



Advanced Interpretation of the **WISC-V**

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Learning Outcomes

- Describe the cognitive processes represented by the WISC-V index scores.
- Describe the theoretical link between cognitive processes and specific academic skills.
- Describe how to use performance on the WISC-V to generate hypotheses about processing deficits.

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Conceptual Structure

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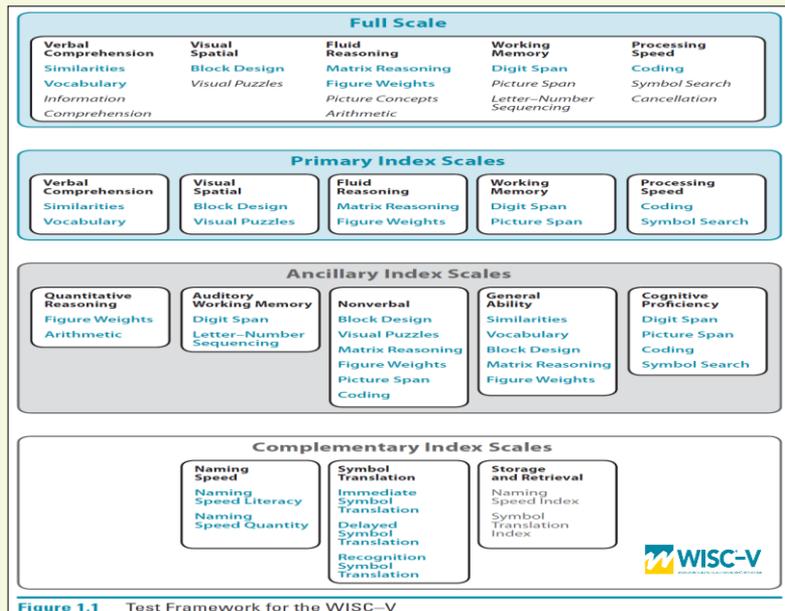


Figure 1.1 Test Framework for the WISC-V

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WISC-V Index Scores and Contributing Cognitive Processes

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Full Scale IQ

Full Scale

Verbal Comprehension	Visual Spatial	Fluid Reasoning	Working Memory	Processing Speed
Similarities	Block Design	Matrix Reasoning	Digit Span	Coding
Vocabulary	Visual Puzzles	Figure Weights	Picture Span	Symbol Search
Information		Picture Concepts	Letter-Number Sequencing	Cancellation
Comprehension		Arithmetic		

- Most reliable score – good predictor of important life outcomes.
- Derived from a sum of 7 subtest scaled scores.
- Considered the score that is most representative of global intellectual functioning (g).
- Traditionally, FSIQ has been the first score to be considered in profile interpretation.

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Primary Index Scales

Primary Index Scales

Verbal
Comprehension

Similarities

Vocabulary

Visual
Spatial

Block Design

Visual Puzzles

Fluid
Reasoning

Matrix Reasoning

Figure Weights

Working
Memory

Digit Span

Picture Span

Processing
Speed

Coding

Symbol Search

The primary index scores, along with the FSIQ, are recommended for a comprehensive description and evaluation of intellectual ability.

Verbal Comprehension Index

- The VCI is a measure of crystallized intelligence. It measures the child's ability to access and apply acquired word knowledge.
- The application of this knowledge involves verbal concept formation, reasoning, and expression.

Word Knowledge
Acquisition

Information
Retrieval

Ability to Reason
and Solve Verbal
Problems

Communication
of Knowledge

Visual-Spatial Index

The VSI measures the child's ability to evaluate visual details and to understand visual spatial relationships to construct geometric designs from a model.

Visual Spatial Reasoning

Integration and synthesis of part-whole relationships

Attentiveness to visual detail

Visual-Motor Integration

Fluid Reasoning Index

The FRI measures the child's ability to detect the underlying conceptual relationship among visual objects and to use reasoning to identify and apply rules.

