Review of the Wechsler Adult Intelligence Scale-Fourth Edition: Canadian

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The Wechsler Adult Intelligence Scale–Fourth Edition: Canadian (WAIS-IV: CDN), authored by David Wechsler (2008), is the most current version of the popular assessment that first appeared in 1939 as the Wechsler-Bellevue Intelligence Scale (WB; Zhu & Weiss, 2005). The WAIS-IV: CDN is published by Pearson Canada Assessment, Inc., which is located at 55 Horner Avenue, Toronto, Ontario, Canada, M8Z 4X6 (Pearson Canada Assessment Inc., 2010). The cost of the WAIS–IV: CDN is $1813.00 and includes the complete kit in a box with the Administration and Scoring Manual, the Technical Manual, two stimulus books, 25 record forms, 25 copies of response booklet 1, 25 copies of response booklet 2, a set of Block Design Cubes, the Symbol Search Scoring Key, Coding Scoring Key, Cancellation Scoring Templates, and the Scoring Assistant Software (Pearson Canada Assessment Inc., 2010). The WAIS-IV: CDN is an individually administered assessment tool designed to measure the cognitive abilities of adults aged 16 years through 90 years, 11 months. This test comes from a long line of Wechsler assessment tools and is the second version of the adult scale to include Canadian norms. Canadian norms were developed due to the consistent differences in the achievement and cognitive scores found between Canadian and American children and adults. The WAIS-IV: CDN is used by professionals in education, the judicial system and healthcare to help with planning, interventions and decision making (Wechsler & Grendon, 2008).

With ten core subtests and five supplemental subtests, the WAIS-IV: CDN provides composite scores for four indexes: the Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PSI), Working Memory Index (WMI) and the Processing Speed Index (PSI) (Wechsler & Grendon, 2008). The VCI consists of three core subtests: Similarities, Vocabulary and Information. Comprehension is a supplemental subtest of the VCI. The PRI also consists of three core subtests: Block Design, Matrix Reasoning and Visual Puzzles. Figure Weights and Picture
Completion are the supplemental subtests of the PRI. Digit Span and Arithmetic comprise the core subtests of the WMI, while the Letter-Number Sequencing subtest is supplemental. The PSI has two core subtests and one supplemental subtest: Symbol Search, Coding and Cancellation, respectively. Scores from each index can be combined to produce the Full Scale Intelligence Quotient (FSIQ), or general intellectual ability. The General Ability Index, which is based on the VCI and PRI, can also be generated if the WMI and PSI scores are perceived to unduly influence an examinee’s FSIQ.

While some subtests and items remained, the WAIS-IV: CDN differs significantly from the previous third edition. Changes include theoretical improvements consistent with current intelligence theory and research (Wechsler & Grendon, 2008). For example, the terms Performance IQ (PIQ) and Verbal IQ (VIQ) are no longer used and were replaced by the PRI and VCI, which better reflect the purpose of the subsets that make up each index. New subtests were also developed to place more emphasis on fluid reasoning and working memory, which current research shows is correlated to intelligence. Furthermore, the recent revision improved the developmental appropriateness of the test through simplifying the vocabulary in the subtest instructions, reducing the number of test items that allow time bonuses and reducing the auditory, visual acuity and motor demands of many subtests items. User-friendliness was improved through a reduction in administration time, to an average of 71 minutes for the ten core subtests. The previous edition had 13 core subtests and took an average of 80 minutes to administer. User-friendliness was also the motive behind the reduction in discontinue rules on many subtest, which were reduced from 6 consecutive scores of 0, to 3 consecutive scores of 0. The manual also noted the improved clinical utility and psychometric properties of the WAIS-IV: CDN when compared to the third edition.
Purpose and Recommended Use

The first Wechsler intelligence test, the WB, was developed in 1939 and was unique in that it provided measures of verbal and performance abilities, as well as overall cognitive ability, in one assessment (Wechsler & Grendon, 2008). From the WB, all other tests in the Wechsler family have emerged and been revised over the past seven decades. Like other Wechsler scales, the WAIS-IV: CDN does not adhere to any specific theory of intelligence, such as the Cattell-Horn-Carroll model. The four factor structure of this test does provide measurement of specific domains, such as working memory and processing speed, as well as a measure of general intelligence (g) represented by the FSIQ, but Wechsler argues against measuring intelligence in more narrow domains for four reasons:

