency is much more limited. The implication for further assessment is clear: A determination of Katarina's intellectual abilities should be derived from cognitive tests administered in Spanish. Figure 6 on page 34 illustrates how the CLI score is derived from Katarina's RPI scores in Spanish and English.

Figure 6.
Determining the Spanish/English Comparative Language Index for Katarina.



Many Spanish-dominant bilingual students, such as Katarina, receive academic instruction in English. The WJ IV includes a unique ability-achievement discrepancy procedure that compares a student's current levels of academic achievement in English with his or her oral language ability in Spanish using the Amplio lenguaje oral cluster score to predict academic achievement. This diagnostic comparison should not be overlooked because a severe discrepancy between Spanish oral language ability and achievement levels in English can suggest the need for English language-intensive intervention with Spanish-language instructional support in the indicated content areas (Gersten et al., 2007; Short & Fitzsimmons, 2007). Conversely, if a bilingual student has greater proficiency in English, the examiner can compare the Broad Oral Language score with the relevant achievement cluster score to determine whether academic achievement is significantly lower than would be expected based on the student's level of oral language ability. The comparison of oral language ability with achievement is an important consideration in determining whether a student has an SLD.

Step 3: Measure Academic Performance

Assessment of a student's academic achievement levels can be conducted with the WJ IV ACH. The WJ IV ACH is helpful for both identification and verification of any performance deficits in six academic achievement clusters that represent areas of SLD eligibility: Basic Reading Skills, Reading Fluency, Reading Comprehension, Math Calculation Skills, Math Problem Solving, and Written Expression. (Two additional areas of SLD eligibility are assessed with the WJ IV OL: Listening Comprehension and Oral Expression.)

Some professionals or school districts prefer to assess only in the area of suspected disability, whereas others assess areas of achievement more broadly. Both approaches have merit depending on the referral question. Testing in areas where the student is meeting age- and grade-level standards (e.g., math) contributes to increased testing time, and results obtained may not be relevant to the presenting learning problem. The referral question should be used as a guide when selecting tests to administer; these should include the particular skills in which the student is not meeting age- or grade-level expectations. Interviewing referral sources to clarify referral questions is a strategy that will help focus the assessment process (Sattler, 2008). Comprehensiveness and efficiency must be balanced when making an initial assessment plan, particularly when the referral question is vague or unclear (e.g., "test him/her in everything").

Another route to homing in on any relative achievement weaknesses is to administer, at a minimum, the core tests from the WJ IV ACH (see Table 3). The core achievement tests provide two measures of reading, two measures of mathematics, and two measures of written language. In addition to the derived test-level information, three cluster scores are obtained: Reading, Mathematics, and Written Language. The core tests and the derived cluster scores measure academic skills and applications only; speeded fluency

measures are not included in the core tests and two-test clusters. Using the selective testing guide in Table 3, examiners may elect to administer additional tests in one or more areas of achievement to evaluate any impact of fluency on the development or application of academic skills.

The Academic Skills/Applications/Fluency comparison is automatically made when all 10 tests that compose the standard achievement battery are administered. A relative weakness in academic fluency may be related to a disability in cognitive processing (e.g., low scores in the Cognitive Processing Speed and/or Perceptual Speed clusters) and can often serve as an indicator of SLD. Finally, regardless of state or local SLD identification criteria, a comparison of the WJ IV ACH clusters with the *Gf-Gc* Composite provides an informative perspective about areas where academic performance is not consistent with the intellectual level a student exhibits through knowledge and reasoning (Schrank et al., 2015).

Step 4: Consider Exclusionary Factors

Examining exclusionary factors is an essential and required component of SLD identification (Stephens et al., 2013). While exclusionary factors should be considered and ruled out prior to referring a child for an SLD evaluation, there are times when the referral occurs and the evaluator must analyze and consider whether low academic performance is due to one of the following exclusionary factors: visual, hearing, or motor handicap; intellectual disabilities; emotional disturbance; environmental, cultural, or economic disadvantage; the lack of appropriate instruction in reading and math; or limited English proficiency (34 Code of Federal Regulations, §300.3ll(a)(6); IDEA, 2004).

Although a review of records and other collected data can assist in ruling out vision, hearing, motor, intellectual, and emotional factors, other factors are more difficult to rule out. A thorough review of the student's life experiences will assist in ruling out environmental, cultural, or economic disadvantage, and a review of attendance records, learning opportunities, and academic performance on report cards can contribute to ruling out the lack of appropriate instruction in reading and math. When these factors are ruled out, a determination of limited English proficiency (LEP) often is involved. The student's Language Exposure and Use Questionnaire can indicate the language spoken at home, but more formal information gathered from the WJ IV can assist in ruling out LEP as the primary cause of academic difficulties. The cognitive-academic language proficiency scores can be used to consider the relationship of language ability to academic performance.

Cognitive-academic language proficiency (CALP) is defined as language proficiency in academic situations or those aspects of language proficiency that emerge and become distinctive with formal schooling (Mather & Wendling, 2014c). If CALP scores are elected as a score option, the WJ IV online scoring and reporting program will report CALP scores for the Comprehension-Knowledge (*Gc*) cluster in the WJ IV COG; the Oral Language, Broad Oral Language, Listening Comprehension, and Oral Expression clusters in the WJ IV OL; and the clusters in the WJ IV ACH that measure brief achievement, reading, writing, academic knowledge, academic skills, and academic applications.

An evaluator or team can examine the CALP scores and use the data to make decisions regarding the impact language ability may have on academic performance. Using the CALP scores, the evaluator can compare a student's performance on cognitive-academic tasks with that of his or her same age or grade peers. CALP scores range from 1 to 6, with 1 indicating extremely limited and 6 indicating very advanced proficiency. For

example, a student earning a CALP score of 3 on the WJ IV OL Oral Language cluster would fall in the "limited cognitive-academic language proficiency" range on English oral language tasks. If the student was receiving classroom oral language instruction at the student's chronological age level, he or she would likely have difficulty with classroom language demands. Table 9 includes the six levels of CALP (plus two critical in-between levels) and related interpretive information.

Table 9.
CALP Levels, Related W *Difference Scores, RPI Scores, and Instructional Implications*

CALP Level	CALP Level Description	*W* Difference	RPI	Instructional Implications
6	Very Advanced	+31 and above	100/90	Extremely easy
5	Advanced	+14 to +30	98/90 to 100/90	Very easy
4–5 (4.5)	Fluent to Advanced	+7 to +13	95/90 to 98/90	Easy
4	Fluent	–6 to +6	82/90 to 95/90	Manageable
3–4 (3.5)	Limited to Fluent	–13 to –7	67/90 to 82/90	Difficult
3	Limited	–30 to –14	24/90 to 67/90	Very difficult
2	Very Limited	–50 to –31	3/90 to 24/90	Extremely difficult
1	Extremely Limited	–51 and below	0/90 to 3/90	Nearly impossible

Low levels of CALP can be a reason for poor academic performance. Evaluators should note, in particular, a student's CALP levels on the WJ IV OL Oral Language and Broad Oral Language clusters. Performance on the two clusters may differ because the Broad Oral Language cluster includes OL Test 6: Understanding Directions, which is influenced by the effects of working memory on listening and language processing. Regardless of which score is used to evaluate the influence of language proficiency as a possible exclusionary factor for SLD determination, a CALP score of 3 or lower would indicate limited (or lower) cognitive-academic language proficiency.

Step 5: Use Integrated Data Analysis Procedures to Identify Needs and Disabilities

After the WJ IV tests have been administered and scored, all data that were collected should be compared and contrasted using integrated data analysis techniques. Integrated data analysis is the analysis of multiple data sets (e.g., norm-referenced and criterion-referenced test results, RTI data) that have been pooled into one analysis (Curran & Hussong, 2009). It involves a logical cross-validated analysis (Schultz et al., 2012) that includes determining the trustworthiness and validity of data collected, organizing the data for interpretation, and triangulating data decision points.