Inductive and Quantitative Reasoning

Broad Visual Intelligence

Simultaneous Processing

Abstract Thinking

Working Memory Index

The WMI measures the child's ability to register, maintain, and manipulate visual and auditory information in conscious awareness.

- Registration requires attention, auditory and visual discrimination, and concentration.
- Maintenance is the process by which information is kept active in conscious awareness, using the phonological loop or visual sketchpad (see Baddeley, 2012).
- Manipulation is mental resequencing of information based on the application of a specific rule.

Attention

Concentration

Mental Control

Visual and
Auditory

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Processing Speed Index

- The Processing Speed Index measures the child's speed and accuracy of visual identification, decision-making, and decision implementation.
- Processing speed involves the child quickly and correctly scanning or discriminating between simple visual information.

Short-term Visual
Memory

Visual-Motor
Coordination

Visual
Discrimination

Visual Scanning

Concentration

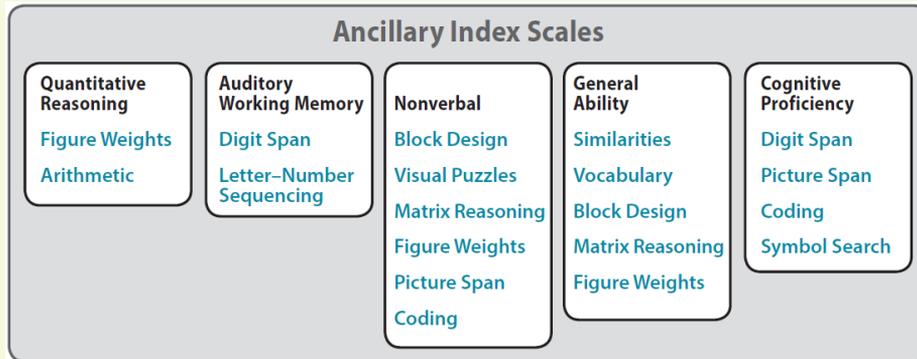
Cognitive
Flexibility

Rate of Test-Taking

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Ancillary Index Scales



- Derived from combinations of primary subtests or primary and secondary subtests.
- Provide additional information regarding a child's cognitive abilities and WISC-V performance.

Quantitative Reasoning

Subtest	Scaled Score		
Block Design			
Similarities			
Matrix Reasoning			
Digit Span			
Coding			
Vocabulary			
Figure Weights			
Visual Puzzles			
Picture Span			
Symbol Search			
Letter-Number Seq.			
Arithmetic			
Sum of Scaled Scores			
	Quant. Reason.	Auditory Work. Mem.	Nonverb.

AR

- Requires computational ability and quantitative knowledge.
- Loads on FRI, WMI, and VCI.

FW

- Requires math in a more limited, abstract manner.
- Examinee uses quantitative concept of equality to understand relationship among objects.
- Then, examinee applies concepts of matching, addition, and/or multiplication to identify correct response.

QRI Measures . . .