First, cognitive functions are interrelated, functionally and neurologically, making it difficult to measure a pure domain of cognitive functioning…. Second, it is ecologically valid to include subtests that require the use of multiple cognitive abilities. Cognitive tasks are rarely, if ever, performed in isolation…. Third, it would be unreasonable to expect any single measure of intelligence to adequately test all domains in a meaningful and practical way…. Finally, performance on measures of cognitive ability reflects only a portion of what comprises intelligence. (p. 6-7, Wechsler & Grendon, 2008)

In the manual for the WAIS-IV: CDN, it is emphasized that current research and theory support the clear identification of 8 to 10 domains of intelligence and that these domains all contribute to g.

The purpose of the WAIS-IV CDN is to give a valid and reliable measurement of general intelligence and the domains represented by the VCI, PRI, WMI and PSI (Wechsler & Grendon, 2008). The WAIS-IV: CDN was specifically designed for adults, aged 16 years to 90 years, 11 months, and it is sensitive to the natural cognitive changes that occur as individuals get older, such
as declines in processing speed and working memory. This test should only be administered and interpreted by professionals who have trained in cognitive assessment at the graduate level, and who are skilled at using the WAIS-IV: CDN with their specific clientele. The WAIS-IV: CDN can contribute to assessments in educational, judicial and health care fields, where a specific diagnosis, such as intellectual disability, learning disorder or intellectual giftedness, is sought. The manual makes it clear that intelligence tests alone, including the WAIS-IV: CDN, are not sufficient for the comprehensive assessment of individuals or diagnoses of disorders, and that other specific assessments and criteria may be required.

**Major Features of the WAIS-IV: CDN**

As previously described, the WAIS-IV: CDN is structured to provide composite scores for four distinct indexes that contribute to an overall measure of general intelligence, represented by the FSIQ (Wechsler & Grendon, 2008). The VCI measures verbal abilities, the PRI measures non-verbal reasoning and perceptual organization, the WMI measures working memory, attention and concentration, and the PSI measures mental and graphomotor processing speed. The ten core subtests and five supplemental subtests that comprise these indexes measure specific abilities that have been identified as components of intelligence.

**The verbal comprehension index.**

The Information subtest is a core subtest of the VCI that measures the ability to acquire, retain and retrieve general factual knowledge (Wechsler & Grendon, 2008). The examinee answers questions from a broad range of general knowledge topics. This subtest is strongly influenced by culture and involves crystallized intelligence and long-term memory (Sattler, 2008). Similarities, also a core subtest, measures verbal concept formation and reasoning, as well as crystallized intelligence, abstract reasoning, auditory comprehension, memory, associative and categorical thinking, the distinction between non-essential and essential features and verbal expression. In
this subtest the examinee is asked how two things or concepts are alike. Vocabulary is the third core subtest of this index and it measures word knowledge, verbal concept formation, crystallized intelligence, fund of knowledge, learning ability, long term memory and an individual’s degree of language development. Due the specific format of the items, this subtest may also measure auditory comprehension and verbal expression. The examinee is shown picture items and is required to name the object. The examinee is also asked to define words presented visually and orally. Comprehension is the only supplemental VCI subtest and it measures verbal reasoning and conceptualization, verbal comprehension and expression, the ability to evaluate and use past experience, and the ability to use practical knowledge and judgement. During the Comprehension subtest, the examinee answers questions based on his understandings of social conventions and common sense.

The perceptual reasoning index.