This type of data analysis is particularly helpful when using different types of data (e.g., qualitative, quantitative, archival, informal, formal) for decision-making purposes and for determining whether a pattern exists that is relative to the identification of an SLD. Gall, Gall, and Borg (2007) define a pattern as a systematic relationship between two or more phenomena within a case. The evaluator or team is tasked with exploring and explaining systematic relationships between cognitive processing and academic achievement as well as other factors that impact a student's education. This includes the relationship between prior and current instruction, the response of the student to instruction, and the relationship of any exclusionary factors to the student's performance. An integrated data analysis approach will improve the precision and comprehensiveness of SLD identification and the evaluator's understanding of the learner. Children with SLD often present an intricate set of needs that requires a multifaceted approach to thoroughly understand the educational implications.

The *Standards for Educational and Psychological Testing* (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 2014) address the use of multiple data sets as does the IDEA (2004). Table 10 provides relevant descriptions from the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014).

Table 10.
Standards for Educational and Psychological Testing Pertaining to Integrated Data Analysis

Standard	Criterion
10.15	The interpretation of test or test battery results for diagnostic purposes should be based on multiple sources of test and collateral information and on an understanding of the normative, empirical, and theoretical foundations, as well as the limitations, of such tests and data. (p. 167)
12.10	In educational settings, a decision or characterization that will have a major impact on a student should take into consideration not just scores from a single test but other relevant information. (p. 198)

Interpreting data requires a high degree of expertise and professional judgment (Schultz & Stephens, 2009). The single-most important criterion for diagnosis of SLD is clinical judgment, defined as the integration of quantitative and qualitative data by an experienced evaluator using multiple diagnostic criteria (Schrank, Miller, Caterino, & Desrochers, 2006). Identifying a pattern of data that is relevant to the identification of SLD relies on a normative-developmental perspective. A normative-developmental perspective consists of a combination of the normative approaches (e.g., above or below average standard scores) with developmental perspectives characterized by intra- and inter-individual differences in meeting developmental and academic milestones. The WJ IV C-SEP is a systematic yet flexible model for SLD identification that utilizes professional judgment and an integrative, normative-developmental perspective.

Summary and Discussion

The WJ IV COG, WJ OL, and WJ ACH each contain a set of core tests that serves as a foundation for an evaluation and forms the basis for analysis of intra-individual variations among the component tests. When the core tests are administered, any relative strengths and weaknesses in test performance augment the interpretation of derived scores. Additional tests can be selectively administered to obtain a cluster score that represents a broad area of cognition, linguistic competency, or academic performance. Cluster scores will typically possess higher reliabilities than individual tests. The additional tests, and the clusters that are derived, also are included in the analysis of intra-individual variations. This bulletin includes core-selective evaluation process (C-SEP) guides, derived from a review of research and clinical practice, for each of the three WJ IV batteries.

This bulletin also provides guidance on how to use the WJ IV and the C-SEP for identification of a specific learning disability (SLD). The C-SEP has emerged as a particularly viable model for determining whether a student has a pattern of strengths and weaknesses (PSW) that may be relevant to the identification of an SLD (Schultz & Stephens, 2015). Although the last decade of professional practice has yielded a great deal of collective wisdom regarding PSW models that has advanced the field considerably, the amount of time examiners spend in test administration has increased significantly due to the greater number of tests being administered, with many examiners

now routinely administering 14 *or more* tests to evaluate the existence of any strengths and weaknesses among seven broad cognitive abilities in *every* evaluation. In contrast, the C-SEP is a comprehensive yet flexible model wherein the level and depth of test administration and data analysis is proportional to problem complexity.

The C-SEP acknowledges the role of professional judgment in determining which tests, beyond the core tests, should be administered to a particular student. This bulletin includes a number of suggestions for applying professional judgment when determining which tests to administer on a selective basis. Professional judgment is a process that begins with an investigation of the learning problem well before any tests are administered, is often used to modify a test selection plan during a test administration session, and, through application of multiple criteria, is applied when reviewing an initial score report to determine whether additional factor or cluster scores may help clarify the nature of a learning problem. Application of sound clinical judgment to test selection is an important mitigation process that reduces the possibility of making false negative decisions based on a single test score.

A primary strength of the C-SEP model is its compatibility with all contemporary approaches to SLD identification. For example, because the General Intellectual Ability (GIA) score is obtained from administration of the WJ IV COG core tests, the C-SEP can be used in an ability-achievement discrepancy model. The pattern analysis of the core cognitive tests can suggest the need for selective testing to obtain cognitive factor scores and/or an alternative index of intellectual level. In fact, the C-SEP can employ elements of several approaches to gain multiple perspectives. A local education agency that uses the ability-achievement discrepancy model can use the GIA or the *Gf-Gc* Composite to determine program eligibility while also employing a processing perspective to better understand the student's needs and inform interventions. Similarly, a local education agency that utilizes a PSW model can also employ the WJ IV comparison procedures to gain a better understanding of the learner by obtaining information about the presence and severity of any discrepancies between oral language and achievement or intellectual ability and achievement. The *Gf-Gc* Composite/other ability comparison procedure combines the ability-achievement discrepancy and PSW models into one hybrid analysis that is particularly appropriate for determining the presence and severity of a disorder in the basic psychological processes and related domains of achievement when compared with an index of intellectual level that is defined primarily by knowledge and reasoning. Finally, districts (and states) that employ RTI approaches can augment and strengthen the comprehensiveness of an evaluation by using the C-SEP selectively with any of the WJ IV batteries. For example, language levels identified by the WJ IV OL core tests can help inform the nature of many academic problems. In summary, the C-SEP is not a radical departure from current practices; it is a way to refine and improve them.

Although the C-SEP is rooted in CHC theory, test scores are integrated with other data and information to go beyond cognitive factor initialisms to identify, understand, and inform the nature of a learning problem. In the final analysis, an assessment professional must present his or her findings to a team that is tasked with determining whether the child meets the SLD eligibility requirements set forth by the local education agency. Although final determination is a decision of the team, it is the responsibility of the lead assessment professional to present the results of a comprehensive evaluation in a manner that (a) determines whether the student meets the SLD criteria, (b) explains current levels of performance, and (c) informs meaningful interventions. The WJ IV C-SEP model can help assessment professionals address each of these elements in a way that is compatible with any method of SLD identification that is allowed under IDEA.

Appendices.
WJ IV Cognitive and Oral Language Test Correlations With Selected Achievement Clusters

The following three appendices contain tables displaying WJ IV COG and WJ IV OL test correlations with selected reading, mathematics, and writing clusters from the WJ IV ACH. Appendix A contains the WJ IV COG-OL test correlations with the WJ IV ACH Broad Reading, Basic Reading Skills, Reading Comprehension, Reading Comprehension–Extended, Reading Fluency, and Reading Rate clusters. Appendix B contains the same set of cognitive and oral language test correlations with the WJ IV ACH Mathematics, Broad Mathematics, Math Calculation Skills, and Math Problem Solving clusters. And Appendix C contains the same set of cognitive and oral language test correlations with the WJ IV ACH Written Language, Broad Written Language, Basic Writing Skills, and Written Expression clusters. Appreciation is extended to Dr. Kevin McGrew for calculating the values in these tables and his contribution to interpreting the relationship between WJ IV COG and OL test and WJ IV ACH cluster scores.

Each appendix contains five tables that display the correlations by five age groups: ages 6 through 8, ages 9 through 13, ages 14 through 19, ages 20 through 39, and ages 40 through 90+. A column of median correlations displays the median correlation for the defined age group. The correlation of any particular test with a broad area of achievement can vary as a function of age. For example, as shown in Tables A-1 through A-5, the median correlation for COG Test 8: General Information with most areas of reading at ages 6 through 8 is relatively low, but the correlation between Test 8: General Information and all areas of reading performance is moderate from age 9 through adulthood. The progressive influence of COG Test 8: General Information across the lifespan provides support to the suggestion that background knowledge becomes a more important contribution to reading after age 9.

The range of test-to-cluster correlations across all areas of achievement is wide, spanning from a low of .10 to a high of .79. Correlations in the teens and 70s are relatively unusual; the majority of the correlations fall between .40 and .59. The magnitude of the correlations allows evaluators to use the following suggested guidelines for determining the relationship of a test to academic performance.