Capacity to perform mental math operations

Capacity to understand and apply quantitative relationships

Verbal Problem-Solving

Abstract Conceptual Reasoning

Working Memory

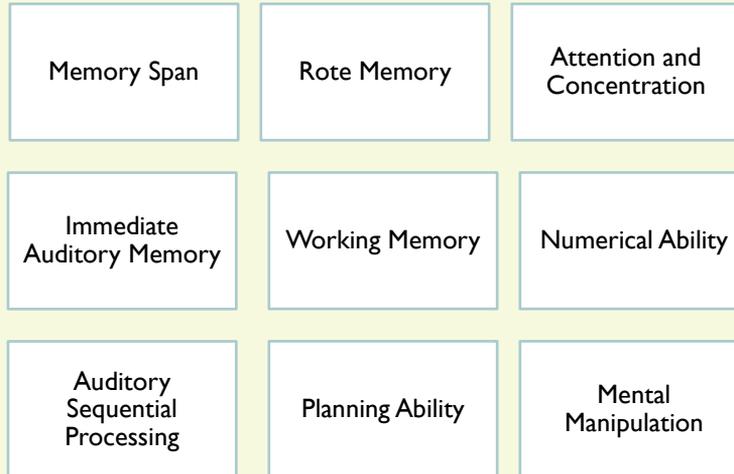
Auditory Working Memory

Subtest	Scaled Score				
Block Design					
Similarities					
Matrix Reasoning					
Digit Span					
Coding					
Vocabulary					
Figure Weights					
Visual Puzzles					
Picture Span					
Symbol Search					
Letter-Number Seq.					
Arithmetic					
Sum of Scaled Scores					
	Quan. Reason.	Auditory Work. Mem.	Nonverbal	General Ability	Cognitive Proficiency

- WMI is based on the multi-component model.
- Two domain-specific storage systems:
 - phonological loop, and
 - visual-spatial sketchpad.

The AWMI is a purer measure of auditory working memory.

AWMI Measures . . .



Nonverbal Index

Subtest	Scaled Score				
Block Design			■		
Similarities			■		
Matrix Reasoning			■		
Digit Span				■	
Coding			■		
Vocabulary					■
Figure Weights			■		
Visual Puzzles			■		
Picture Span			■		
Symbol Search				■	
Letter-Number Seq.					■
Arithmetic					■
Sum of Scaled Scores	■	■	■	■	■
	Quant. Reason.	Auditory Work Mem.	Nonverbal	General Ability	Cognitive Proficiency

- Useful when examinee has obvious verbal difficulties
 - ELL
 - RELD, ELD
 - ASD with Language Impairment
- The processing speed component can affect results just like FSIQ.
- More emphasis on reasoning using visual-spatial processes than FSIQ.

NVI

High NVI Scores

Well-developed general intellectual functioning for visually presented stimuli.

Low NVI Scores

- Slow processing speed.
- Low working memory.
- Low abstract and conceptual reasoning abilities.
- Low spatial reasoning.
- General low intellectual ability.

General Ability Index

Subtest	Scaled Score				
Block Design					
Similarities					
Matrix Reasoning					
Digit Span					
Coding					
Vocabulary					
Figure Weights					
Visual Puzzles					
Picture Span					
Symbol Search					
Letter-Number Seq.					
Arithmetic					
Sum of Scaled Scores					
	Quan. Reason.	Auditory Work Mem.	Nonverbal	General Ability	Cognitive Proficiency

The GAI provides an estimate of general intellectual ability that is less reliant on working memory and processing speed than the FSIQ.

General Ability Index

High GAI Scores

Well-developed

- Abstract, conceptual reasoning.
- Visual-perceptual and spatial reasoning.
- Verbal problem-solving.

Low GAI Scores

- Poor reasoning skills.
- Visual-spatial processing difficulties.
- Language deficits.
- General low intellectual ability.

Cognitive Proficiency Index

Subtest	Scaled Score				
Block Design					
Similarities					
Matrix Reasoning					
Digit Span					
Coding					
Vocabulary					
Figure Weights					
Visual Puzzles					
Picture Span					
Symbol Search					
Letter-Number Seq.					
Arithmetic					
Sum of Scaled Scores					
	Quan. Reason.	Auditory Work Mem.	Nonverbal	General Ability	Cognitive Proficiency

The CPI provides an estimate of the efficiency with which information is processed in the service of learning, problem solving, and higher order reasoning.

CPI

High CPI Scores

High degree of cognitive efficiency for manipulating and rapidly processing information.

Low CPI Scores

- Visual or auditory processing deficits.
- Inattention.
- Distractibility.
- Visuomotor difficulties.
- Limited working memory storage or mental manipulation capacity.
- Generally low cognitive ability.