Block Design is a core Perceptual Reasoning subtest that measures a several abilities including: analysis and synthesis of abstract visual stimuli; nonverbal concept formation and reasoning; broad visual intelligence; fluid intelligence; visual perception and organization; simultaneous processing; visual-motor coordination learning and the ability to separate figure-ground in visual stimuli (Wechsler & Grendon, 2008). The examinee is asked to use coloured blocks to recreate designs presented in the stimulus book, within a set time limit. Matrix Reasoning is also a core subtest and measures fluid intelligence, broad visual intelligence, classification, spatial ability, knowledge of part-whole relationships, simultaneous processing, and perceptual organization. In Matrix Reasoning, the examinee is asked to view an incomplete matrix or series and select the response option that completes the matrix or series. Visual Puzzles is the third core subtest of the PRI and it measures the following abilities: non-verbal reasoning; synthesis and analysis of abstract visual stimuli; visual perception; broad visual intelligence; fluid
intelligence; simultaneous processing; spatial visualization and manipulation; and the ability to anticipate relationships among parts. The examinee is presented with a completed visual puzzle and chooses three response options that reconstruct the puzzle when combined, within a specified time limit. Figure Weights is a new supplemental subtest of the fourth edition and is for individuals aged 16 years to 69 years, 11 months (Wechsler, 2008). Figure Weights measures quantitative and analogical reasoning and involves reasoning processes that can be expressed mathematically. The examinee views a scale with missing weights and selects the response option that keeps the scale balanced within a specified time limit. Picture Completion is another supplemental subtest of the PRI and it measures visual perception and organization, concentration and the ability to differentiate essential from non-essential details in individuals aged 16 years to 69 years, 11 months. The examinee views a picture with an important missing part and is asked to identify the missing part within a specified time limit.

**Working memory index.**

Digit Span is a core subtest of the WMI (Wechsler & Grendon, 2008). This subtest includes three tasks: Digit Span Forward, which measures rote learning and memory, attention, encoding, and auditory processing; Digit Span Backward, which measures working memory, transformation of information, mental manipulation and visuo-spatial imaging; and Digit Span Sequencing, which measures working memory and mental manipulation. The mental shifting between these three tasks also involves cognitive flexibility and mental alertness. In the Digit Span tasks, the examinee is read a sequence of numbers and asked to recall them in a specified order. Another core WMI subtest is Arithmetic. Arithmetic measures mental manipulation, concentration, attention, short and long-term memory, numerical reasoning ability, and mental alertness. The examinee solves mathematical word problems, performed mentally, within a set time limit. Due to its inherent emphasis on mathematics, this subtest may also measure sequential processing and quantitative
knowledge along with fluid, quantitative and logical reasoning. Letter-Number Sequencing is the supplemental WMI subtest, for individuals aged 16 years to 69 years, 11 months. Tasks in this subtest measure sequential processing, mental manipulation, attention, concentration, memory span and short-term auditory memory. They may also measure information processing, cognitive flexibility, and fluid intelligence. The examinee is read a sequence of numbers and letters and recalls the numbers in ascending order and the letters in alphabetical order.

**Processing speed index.**

Symbol Search is a core PSI subtest that measures processing speed as well as short-term visual memory, visual motor coordination, cognitive flexibility, visual discrimination, psychomotor speed, speed of mental operation, attention and concentration (Wechsler & Grendon, 2008). Symbol Search may also measure auditory comprehension, perceptual organization and fluid intelligence along with planning and learning ability. In this subtest, the examinee has a specified time to scan a group of symbols to determine if one of the symbols in the target group matches. Coding is also a core subtest of this index and it measures processing speed, short-term visual memory, learning ability, psychomotor speed, visual perception, visual motor coordination, visual scanning ability, cognitive flexibility, attention, concentration and motivation. The examinee copies symbols that are paired with numbers, using a key, within a specified time limit. Visual sequential processing and fluid intelligence may also be factors in this subtest. The Cancellation subtest is supplemental and measures processing speed, visual selective attention, vigilance, perceptual speed and visual-motor ability in individuals aged 16 years to 69 years, 11 months. In this subtest, the examinee scans a structured arrangement of shapes and marks target shapes within specified time limit.

**Administration, Scoring and Interpretation**
The administration guidelines are clearly described in the Administration and Scoring Manual (Wechsler, 2008). A quiet, distraction-free environment with a table large enough for two people, plus the administration materials is recommended (Lichtenberger & Kaufman, 2009). Examiners also need to ensure that they have all of the materials needed for administration and should be aware that all required materials, such as a stopwatch, pencils without erasers and clipboard, are not included in the kit (Lichtenberger & Kaufman, 2009). The importance of establishing and maintaining rapport is outlined, as is the rationale for choosing subtests. The manual emphasizes the importance of standardization and that subtest decisions should be based on client needs.