Table A defines three categories of correlations for interpretive purposes. Test and achievement correlations that exceed .60 are defined as relatively high, correlations within the range from .40 to .60 are defined as moderate, and correlations less than .40 are defined as relatively low.

Table A.
WJ IV Test-Cluster Correlation Categories, Ranges, and Relationship Likelihood

Category	Range	Relationship Likelihood*
Relatively High	>.60	High likelihood of test performance being related to achievement cluster
Moderate	.40 – .60	Test performance may be related to achievement cluster
Relatively Low	<.40	Low likelihood of test performance being related to achievement cluster

*Based on covariance in the general population

Correlations of .60 or greater are relatively high in relation to correlations for other tests in the set. Correlations of this magnitude suggest a high likelihood of a covarying relationship between performance on the test and the target achievement cluster, based on observed variance in the general population. For example, the .73 correlation

between COG Test 2: Number Series and the Mathematics cluster at ages 6 through 8 (see Table B-1) suggests a high likelihood of a covarying relationship between the test and the cluster. In this example, knowledge of what the predictor test and target cluster measure can be used to suggest that an individual's performance on the Mathematics cluster (consisting of ACH Test 2: Applied Problems and ACH Test 5: Calculation) is likely related to his or her quantitative reasoning ability (as measured by COG Test 2: Number Series).

A high correlation between a cognitive or oral language test and an area of achievement cannot be interpreted to mean that the cognitive or oral language predictor test is a causal factor in achievement performance. However, evaluators who are skilled in WJ IV interpretation will often seek to explain covarying performance on highly related tests and clusters in terms of one or more common underlying factors. This type of interpretation requires a high degree of knowledge about what each test and cluster measures. For example, note that COG Test 2: Number Series also displays relatively high correlations with reading and writing performance across the age span (see Tables A-1 through A-5 and C-1 through C-5). Even for professionals experienced with WJ IV, it may be difficult, at least initially, to explain the nature of the high correlation between Test 2: Number Series and reading or writing performance. But knowledge of contemporary CHC theory and current research, including the relative importance of Fluid Reasoning (*Gf*) abilities to the expression of intelligence, can be used to suggest that deductive and inductive reasoning abilities are not domain specific but, instead, are widely applicable. In addition, the relative cognitive complexity inherent in Test 2: Number Series tasks, the attentional control required for successful performance, and the load placed on working memory capacity (Cormier, McGrew, Bulut, & Funamoto, 2016) may mirror the application and interplay of multiple cognitive functions that are required in many achievement tasks. These considerations may help explain the covarying relationship between COG Test 2: Number Series and performance in diverse areas of achievement.

Correlations of .40 to .59 indicate a moderate relationship between the cognitive or oral language test and the area of achievement. Correlations in this range suggest that performances on the test and achievement cluster may be related. More specifically, correlations of this magnitude suggest that 16% to 35% of test and predicted cluster performance may be attributed to shared variance, with the amount of shared variance increasing with the magnitude of the correlation (from 16% to 35%).

Most of the core tests in the WJ IV COG and WJ IV OL (as well as most of the tests in the WJ IV COG Standard Battery) exhibit correlations with achievement within this moderate range. Correlations in the moderate range suggest that the test provides some degree of common variance with the target achievement area while also measuring some unique aspect (or aspects) of ability. This is a design characteristic of the WJ IV COG core tests—that each test is both predictive of achievement *and* best represents a distinct broad CHC ability.

Correlations less than .40 suggest a relatively low relationship between the test and achievement cluster scores. For example, COG Test 14: Picture Recognition displays relatively low correlations with all areas of reading, math, and writing performance at all ages. Inspection of the tables in Appendices A through C reveals that the correlations between Test 14: Picture Recognition and all areas of achievement range from a low of .11 to a high of .37, with age-group medians typically in the twenties. These relatively low correlations suggest that, in most cases, there is a low likelihood of an interpretable,

underlying factor that is shared between Test 14: Picture Recognition and the areas of academic achievement.

The above example helps demonstrate one of the key principles of the WJ IV C-SEP model. That is, if performance on COG Test 7: Visualization suggests intact visual processing skills, there may be little, if any, reason to administer a second test to report a cluster score (in this case, COG Test 14: Picture Recognition and the Visual Processing [*Gv*] cluster) if it will not add any information to help address a referral question. Several tests in the WJ IV COG Extended Battery show similarly low correlations with areas of achievement in the general population, including COG Test 12: Nonword Repetition, COG Test 18: Memory for Words, COG Test 13: Visual-Auditory Learning, and COG Test 15: Analysis-Synthesis. Consequently, some tests may not provide any additional predictive or interpretive value beyond the core tests and therefore may not need to be administered, *unless—using the guidelines provided in this bulletin—the evaluator thinks the additional test and cluster may yield relevant information*.

The important point is that cognitive and oral language tests that display low correlations with achievement clusters can provide valuable information because they measure something unique that may help determine the nature of a learning problem, but the selection of additional tests, beyond the core tests, requires knowledge of what the WJ IV measures and knowledge of the nature of cognitive abilities and learning disabilities. For example, COG Test 12: Nonword Repetition and OL Test 4: Rapid Picture Naming may be particularly sensitive to the presence of developmental dyslexia and may be useful to administer when that disability is suspected. COG Test 16: Object-Number Sequencing and COG Test 18: Memory for Words can provide measures of additional facets of working memory capacity, thus extending the breadth of working memory capacity measurement when memory is a focus of concern. COG Test 15: Analysis-Synthesis can contribute a measure of algorithmic reasoning to create a broad Fluid Reasoning–Extended cluster score when desired.

In addition to providing an empirically based guide to aid in selective testing, the tables in Appendices A, B, and C offer an additional form of validity evidence for the C-SEP model. The WJ IV COG and OL tests demonstrate different levels of correlation with areas of achievement, and the correlations vary by age. In most cases, the core tests provide the single best predictor of achievement from within a broad factor or area of cognitive-linguistic competency. Although there are many good tests in the WJ IV that are not core tests, unless there is a specific reason to delve further (beyond the core tests) into a CHC factor of cognition or area of oral language competency, it may not be necessary to administer all of the tests to yield a complete set of CHC broad ability scores in every evaluation.

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Appendix A.
WJ IV Cognitive and Oral Language Test Correlations With Selected WJ IV Achievement Reading Clusters

Table A-1.
WJ IV Cognitive and Oral Language Test Correlations With Achievement Reading Clusters for Ages 6 Through 8

Battery/Test	Primary CHC Factor	Ages 6 Through 8						Mdn
		Broad Rdg	Bas Rdg Skills	Rdg Cmp	Rdg Cmp-Ext	Rdg Flu	Rdg Rate	
Tests of Cognitive Abilities								
Number Series	***Gf***	**.64**	**.67**	**.68**	**.67**	**.54**	**.50**	**.66**
Oral Vocabulary	***Gc***	**.56**	**.54**	**.55**	**.64**	**.49**	**.41**	**.55**
Number-Pattern Matching	*Gs*	.62	.46	.48	.47	.61	.71	.54
Phonological Processing	***Ga***	**.53**	**.56**	**.56**	**.63**	**.48**	**.43**	**.54**
Letter-Pattern Matching	***Gs***	**.52**	**.36**	**.42**	**.43**	**.53**	**.62**	**.47**
Concept Formation	*Gf*	.45	.40	.49	.48	.42	.37	.43
Verbal Attention	***Gwm***	**.40**	**.46**	**.42**	**.43**	**.36**	**.30**	**.41**
Numbers Reversed	*Gwm*	.43	.38	.37	.39	.44	.37	.39
Visualization	***Gv***	**.37**	**.36**	**.39**	**.41**	**.36**	**.33**	**.36**
Picture Recognition	*Gv*	.35	.36	.37	.36	.29	.25	.36
General Information	*Gc*	.41	.32	.32	.40	.38	.32	.35
Nonword Repetition	*Ga*	.34	.40	.33	.37	.34	.25	.34
Object-Number Sequencing	*Gwm*	.31	.24	.30	.32	.34	.37	.32
Story Recall	***Glr***	**.31**	**.31**	**.36**	**.41**	**.28**	**.23**	**.31**
Visual-Auditory Learning	*Glr*	.30	.31	.29	.32	.30	.25	.30
Pair Cancellation	*Gs*	.37	.22	.17	.20	.40	.48	.29
Memory for Words	*Gwm*	.29	.31	.22	.27	.29	.26	.28
Analysis-Synthesis	*Gf*	.28	.27	.29	.31	.27	.25	.28
Tests of Oral Language								
Sound Awareness	*Ga*	.63	.63	.62	.64	.59	.49	.62
Oral Comprehension	***Gc***	**.50**	**.55**	**.49**	**.57**	**.40**	**.34**	**.49**
Segmentation	***Ga***	**.43**	**.48**	**.52**	**.54**	**.33**	**.24**	**.46**
Understanding Directions	*Gwm*	.43	.45	.46	.46	.38	.32	.44
Sentence Repetition	*Gwm*	.44	.44	.39	.46	.42	.34	.43
Picture Vocabulary	***Gc***	**.40**	**.43**	**.42**	**.50**	**.35**	**.31**	**.41**
Retrieval Fluency	*Glr*	.35	.31	.34	.38	.31	.40	.35
Rapid Picture Naming	***Glr***	**.36**	**.32**	**.29**	**.30**	**.33**	**.38**	**.33**
Sound Blending	*Ga*	.29	.33	.28	.31	.29	.17	.29