Complementary Index Scales

Complementary Index Scales

Naming Speed

Naming Speed Literacy
Naming Speed Quantity

Symbol Translation

Immediate Symbol Translation
Delayed Symbol Translation
Recognition Symbol Translation

Storage and Retrieval

Naming Speed Index
Symbol Translation Index

Complementary scales were designed to enhance the assessment of children with learning difficulties.

Naming Speed Index

- The NSI provides a broad estimate of automaticity of basic naming ability drawn from a variety of tasks.
- These tasks were developed to enhance the assessment of children with suspected learning disabilities and are not designed as measures of intellectual ability.

High NSI Scores

High degree of

- naming automaticity, and
- rapid efficient verbal retrieval abilities.

Low NSI Scores

- Visual-processing deficits.
- Information retrieval difficulties.
- Weak language skills.
- Low naming skills.
- Generally slow cognitive functioning.

Symbol Translation Index

The STI provides a broad estimate of visual-verbal associative memory drawn from a variety of conditions.

High STI Scores

Well-developed encoding and retrieval of newly learned visual-verbal associations after short and long delays.

Low STI Scores

- Visual or verbal processing deficits.
- Inattention.
- Distractibility.
- Poor information encoding.
- Difficulties accessing information from memory.
- Rapid forgetting.
- General memory impairment.

Storage and Retrieval Index

The SRI provides a broad estimate of long-term storage and retrieval accuracy and fluency.

High SRI Scores

Well-developed capacity for new learning and rapid access to existing verbal knowledge stores.

Low STI Scores

- Difficulty encoding and/or retrieving information from long-term memory.
- Difficulty acquiring new information.
- Slow processing speed.
- Visual and/or language processing deficits.
- Inattentiveness.



Cognitive Processes Contributing to Academic Skills

Reading-Related Processes

Contributing Processes

- Phonological Processing
- Rapid Naming
- Auditory Working Memory
- Language Comprehension
- Executive Functions
- Visuospatial Abilities

Cognitive Processes and Reading

- Verbal comprehension and working memory were the best WISC-III/WISC-IV predictors of reading ability.
- Children diagnosed with SLD-R show reduced verbal working memory (Kibby & Cohen, 2008) and processing speed deficits (Shanahan et al., 2006).
- Rapid automatic naming measures, similar to Naming Speed Literacy, significantly predict reading ability in both younger and older children with reading disorder (Park & Lombardino, 2013).
- Children with reading disorders perform poorly on verbal learning measures (Kibby & Cohen, 2008) and on paired associate learning tasks that involve pairing a visual input (i.e., a symbol) with a verbal response, that is, a word or nonword (Litt & Nation, 2014; Messbauer & de Jong, 2003).

Special Group Study Results:
 Specific Learning Disorder-Reading N=30

Score	Clinical Mean	Control Mean	Mean Diff	P value	Std. Diff
VCI	89.1	100.7	11.63	<.01	.98
VSI	93.3	101.6	8.27	<.01	.62
FRI	92.5	101.9	9.40	<.01	.77
WMI	87.8	104.1	16.23	<.01	1.52
PSI	93.0	100.3	7.37	.02	.50
FSIQ	88.9	102.0	13.07	<.01	1.06
QRI	92.2	102.7	10.57	<.01	.80
AWMI	90.1	101.2	11.07	<.01	1.14
NVI	89.6	102.6	13.03	<.01	1.04
GAI	90.0	101.6	11.63	<.01	.96
CPI	88.6	102.7	14.17	<.01	1.09
NSI	88.4	101.6	13.14	<.01	.95
STI	91.8	101.5	9.63	<.01	.80
SRI	87.4	101.9	14.55	<.01	1.23

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Math-Related Processes

Contributing Processes

- Attention
- Visual-Spatial Processing
- Working Memory
- Language Comprehension
- Executive Functions

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Cognitive Processes and Math