The WAIS-IV: CDN is administered individually (Wechsler, 2008). There are verbatim instructions that must be read to introduce the test and each subtest, as well as detailed procedures as needed. Administration time can vary depending on a number of factors, but most individuals complete the ten core subtests in 65 to 100 minutes. Each additional subtest can add about 10 to 15 minutes to the total administration time, which can also be influences by human variables. For example, individuals who may be gifted or of higher intelligence will likely complete more test items and take longer on each subtest as a result. Conversely, individuals who may have an intellectual disability will likely complete fewer items and therefore require less time. The examiner must administer the subtests in the order specified in the manual, unless there is a clinical need to do otherwise. As with any variation to standardized assessments, the change in administration order and the reason for the change should be documented in the assessment report. The examiner can also substitute one supplemental subtest for a core subtest in each index, though results may be less accurate due to an increased chance of measurement error.

There are start points, reverse rules and discontinue rules for each subtest that are designed to reduce testing time and keep examinees from becoming frustrated (Wechsler, 2008). Start
points are indicated for each subtest and are the same for all ages. Individuals suspected of an intellectual disability are the exception, and should start with the first item in each subtest. The reverse rule is in effect on all subtests that do not start with item 1. The examinee must achieve a perfect score, which is the maximum number of points that can be achieved on an item, on the first two items administered to receive credit for the previous items. If the examinee does not, the examiner must administer the preceding items in reverse order until the examinee achieves two consecutive correct scores. The discontinue rule is different for each subtest and each rule indicates that the examiner should stop administering items for that subtest after a specified number incorrect responses.

The Administration and Scoring Manual describes how responses are scored, derived and interpreted for each subtest, index and the FSIQ (Wechsler, 2008). With specific instructions provided, scoring is generally quite objective, although judgment may be needed for scoring items on the Vocabulary, Similarities, Information and Comprehension subtests. There are sample responses and examples of when to query responses but the subjectivity that can be involved in scoring emphasizes the importance of being familiar with the subtests. Responses are recorded on the record form which provides space for verbatim responses and information about the start points, reversal rules and discontinue rules. Details about the steps involved in completing the Summary page are clearly described in the manual, as are the steps for completing the Analysis page. Raw scores, which are usually the total number of item scores for each subtest, are calculated and converted into scaled scores. Scaled scores, with a mean of 10 and a standard deviation of 3, are dependent on the correct age calculation of the examinee and the use of appropriate conversion tables. Once scaled scores are calculated, composite scores, with a mean of 100 and a standard deviation of 15, percentile ranks and confidence intervals can be determined.
using the appropriate tables in the Administration and Scoring Manual. Scoring software is also available for a fee (Pearson Canada Assessment Inc., 2010).

When the composite scores of the VCI, PRI, WMI and PSI are computed, the examiner can compare the examinee to the normative sample (Wechsler & Grendon, 2008). Standard scores, percentile ranks, confidence intervals and descriptive classifications, such as Average and Borderline, can be used to help the examiner compare the examinee’s cognitive functioning with that of his same age peers. For example, a standard score of 130 and above is considered Very Superior and better than 98% of other adults in the same age group. The General Ability Index (GAI), is based on the three VCI subtests and the three PRI subtests and is a measure of cognitive functioning that is not dependent upon working memory or processing speed, which can be especially useful when working adults who have learning disabilities, ADHD, or neurological problems.