Note. Bold font designates the core WJ IV COG or OL tests.

Table A-2.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Reading Clusters for Ages 9 Through 13

Battery/Test	Primary CHC Factor	Ages 9 Through 13						Mdn
		Broad Rdg	Bas Rdg Skills	Rdg Cmp	Rdg Cmp-Ext	Rdg Flu	Rdg Rate	
Tests of Cognitive Abilities								
Number Series	***Gf***	**.62**	**.63**	**.64**	**.64**	**.51**	**.50**	**.62**
Oral Vocabulary	***Gc***	**.61**	**.57**	**.57**	**.67**	**.53**	**.45**	**.57**
Number-Pattern Matching	*Gs*	.60	.42	.44	.44	.57	.68	.50
General Information	*Gc*	.53	.41	.43	.53	.51	.40	.47
Phonological Processing	***Ga***	**.45**	**.49**	**.47**	**.54**	**.40**	**.38**	**.46**
Letter-Pattern Matching	***Gs***	**.52**	**.35**	**.38**	**.39**	**.53**	**.64**	**.45**
Verbal Attention	***Gwm***	**.42**	**.47**	**.42**	**.43**	**.35**	**.31**	**.42**
Concept Formation	*Gf*	.41	.31	.43	.42	.38	.38	.39
Numbers Reversed	*Gwm*	.41	.38	.34	.37	.42	.36	.38
Nonword Repetition	*Ga*	.35	.39	.32	.35	.35	.27	.35
Pair Cancellation	*Gs*	.41	.27	.20	.23	.42	.51	.34
Object-Number Sequencing	*Gwm*	.33	.24	.29	.32	.34	.37	.32
Story Recall	***Glr***	**.33**	**.23**	**.35**	**.39**	**.29**	**.26**	**.31**
Visualization	***Gv***	**.30**	**.30**	**.31**	**.33**	**.29**	**.25**	**.30**
Analysis-Synthesis	*Gf*	.30	.27	.31	.34	.28	.27	.29
Memory for Words	*Gwm*	.29	.31	.26	.30	.28	.26	.29
Visual-Auditory Learning	*Glr*	.26	.21	.25	.28	.27	.25	.26
Picture Recognition	*Gv*	.27	.25	.27	.25	.21	.20	.25
Tests of Oral Language								
Sound Awareness	*Ga*	.56	.54	.52	.56	.52	.44	.53
Oral Comprehension	***Gc***	**.52**	**.52**	**.50**	**.60**	**.39**	**.35**	**.51**
Picture Vocabulary	***Gc***	**.49**	**.48**	**.46**	**.56**	**.43**	**.39**	**.47**
Sentence Repetition	*Gwm*	.46	.45	.41	.47	.40	.36	.43
Understanding Directions	*Gwm*	.44	.41	.41	.43	.38	.37	.41
Retrieval Fluency	*Glr*	.38	.33	.36	.41	.33	.42	.37
Rapid Picture Naming	***Glr***	**.39**	**.31**	**.29**	**.31**	**.34**	**.42**	**.33**
Segmentation	***Ga***	**.29**	**.34**	**.37**	**.40**	**.18**	**.14**	**.32**
Sound Blending	*Ga*	.21	.26	.20	.25	.23	.10	.22

Note. Bold font designates the core WJ IV COG or OL tests.

Table A-3.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Reading Clusters for Ages 14 Through 19

Battery/Test	Primary CHC Factor	Ages 14 Through 19						Mdn
		Broad Rdg	Bas Rdg Skills	Rdg Cmp	Rdg Cmp-Ext	Rdg Flu	Rdg Rate	
Tests of Cognitive Abilities								
Oral Vocabulary	***Gc***	**.68**	**.62**	**.62**	**.72**	**.58**	**.50**	**.62**
Number Series	***Gf***	**.62**	**.62**	**.65**	**.66**	**.50**	**.47**	**.62**
Phonological Processing	***Ga***	**.53**	**.56**	**.53**	**.60**	**.46**	**.42**	**.53**
General Information	*Gc*	.59	.47	.48	.59	.54	.45	.51
Number-Pattern Matching	*Gs*	.58	.41	.44	.44	.55	.64	.50
Letter-Pattern Matching	***Gs***	**.53**	**.36**	**.43**	**.43**	**.53**	**.63**	**.48**
Concept Formation	*Gf*	.47	.36	.51	.51	.43	.41	.45
Numbers Reversed	*Gwm*	.47	.44	.42	.45	.45	.36	.44
Verbal Attention	***Gwm***	**.45**	**.48**	**.44**	**.46**	**.38**	**.33**	**.44**
Object-Number Sequencing	*Gwm*	.41	.29	.38	.40	.41	.43	.40
Pair Cancellation	*Gs*	.46	.32	.25	.28	.47	.52	.39
Visualization	***Gv***	**.37**	**.36**	**.42**	**.44**	**.35**	**.29**	**.37**
Story Recall	***Glr***	**.38**	**.27**	**.41**	**.44**	**.34**	**.27**	**.36**
Nonword Repetition	*Ga*	.34	.39	.29	.33	.33	.24	.33
Memory for Words	*Gwm*	.36	.37	.30	.34	.31	.30	.33
Analysis-Synthesis	*Gf*	.33	.29	.35	.37	.30	.28	.31
Visual-Auditory Learning	*Glr*	.31	.27	.33	.35	.29	.26	.30
Picture Recognition	*Gv*	.21	.21	.23	.21	.13	.13	.21
Tests of Oral Language								
Oral Comprehension	***Gc***	**.58**	**.58**	**.55**	**.65**	**.44**	**.38**	**.56**
Picture Vocabulary	***Gc***	**.58**	**.56**	**.55**	**.64**	**.52**	**.46**	**.56**
Sound Awareness	*Ga*	.56	.55	.55	.59	.52	.42	.55
Sentence Repetition	*Gwm*	.50	.49	.44	.51	.44	.38	.46
Understanding Directions	*Gwm*	.44	.44	.45	.44	.37	.35	.44
Segmentation	***Ga***	**.41**	**.45**	**.47**	**.49**	**.27**	**.20**	**.43**
Retrieval Fluency	*Glr*	.40	.33	.37	.41	.34	.44	.38
Sound Blending	*Ga*	.35	.39	.34	.38	.36	.21	.35
Rapid Picture Naming	***Glr***	**.33**	**.27**	**.26**	**.26**	**.28**	**.36**	**.28**

Note. Bold font designates the core WJ IV COG or OL tests.