- Difficulties in verbal comprehension, working memory, and processing speed (Willcutt et al., 2013).
- General cognitive functioning, processing speed, and components of working memory are longitudinal predictors of math achievement (Geary, 2011).
- Difficulties with working memory (Geary, 2010), attention (Raghubar et al., 2009), and semantic-retrieval and visuospatial skills (Cirino, Morris, & Morris, 2007) are related to mathematics difficulties.
- Early number skills and conceptual reasoning skills predict math achievement (Fuchs, Geary, Compton, Fuchs, Hamlett, & Bryant, 2010).
- Language, nonverbal reasoning, and attention are significantly related to performance on math word problems (Fuchs, Geary, Compton, Fuchs, Hamlett, Seethaler, et al., 2010; Tolar et al., 2012).

Special Group Study Results: Specific Learning Disorder-Math N=28

Score	Clinical Mean	Control Mean	Mean Diff	P value	Std. Diff
VCI	90.3	99.5	9.19	<.01	.61
VSI	85.4	100.0	14.61	<.01	1.04
FRI	82.2	96.7	14.46	<.01	.91
WMI	88.7	97.7	9.00	.07	.52
PSI	90.2	97.7	7.46	.03	.50
FSIQ	83.6	98.4	14.85	<.01	1.04
QRI	79.9	96.2	16.29	<.01	1.09
AWMI	88.3	99.1	10.78	.02	.69
NVI	81.5	97.6	16.11	<.01	1.09
GAI	84.2	98.6	14.44	<.01	1.00
CPI	87.3	97.0	9.71	.02	.63
NSI	92.6	96.4	3.79	.36	.23
STI	90.1	100.2	10.07	.02	.63
SRI	89.7	98.0	8.25	.03	.55



Generate Hypotheses Twelve Male – Grade 6

(See WISC-V Score Report)

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Reasons for Referral

His teachers report that Twelve has difficulty

- listening and following directions,
- reading grade-level text with comprehension,
- meeting expectations in the preparation of compositions or written responses to demonstrate what he has learned, and
- completing long-term assignments (i.e., book reports).

Often, he is talking when he should be working.

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Reasons for Referral

His parents report similar concerns at home.

- Twelve often does not remember his chores or starts his chores and does not complete them.
- He complains about assigned reading and refuses at times to complete written assignments.

Demographic Information

WISC®-V

Wechsler Intelligence Scale for Children®-Fifth Edition

Score Report

Examinee Name	Twelve Male	Date of Report	02/04/2015
Examinee ID		Grade	6
Date of Birth	07/18/2002	Primary Language	English
Gender	Male	Handedness	Right
Race/Ethnicity	White	Examiner Name	Gloria Maccow
Date of Testing	01/26/2015	Age at Testing	12 years 6 months

Full Scale IQ and Primary Index Scores

Composite Score Summary

Composite		Sum of Scaled Scores	Composite Score	Percentile Rank	95% Confidence Interval	Qualitative Description
Verbal Comprehension	VCI	23	108	70	100-115	Average
Visual Spatial	VSI	22	105	63	97-112	Average
Fluid Reasoning	FRI	23	109	73	101-116	Average
Working Memory	WMI	16	88	21	81-97	Low Average
Processing Speed	PSI	23	108	70	98-116	Average
Full Scale IQ	FSIQ	73	103	58	97-109	Average

Subtest Scores

Subtest Score Summary

Scale	Subtest Name		Total Raw Score	Scaled Score	Percentile Rank
Verbal Comprehension	Similarities	SI	33	12	75
	Vocabulary	VC	32	11	63
	(Information)	IN	20	10	50
	(Comprehension)	CO	27	12	75
Visual Spatial	Block Design	BD	35	11	63
	Visual Puzzles	VP	19	11	63
Fluid Reasoning	Matrix Reasoning	MR	23	13	84
	Figure Weights	FW	23	10	50
	(Picture Concepts)	PC	18	12	75
	(Arithmetic)	AR	15	6	9
Working Memory	Digit Span	DS	19	6	9
	Picture Span	PS	31	10	50
	(Letter-Number Seq.)	LN	14	7	16
Processing Speed	Coding	CD	53	10	50
	Symbol Search	SS	35	13	84
	(Cancellation)	CA	70	10	50

Subtests used to derive the FSIQ are bolded. Secondary subtests are in parentheses.