**Standardization, Technical Characteristics and Utility**

The updated standardization sample for the WAIS-IV: CDN was based on information from the 2006 Canada Census (Wechsler & Grendon, 2008). The standardization sample included 688 examinees and was divided into 13 age groups. Male and female age examinees were equal in most groups, except in the five oldest age groups which had more women than men to correlate with the Census information. Ethnic groups and education level were also considered based in the Census data. Utility was improved through clinical group studies that included adults with clinical diagnoses of mild and moderate mental retardation, borderline intellectual functioning, hearing impairment, reading disability, math disability, attention-deficit/ hyperactivity disorder, schizophrenia, traumatic brain injury, chronic alcohol abuse, Huntington’s disease, Korsakoff’s syndrome, Parkinson’s disease, and Alzheimer’s disease. Development of the WAIS-IV also included validity and reliability studies (Wechsler & Grendon, 2008). Overall, the reliability of
the WAIS-IV: CDN is excellent with an internal consistency of .85 to .98 for subtests and .96 to 0.98 for the FSIQ. Test-retest reliability was .87 to .96 for subtests and .96 for the FSIQ. Validity was also excellent, with high correlations between the fourth edition and the WAIS-III, Wechsler Preschool and Primary Scale of Intelligence-Third Edition, Wechsler Intelligence Scale for Children-Fourth Edition, and the Wechsler Abbreviated Scale of Intelligence.

**Evaluation of the WAIS-IV: CDN**

There are a number of areas of strength associated with the WAIS-IV:CDN. First, several changes were made to increase its developmental appropriateness and user friendliness such as reduced administration time, revised instructions as well as added demonstration and sample items to ensure clarity and proper understanding of tasks, reduced vocabulary-level for verbatim instructions, reduced emphasis on motor demands and timed performance, enlarged visual stimuli, expanded sample responses, simplified technical manual organization, redesigned record form and increased test portability (Pearson Assessment Canada Inc., 2010). The Scoring Assistant is also a user-friendly bonus as it helps score and report test results quickly and easily and allows access to other scoring applications for potential cross battery analysis. The second area of strength is in the technical characteristics of the test. There is strong reliability at the FSIQ, composite and subtest levels. Also, validity studies support the use of the WAIS-IV: CDN for cognitive assessments and achievement prediction. Validity and linking studies have been conducted with a number of tests such as the Wechsler Memory Scale-Fourth Edition, the Wechsler Individual Achievement Test – Second Edition, Canadian Norms and the upcoming third edition of the Wechsler Individual Achievement Test. The third area of strength is in the clinical utility with 13 groups with special needs considered in fourth edition of the test. These strengths, combined with its historical and theoretical foundations, ensure that the WAIS-IV: CDN will continue it its popularity for years to come.
There are some limitations associated with the WAIS-IV: CDN, however. It does not follow CHC theory explicitly or strictly, though Wechsler thoroughly defends his reasons for this. There are also a number of issues concerning the administration process. First, the Picture Completion 20 second rule is ambiguous. The lack of clear definition around what a response is makes it difficult to determine if a response was given during the specified time. The time pressure during the Figure Weights subtest can also be a problem as there is a 20-40 second time limit with examiner cues to respond every 10 seconds. This can be frustrating and impede the performance of the examinee (Lichtenberger & Kaufman, 2009). The Block Design subtest is also problematic due to the criteria for errors. The rotation of 30 degrees or more is considered an error but it can be difficult to determine the exact degree without precise measurement, which is impractical. In the Comprehension and Information subtests, it can be difficult to know when to query a response due to the subjectivity of the task evaluation. Finally, the WAIS-IV: CDN does not accurately reflect cognitive abilities at the extreme high and low ends of the scale. The lowest FSIQ an individual can achieve is 40, but some will inevitable fall below this level. The same is true for very high scores at the other end of the scale. It can also be difficult to assess individuals who do not speak or understand English, due to the verbal nature of the test instructions.

Overall, the strengths of the WAIS-IV: CDN outweigh its limitations. Working in the field of education, I can attest that this test is a valuable tool to have when conducting comprehensive psychoeducational assessments. For older students who are looking to gain supports on government or postsecondary entry exams, the WAIS-IV: CDN can be invaluable. Students with intellectual disabilities who are transitioning into the community often require psychoeducational assessments to secure support services such as financial or employment assistance. The information that the WAIS-IV: CDN provides in these situations can be life changing and key to one’s quality of life. I am also aware that this assessment may not be appropriate for all
individuals. For those from diverse cultural or linguistic backgrounds, or those with hearing impairments, the WAIS-IV: CDN may not provide accurate measures of abilities, particularly of those measured by the VCI. For these individuals especially, it is important to consider the whole person in the assessment process, especially when the stakes are high. Still, based on its strengths, history and reputation, I would recommend the WAIS-IV: CDN for continued use in educational settings.
References