Table A-4.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Reading Clusters for Ages 20 Through 39

Battery/Test	Primary CHC Factor	Ages 20 Through 39						Mdn
		Broad Rdg	Bas Rdg Skills	Rdg Cmp	Rdg Cmp-Ext	Rdg Flu	Rdg Rate	
Tests of Cognitive Abilities								
Oral Vocabulary	***Gc***	**.67**	**.62**	**.65**	**.75**	**.57**	**.46**	**.64**
Number Series	***Gf***	**.61**	**.64**	**.65**	**.65**	**.48**	**.44**	**.62**
Phonological Processing	***Ga***	**.57**	**.58**	**.55**	**.63**	**.49**	**.45**	**.56**
General Information	*Gc*	.59	.49	.51	.61	.53	.40	.52
Letter-Pattern Matching	***Gs***	**.57**	**.42**	**.43**	**.45**	**.57**	**.66**	**.51**
Number-Pattern Matching	*Gs*	.57	.43	.43	.43	.55	.64	.49
Concept Formation	*Gf*	.51	.42	.55	.54	.46	.42	.48
Numbers Reversed	*Gwm*	.49	.47	.43	.46	.45	.35	.45
Verbal Attention	***Gwm***	**.45**	**.50**	**.44**	**.46**	**.37**	**.31**	**.45**
Object-Number Sequencing	*Gwm*	.44	.36	.39	.42	.42	.41	.42
Visualization	***Gv***	**.41**	**.41**	**.46**	**.46**	**.37**	**.32**	**.41**
Pair Cancellation	*Gs*	.45	.35	.25	.30	.45	.50	.40
Visual-Auditory Learning	*Glr*	.39	.35	.40	.42	.36	.32	.38
Analysis-Synthesis	*Gf*	.38	.35	.40	.42	.33	.31	.37
Memory for Words	*Gwm*	.40	.40	.32	.36	.36	.32	.36
Nonword Repetition	*Ga*	.37	.42	.31	.33	.36	.26	.35
Story Recall	***Glr***	**.35**	**.27**	**.39**	**.43**	**.31**	**.24**	**.33**
Picture Recognition	*Gv*	.27	.28	.29	.26	.19	.18	.27
Tests of Oral Language								
Sound Awareness	*Ga*	.60	.57	.58	.62	.55	.45	.57
Picture Vocabulary	***Gc***	**.58**	**.56**	**.56**	**.64**	**.51**	**.44**	**.56**
Oral Comprehension	***Gc***	**.57**	**.56**	**.56**	**.66**	**.42**	**.34**	**.56**
Sentence Repetition	*Gwm*	.55	.51	.46	.53	.50	.44	.51
Understanding Directions	*Gwm*	.51	.46	.49	.49	.44	.40	.48
Segmentation	***Ga***	**.44**	**.47**	**.49**	**.53**	**.31**	**.23**	**.46**
Sound Blending	*Ga*	.41	.44	.39	.43	.40	.25	.41
Retrieval Fluency	*Glr*	.41	.34	.38	.41	.34	.41	.39
Rapid Picture Naming	***Glr***	**.37**	**.32**	**.26**	**.27**	**.34**	**.42**	**.33**

Note. Bold font designates the core WJ IV COG or OL tests.

Table A-5.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Reading Clusters for Ages 40 Through 90+

Battery/Test	Primary CHC Factor	Ages 40 Through 90+						Mdn
		Broad Rdg	Bas Rdg Skills	Rdg Cmp	Rdg Cmp-Ext	Rdg Flu	Rdg Rate	
Tests of Cognitive Abilities								
Oral Vocabulary	***Gc***	**.71**	**.67**	**.69**	**.77**	**.63**	**.53**	**.68**
Number Series	***Gf***	**.68**	**.67**	**.69**	**.70**	**.58**	**.55**	**.67**
Phonological Processing	***Ga***	**.62**	**.62**	**.62**	**.68**	**.56**	**.53**	**.62**
General Information	*Gc*	.64	.55	.58	.66	.59	.48	.59
Letter-Pattern Matching	***Gs***	**.59**	**.46**	**.49**	**.51**	**.59**	**.68**	**.55**
Number-Pattern Matching	*Gs*	.61	.48	.48	.49	.60	.69	.55
Verbal Attention	***Gwm***	**.54**	**.57**	**.52**	**.57**	**.48**	**.42**	**.53**
Numbers Reversed	*Gwm*	.54	.48	.48	.52	.52	.45	.50
Concept Formation	*Gf*	.49	.41	.53	.52	.44	.43	.46
Object-Number Sequencing	*Gwm*	.46	.39	.45	.49	.45	.48	.46
Story Recall	***Glr***	**.45**	**.37**	**.46**	**.49**	**.40**	**.36**	**.42**
Pair Cancellation	*Gs*	.45	.37	.29	.33	.46	.51	.41
Visualization	***Gv***	**.41**	**.40**	**.45**	**.47**	**.38**	**.35**	**.41**
Memory for Words	*Gwm*	.43	.41	.35	.40	.43	.40	.40
Nonword Repetition	*Ga*	.40	.44	.36	.40	.41	.31	.40
Visual-Auditory Learning	*Glr*	.40	.35	.40	.43	.38	.37	.39
Analysis-Synthesis	*Gf*	.39	.37	.39	.42	.36	.36	.38
Picture Recognition	*Gv*	.31	.30	.30	.29	.25	.27	.30
Tests of Oral Language								
Sound Awareness	*Ga*	.66	.63	.62	.67	.62	.54	.63
Oral Comprehension	***Gc***	**.64**	**.64**	**.62**	**.71**	**.52**	**.47**	**.63**
Picture Vocabulary	***Gc***	**.62**	**.62**	**.61**	**.68**	**.55**	**.49**	**.61**
Sentence Repetition	*Gwm*	.59	.58	.53	.60	.55	.49	.56
Understanding Directions	*Gwm*	.54	.50	.53	.54	.48	.47	.52
Segmentation	***Ga***	**.49**	**.50**	**.54**	**.57**	**.38**	**.33**	**.50**
Sound Blending	*Ga*	.45	.47	.44	.49	.46	.33	.45
Retrieval Fluency	*Glr*	.44	.38	.42	.44	.40	.49	.43
Rapid Picture Naming	***Glr***	**.40**	**.35**	**.35**	**.36**	**.37**	**.45**	**.36**

Note. Bold font designates the core WJ IV COG or OL tests.

Appendix B.
WJ IV Cognitive and Oral Language Test Correlations With Selected WJ IV Achievement Math Clusters

Table B-1.
WJ IV Cognitive and Oral Language Test Correlations With Achievement Math Clusters for Ages 6 Through 8

Battery/Test	Primary CHC Factor	Ages 6 Through 8				Mdn
		Math	Broad Math	Math Calc Skills	Math Prob Solving	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.73**	**.71**	**.67**	**.72**	**.72**
Number-Pattern Matching	*Gs*	.54	.62	.65	.39	.58
Letter-Pattern Matching	***Gs***	**.48**	**.57**	**.60**	**.35**	**.53**
Oral Vocabulary	***Gc***	**.54**	**.51**	**.45**	**.56**	**.52**
Phonological Processing	***Ga***	**.51**	**.50**	**.47**	**.55**	**.50**
Visualization	***Gv***	**.49**	**.44**	**.36**	**.50**	**.46**
Concept Formation	*Gf*	.48	.44	.37	.54	.46
Numbers Reversed	*Gwm*	.44	.45	.42	.46	.45
Pair Cancellation	*Gs*	.39	.43	.44	.34	.41
Analysis-Synthesis	*Gf*	.43	.39	.33	.51	.41
Object-Number Sequencing	*Gwm*	.40	.41	.39	.43	.41
Verbal Attention	***Gwm***	**.38**	**.41**	**.39**	**.45**	**.40**
Story Recall	***Glr***	**.38**	**.38**	**.35**	**.37**	**.37**
General Information	*Gc*	.33	.34	.29	.38	.34
Visual-Auditory Learning	*Glr*	.33	.28	.23	.37	.30
Memory for Words	*Gwm*	.28	.25	.21	.37	.26
Picture Recognition	*Gv*	.25	.28	.24	.26	.25
Nonword Repetition	*Ga*	.21	.21	.19	.31	.21
Tests of Oral Language						
Sound Awareness	*Ga*	.46	.52	.50	.48	.49
Oral Comprehension	***Gc***	**.41**	**.39**	**.31**	**.44**	**.40**
Understanding Directions	*Gwm*	.40	.39	.34	.46	.40
Segmentation	***Ga***	**.42**	**.37**	**.32**	**.47**	**.39**
Retrieval Fluency	*Glr*	.36	.36	.34	.36	.36
Sentence Repetition	*Gwm*	.34	.34	.30	.41	.34
Picture Vocabulary	***Gc***	**.35**	**.31**	**.25**	**.39**	**.33**
Sound Blending	*Ga*	.28	.26	.22	.34	.27
Rapid Picture Naming	***Glr***	**.20**	**.26**	**.28**	**.20**	**.23**

Note. Bold font designates the core WJ IV COG or OL tests.

Table B-2.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Math Clusters for Ages 9 Through 13

Battery/Test	Primary CHC Factor	Ages 9 Through 13				Mdn
		Math	Broad Math	Math Calc Skills	Math Prob Solving	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.74**	**.73**	**.68**	**.75**	**.73**
Oral Vocabulary	***Gc***	**.57**	**.55**	**.49**	**.57**	**.56**
Number-Pattern Matching	*Gs*	.52	.57	.58	.40	.55
Letter-Pattern Matching	***Gs***	**.45**	**.55**	**.58**	**.36**	**.50**
Concept Formation	*Gf*	.51	.45	.38	.53	.48
Analysis-Synthesis	*Gf*	.49	.43	.35	.53	.46
Pair Cancellation	*Gs*	.42	.47	.48	.38	.45
Numbers Reversed	*Gwm*	.44	.46	.43	.44	.44
General Information	*Gc*	.42	.45	.40	.45	.44
Visualization	***Gv***	**.47**	**.41**	**.33**	**.44**	**.42**
Phonological Processing	***Ga***	**.41**	**.42**	**.39**	**.50**	**.42**
Verbal Attention	***Gwm***	**.41**	**.42**	**.40**	**.44**	**.42**
Object-Number Sequencing	*Gwm*	.39	.41	.39	.39	.39
Story Recall	***Glr***	**.39**	**.38**	**.36**	**.35**	**.37**
Visual-Auditory Learning	*Glr*	.30	.25	.20	.34	.28
Memory for Words	*Gwm*	.28	.25	.21	.33	.27
Nonword Repetition	*Ga*	.24	.25	.23	.30	.25
Picture Recognition	*Gv*	.21	.25	.23	.23	.23
Tests of Oral Language						
Sound Awareness	*Ga*	.42	.48	.48	.45	.46
Oral Comprehension	***Gc***	**.43**	**.42**	**.34**	**.45**	**.42**
Understanding Directions	*Gwm*	.41	.43	.39	.44	.42
Picture Vocabulary	***Gc***	**.43**	**.41**	**.34**	**.48**	**.42**
Retrieval Fluency	*Glr*	.36	.38	.35	.42	.37
Sentence Repetition	*Gwm*	.34	.36	.33	.41	.35
Rapid Picture Naming	***Glr***	**.25**	**.32**	**.32**	**.28**	**.30**
Segmentation	***Ga***	**.31**	**.25**	**.20**	**.36**	**.28**
Sound Blending	*Ga*	.22	.19	.16	.25	.21

Note. Bold font designates the core WJ IV COG or OL tests.

Table B-3.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Math Clusters for Ages 14 Through 19

Battery/Test	Primary CHC Factor	Ages 14 Through 19				Mdn
		Math	Broad Math	Math Calc Skills	Math Prob Solving	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.75**	**.74**	**.69**	**.77**	**.75**
Oral Vocabulary	***Gc***	**.65**	**.62**	**.55**	**.66**	**.64**
Number-Pattern Matching	*Gs*	.51	.56	.58	.41	.54
Concept Formation	*Gf*	.56	.50	.43	.56	.53
General Information	*Gc*	.52	.52	.47	.54	.52
Phonological Processing	***Ga***	**.52**	**.50**	**.47**	**.59**	**.51**
Numbers Reversed	*Gwm*	.50	.50	.46	.51	.50
Letter-Pattern Matching	***Gs***	**.46**	**.53**	**.54**	**.39**	**.49**
Visualization	***Gv***	**.53**	**.49**	**.42**	**.50**	**.49**
Analysis-Synthesis	*Gf*	.50	.46	.40	.54	.48
Pair Cancellation	*Gs*	.46	.49	.49	.43	.48
Object-Number Sequencing	*Gwm*	.48	.49	.46	.47	.47
Verbal Attention	***Gwm***	**.45**	**.45**	**.43**	**.48**	**.45**
Story Recall	***Glr***	**.44**	**.43**	**.42**	**.40**	**.42**
Visual-Auditory Learning	*Glr*	.35	.29	.24	.38	.32
Memory for Words	*Gwm*	.33	.30	.25	.37	.32
Nonword Repetition	*Ga*	.28	.27	.24	.33	.27
Picture Recognition	*Gv*	.14	.18	.15	.16	.16
Tests of Oral Language						
Picture Vocabulary	***Gc***	**.52**	**.48**	**.41**	**.56**	**.50**
Oral Comprehension	***Gc***	**.51**	**.48**	**.40**	**.54**	**.49**
Sound Awareness	*Ga*	.47	.50	.48	.49	.49
Understanding Directions	*Gwm*	.45	.45	.42	.45	.45
Retrieval Fluency	*Glr*	.39	.40	.37	.44	.40
Sentence Repetition	*Gwm*	.38	.38	.34	.43	.38
Segmentation	***Ga***	**.41**	**.34**	**.29**	**.43**	**.38**
Sound Blending	*Ga*	.39	.35	.31	.40	.37
Rapid Picture Naming	***Glr***	**.21**	**.26**	**.27**	**.23**	**.24**

Note. Bold font designates the core WJ IV COG or OL tests.

Table B-4.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Math Clusters for Ages 20 Through 39

Battery/Test	Primary CHC Factor	Ages 20 Through 39				Mdn
		Math	Broad Math	Math Calc Skills	Math Prob Solving	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.75**	**.74**	**.70**	**.76**	**.75**
Oral Vocabulary	***Gc***	**.64**	**.61**	**.54**	**.66**	**.63**
Concept Formation	*Gf*	.57	.53	.46	.60	.55
Phonological Processing	***Ga***	**.54**	**.53**	**.49**	**.60**	**.54**
Visualization	***Gv***	**.57**	**.52**	**.44**	**.55**	**.54**
General Information	*Gc*	.52	.52	.45	.57	.52
Analysis-Synthesis	*Gf*	.53	.48	.41	.58	.50
Numbers Reversed	*Gwm*	.49	.49	.44	.52	.49
Number-Pattern Matching	*Gs*	.46	.52	.54	.39	.49
Letter-Pattern Matching	***Gs***	**.42**	**.51**	**.52**	**.39**	**.47**
Object-Number Sequencing	*Gwm*	.45	.46	.43	.48	.45
Pair Cancellation	*Gs*	.44	.47	.46	.44	.45
Verbal Attention	***Gwm***	**.43**	**.45**	**.42**	**.49**	**.44**
Story Recall	***Glr***	**.41**	**.39**	**.37**	**.39**	**.39**
Visual-Auditory Learning	*Glr*	.38	.34	.28	.43	.36
Memory for Words	*Gwm*	.34	.32	.28	.40	.33
Nonword Repetition	*Ga*	.23	.25	.25	.29	.25
Picture Recognition	*Gv*	.17	.21	.19	.25	.20
Tests of Oral Language						
Picture Vocabulary	***Gc***	**.54**	**.51**	**.43**	**.59**	**.52**
Sound Awareness	*Ga*	.47	.51	.50	.54	.50
Oral Comprehension	***Gc***	**.51**	**.48**	**.39**	**.55**	**.49**
Understanding Directions	*Gwm*	.45	.47	.45	.47	.46
Sentence Repetition	*Gwm*	.43	.44	.41	.49	.43
Segmentation	***Ga***	**.42**	**.36**	**.30**	**.45**	**.39**
Sound Blending	*Ga*	.38	.36	.32	.41	.37
Retrieval Fluency	*Glr*	.35	.37	.35	.41	.36
Rapid Picture Naming	***Glr***	**.18**	**.26**	**.28**	**.23**	**.24**

Note. Bold font designates the core WJ IV COG or OL tests.

Table B-5.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Math Clusters for Ages 40 Through 90+

Battery/Test	Primary CHC Factor	Ages 40 Through 90+				Mdn
		Math	Broad Math	Math Calc Skills	Math Prob Solving	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.79**	**.77**	**.73**	**.79**	**.78**
Oral Vocabulary	***Gc***	**.68**	**.66**	**.60**	**.69**	**.67**
Phonological Processing	***Ga***	**.59**	**.58**	**.55**	**.65**	**.59**
General Information	*Gc*	.58	.57	.52	.60	.57
Concept Formation	*Gf*	.59	.53	.47	.60	.56
Number-Pattern Matching	*Gs*	.53	.58	.59	.47	.55
Analysis-Synthesis	*Gf*	.56	.52	.46	.62	.54
Visualization	***Gv***	**.57**	**.52**	**.45**	**.56**	**.54**
Letter-Pattern Matching	***Gs***	**.49**	**.57**	**.58**	**.45**	**.53**
Numbers Reversed	*Gwm*	.54	.52	.48	.55	.53
Verbal Attention	***Gwm***	**.51**	**.52**	**.49**	**.56**	**.51**
Object-Number Sequencing	*Gwm*	.50	.51	.47	.53	.50
Pair Cancellation	*Gs*	.48	.51	.50	.48	.49
Story Recall	***Glr***	**.51**	**.49**	**.46**	**.49**	**.49**
Visual-Auditory Learning	*Glr*	.45	.41	.36	.48	.43
Memory for Words	*Gwm*	.37	.35	.31	.42	.36
Nonword Repetition	*Ga*	.29	.30	.28	.36	.29
Picture Recognition	*Gv*	.25	.29	.26	.29	.27
Tests of Oral Language						
Oral Comprehension	***Gc***	**.58**	**.56**	**.50**	**.60**	**.57**
Sound Awareness	*Ga*	.54	.57	.56	.57	.56
Picture Vocabulary	***Gc***	**.55**	**.52**	**.46**	**.56**	**.54**
Understanding Directions	*Gwm*	.48	.49	.45	.52	.48
Segmentation	***Ga***	**.49**	**.44**	**.39**	**.54**	**.47**
Sentence Repetition	*Gwm*	.46	.46	.43	.52	.46
Sound Blending	*Ga*	.46	.44	.40	.48	.45
Retrieval Fluency	*Glr*	.43	.45	.43	.49	.44
Rapid Picture Naming	***Glr***	**.25**	**.32**	**.33**	**.29**	**.30**

Note. Bold font designates the core WJ IV COG or OL tests.

Appendix C.
WJ IV Cognitive and Oral Language Test Correlations With Selected WJ IV Achievement Writing Clusters

Table C-1.
WJ IV Cognitive and Oral Language Test Correlations With Achievement Writing Clusters for Ages 6 Through 8

Battery/Test	Primary CHC Factor	Ages 6 Through 8				Mdn
		Written Lang	Broad Wr Lang	Basic Wr Skills	Written Exp	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.68**	**.68**	**.62**	**.66**	**.67**
Number-Pattern Matching	*Gs*	.57	.63	.53	.62	.59
Phonological Processing	***Ga***	**.52**	**.54**	**.55**	**.49**	**.53**
Verbal Attention	***Gwm***	**.49**	**.50**	**.54**	**.45**	**.50**
Oral Vocabulary	***Gc***	**.49**	**.47**	**.56**	**.40**	**.48**
Letter-Pattern Matching	***Gs***	**.45**	**.50**	**.43**	**.49**	**.47**
Story Recall	***Glr***	**.45**	**.42**	**.36**	**.43**	**.42**
Numbers Reversed	*Gwm*	.39	.43	.47	.40	.41
Nonword Repetition	*Ga*	.41	.41	.40	.36	.41
Visualization	***Gv***	**.36**	**.37**	**.40**	**.33**	**.37**
Picture Recognition	*Gv*	.37	.36	.27	.36	.36
Concept Formation	*Gf*	.36	.36	.35	.31	.35
Analysis-Synthesis	*Gf*	.34	.34	.32	.33	.33
Object-Number Sequencing	*Gwm*	.32	.35	.36	.31	.33
Memory for Words	*Gwm*	.32	.30	.34	.24	.31
Visual-Auditory Learning	*Glr*	.29	.31	.23	.29	.29
Pair Cancellation	*Gs*	.24	.31	.30	.27	.29
General Information	*Gc*	.29	.26	.37	.17	.28
Tests of Oral Language						
Sound Awareness	*Ga*	.61	.62	.60	.60	.60
Oral Comprehension	***Gc***	**.48**	**.46**	**.52**	**.38**	**.47**
Segmentation	***Ga***	**.48**	**.45**	**.42**	**.43**	**.44**
Sentence Repetition	*Gwm*	.38	.39	.47	.30	.38
Understanding Directions	*Gwm*	.38	.39	.39	.38	.38
Retrieval Fluency	*Glr*	.32	.33	.32	.31	.32
Picture Vocabulary	***Gc***	**.33**	**.29**	**.38**	**.24**	**.31**
Sound Blending	*Ga*	.29	.28	.26	.26	.27
Rapid Picture Naming	***Glr***	**.24**	**.26**	**.22**	**.26**	**.25**

Note. Bold font designates the core WJ IV COG or OL tests.

Table C-2.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Writing Clusters for Ages 9 Through 13

Battery/Test	Primary CHC Factor	Ages 9 Through 13				Mdn
		Written Lang	Broad Wr Lang	Basic Wr Skills	Written Exp	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.64**	**.66**	**.60**	**.63**	**.63**
Number-Pattern Matching	*Gs*	.55	.61	.50	.61	.58
Oral Vocabulary	***Gc***	**.53**	**.52**	**.61**	**.40**	**.52**
Verbal Attention	***Gwm***	**.48**	**.49**	**.55**	**.39**	**.49**
Phonological Processing	***Ga***	**.46**	**.48**	**.52**	**.42**	**.47**
Letter-Pattern Matching	***Gs***	**.45**	**.51**	**.42**	**.49**	**.47**
General Information	*Gc*	.40	.39	.50	.25	.40
Nonword Repetition	*Ga*	.39	.39	.41	.31	.39
Numbers Reversed	*Gwm*	.36	.41	.47	.36	.39
Story Recall	***Glr***	**.40**	**.38**	**.32**	**.39**	**.38**
Pair Cancellation	*Gs*	.32	.38	.34	.34	.34
Concept Formation	*Gf*	.33	.34	.33	.28	.33
Analysis-Synthesis	*Gf*	.33	.34	.32	.32	.33
Memory for Words	*Gwm*	.30	.30	.36	.23	.30
Visualization	***Gv***	**.29**	**.31**	**.33**	**.28**	**.30**
Object-Number Sequencing	*Gwm*	.28	.31	.35	.25	.30
Picture Recognition	*Gv*	.27	.28	.17	.28	.27
Visual-Auditory Learning	*Glr*	.23	.26	.19	.25	.24
Tests of Oral Language						
Sound Awareness	*Ga*	.52	.54	.55	.48	.53
Oral Comprehension	***Gc***	**.48**	**.46**	**.54**	**.36**	**.47**
Picture Vocabulary	***Gc***	**.43**	**.39**	**.52**	**.28**	**.41**
Sentence Repetition	*Gwm*	.40	.42	.48	.31	.41
Understanding Directions	*Gwm*	.36	.38	.39	.34	.37
Retrieval Fluency	*Glr*	.34	.35	.37	.32	.35
Segmentation	***Ga***	**.35**	**.32**	**.30**	**.30**	**.31**
Rapid Picture Naming	***Glr***	**.26**	**.29**	**.25**	**.27**	**.27**
Sound Blending	*Ga*	.22	.20	.23	.15	.21

Note. Bold font designates the core WJ IV COG or OL tests.

Table C-3.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Writing Clusters for Ages 14 Through 19

Battery/Test	Primary CHC Factor	Ages 14 Through 19				Mdn
		Written Lang	Broad Wr Lang	Basic Wr Skills	Written Exp	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.64**	**.64**	**.59**	**.62**	**.63**
Oral Vocabulary	***Gc***	**.62**	**.61**	**.68**	**.50**	**.61**
Number-Pattern Matching	*Gs*	.54	.59	.50	.59	.56
Phonological Processing	***Ga***	**.54**	**.56**	**.59**	**.48**	**.55**
Verbal Attention	***Gwm***	**.51**	**.51**	**.57**	**.42**	**.51**
Letter-Pattern Matching	***Gs***	**.47**	**.52**	**.43**	**.52**	**.50**
General Information	*Gc*	.50	.48	.56	.34	.49
Numbers Reversed	*Gwm*	.44	.47	.52	.43	.46
Story Recall	***Glr***	**.45**	**.42**	**.36**	**.44**	**.43**
Nonword Repetition	*Ga*	.42	.41	.43	.33	.42
Visualization	***Gv***	**.38**	**.40**	**.41**	**.36**	**.39**
Object-Number Sequencing	*Gwm*	.38	.40	.41	.36	.39
Pair Cancellation	*Gs*	.35	.41	.38	.37	.37
Concept Formation	*Gf*	.39	.39	.35	.36	.37
Analysis-Synthesis	*Gf*	.38	.38	.35	.37	.37
Memory for Words	*Gwm*	.37	.36	.41	.30	.37
Visual-Auditory Learning	*Glr*	.28	.31	.20	.31	.29
Picture Recognition	*Gv*	.24	.24	.11	.26	.24
Tests of Oral Language						
Sound Awareness	*Ga*	.54	.55	.56	.51	.55
Oral Comprehension	***Gc***	**.54**	**.53**	**.60**	**.42**	**.54**
Picture Vocabulary	***Gc***	**.53**	**.50**	**.60**	**.40**	**.52**
Sentence Repetition	*Gwm*	.45	.46	.51	.35	.46
Segmentation	***Ga***	**.45**	**.43**	**.39**	**.41**	**.42**
Understanding Directions	*Gwm*	.41	.43	.40	.41	.41
Sound Blending	*Ga*	.38	.36	.37	.31	.36
Retrieval Fluency	*Glr*	.35	.36	.39	.32	.35
Rapid Picture Naming	***Glr***	**.21**	**.23**	**.19**	**.23**	**.22**

Note. Bold font designates the core WJ IV COG or OL tests.

Table C-4.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Writing Clusters for Ages 20 Through 39

Battery/Test	Primary CHC Factor	Ages 20 Through 39				Mdn
		Written Lang	Broad Wr Lang	Basic Wr Skills	Written Exp	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.63**	**.63**	**.56**	**.62**	**.62**
Oral Vocabulary	***Gc***	**.60**	**.58**	**.67**	**.46**	**.59**
Phonological Processing	***Ga***	**.54**	**.56**	**.59**	**.48**	**.55**
Number-Pattern Matching	*Gs*	.52	.58	.48	.57	.55
Verbal Attention	***Gwm***	**.51**	**.51**	**.58**	**.42**	**.51**
Letter-Pattern Matching	***Gs***	**.49**	**.55**	**.46**	**.52**	**.50**
General Information	*Gc*	.50	.47	.58	.33	.48
Numbers Reversed	*Gwm*	.44	.47	.53	.41	.45
Nonword Repetition	*Ga*	.44	.43	.44	.33	.43
Story Recall	***Glr***	**.43**	**.40**	**.35**	**.41**	**.41**
Object-Number Sequencing	*Gwm*	.39	.41	.45	.34	.40
Concept Formation	*Gf*	.38	.40	.40	.34	.39
Visualization	***Gv***	**.37**	**.39**	**.43**	**.35**	**.38**
Memory for Words	*Gwm*	.38	.37	.45	.28	.38
Analysis-Synthesis	*Gf*	.37	.38	.39	.35	.37
Pair Cancellation	*Gs*	.34	.40	.39	.34	.36
Visual-Auditory Learning	*Glr*	.33	.35	.29	.33	.33
Picture Recognition	*Gv*	.28	.29	.17	.29	.28
Tests of Oral Language						
Sound Awareness	*Ga*	.54	.55	.55	.51	.55
Oral Comprehension	***Gc***	**.50**	**.48**	**.57**	**.38**	**.49**
Sentence Repetition	*Gwm*	.48	.50	.56	.37	.49
Picture Vocabulary	***Gc***	**.50**	**.47**	**.58**	**.37**	**.48**
Understanding Directions	*Gwm*	.43	.45	.44	.42	.43
Segmentation	***Ga***	**.45**	**.42**	**.42**	**.38**	**.42**
Sound Blending	*Ga*	.40	.38	.42	.30	.39
Retrieval Fluency	*Glr*	.34	.36	.37	.32	.35
Rapid Picture Naming	***Glr***	**.25**	**.27**	**.21**	**.27**	**.26**

Note. Bold font designates the core WJ IV COG or OL tests.

Table C-5.

WJ IV Cognitive and Oral Language Test Correlations With Achievement Writing Clusters for Ages 40 Through 90+

Battery/Test	Primary CHC Factor	Ages 40 Through 90+				Mdn
		Written Lang	Broad Wr Lang	Basic Wr Skills	Written Exp	
Tests of Cognitive Abilities						
Number Series	***Gf***	**.68**	**.68**	**.63**	**.66**	**.67**
Oral Vocabulary	***Gc***	**.66**	**.65**	**.71**	**.56**	**.65**
Phonological Processing	***Ga***	**.63**	**.64**	**.66**	**.58**	**.64**
Verbal Attention	***Gwm***	**.60**	**.60**	**.66**	**.52**	**.60**
Number-Pattern Matching	*Gs*	.57	.61	.54	.62	.59
Letter-Pattern Matching	***Gs***	**.54**	**.58**	**.50**	**.59**	**.56**
General Information	*Gc*	.56	.53	.61	.42	.55
Numbers Reversed	*Gwm*	.50	.52	.57	.48	.51
Nonword Repetition	*Ga*	.47	.47	.49	.39	.47
Story Recall	***Glr***	**.48**	**.46**	**.42**	**.46**	**.46**
Object-Number Sequencing	*Gwm*	.45	.47	.49	.43	.46
Analysis-Synthesis	*Gf*	.43	.42	.42	.40	.42
Visualization	***Gv***	**.42**	**.42**	**.44**	**.39**	**.42**
Memory for Words	*Gwm*	.42	.41	.48	.33	.42
Pair Cancellation	*Gs*	.40	.45	.41	.41	.41
Concept Formation	*Gf*	.42	.42	.39	.40	.41
Visual-Auditory Learning	*Glr*	.38	.39	.32	.38	.38
Picture Recognition	*Gv*	.32	.33	.22	.33	.33
Tests of Oral Language						
Sound Awareness	*Ga*	.63	.63	.63	.59	.63
Oral Comprehension	***Gc***	**.60**	**.59**	**.65**	**.49**	**.59**
Sentence Repetition	*Gwm*	.55	.56	.61	.47	.56
Picture Vocabulary	***Gc***	**.57**	**.53**	**.62**	**.44**	**.55**
Segmentation	***Ga***	**.50**	**.48**	**.47**	**.46**	**.47**
Understanding Directions	*Gwm*	.47	.48	.48	.45	.47
Sound Blending	*Ga*	.48	.45	.46	.39	.46
Retrieval Fluency	*Glr*	.42	.43	.44	.40	.42
Rapid Picture Naming	***Glr***	**.31**	**.33**	**.27**	**.34**	**.32**

Note. Bold font designates the core WJ IV COG or OL tests.

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