Primary Analysis

Index Level Strengths and Weaknesses

Index	Score	Comparison Score	Difference	Critical Value	Strength or Weakness	Base Rate
VCI	108	103.6	4.4	8.82		>25%
VSI	105	103.6	1.4	9.32		>25%
FRI	109	103.6	5.4	8.30		>25%
WMI	88	103.6	-15.6	9.32	W	<=5%
PSI	108	103.6	4.4	12.92		>25%

Comparison score mean derived from the five index scores (MIS).
 Statistical significance (critical values) at the .05 level.
 Base rates are reported by overall sample.

Primary Analysis

Index Level Pairwise Difference Comparisons

Index Comparison	Score 1	Score 2	Difference	Critical Value	Significant Difference	Base Rate
VCI - VSI	108	105	3	10.60	N	42.9%
VCI - FRI	108	109	-1	9.74	N	48.2%
VCI - WMI	108	88	20	10.60	Y	9.0%
VCI - PSI	108	108	0	13.79	N	
VSI - FRI	105	109	-4	10.18	N	40.1%
VSI - WMI	105	88	17	11.00	Y	14.2%
VSI - PSI	105	108	-3	14.10	N	44.6%
FRI - WMI	109	88	21	10.18	Y	8.5%
FRI - PSI	109	108	1	13.47	N	48.9%
WMI - PSI	88	108	-20	14.10	Y	12.2%

Statistical significance (critical values) at the .05 level.
 Base rates are reported by overall sample.

Primary Analysis

Subtest Level Strengths and Weaknesses

Subtest	Score	Comparison Score	Difference	Critical Value	Strength or Weakness	Base Rate
SI	12	10.7	1.3	2.87		<=25%
VC	11	10.7	0.3	2.45		>25%
BD	11	10.7	0.3	3.06		>25%
VP	11	10.7	0.3	2.57		>25%
MR	13	10.7	2.3	2.57		<=15%
FW	10	10.7	-0.7	1.94		>25%
DS	6	10.7	-4.7	2.20	W	<=2%
PS	10	10.7	-0.7	2.97		>25%
CD	10	10.7	-0.7	3.33		>25%
SS	13	10.7	2.3	4.42		<=25%

Comparison score mean derived from the ten primary subtest scores (MSS-P).
 Statistical significance (critical values) at the .05 level.

Primary Analysis

Subtest Level Pairwise Difference Comparisons

Subtest Comparison	Score 1	Score 2	Difference	Critical Value	Significant Difference	Base Rate
SI - VC	12	11	1	3.02	N	40.7%
BD - VP	11	11	0	3.04	N	
MR - FW	13	10	3	2.60	Y	20.7%
DS - PS	6	10	-4	2.89	Y	11.1%
CD - SS	10	13	-3	3.63	N	16.8%

Statistical significance (critical values) at the .05 level.

Ancillary and Complementary Indexes

Index Score Summary							
Composite		Sum of Scaled/ Standard Scores	Index Score	Percentile Rank	95% Confidence Interval	Qualitative Description	SEM
Ancillary							
Quantitative Reasoning	QRI	16	88	21	82-95	Low Average	3.00
Auditory Working Memory	AWMI	13	81	10	75-90	Low Average	3.67
Nonverbal	NVI	65	106	66	99-112	Average	3.00
General Ability	GAI	57	109	73	103-114	Average	2.60
Cognitive Proficiency	CPI	39	98	45	91-105	Average	4.24
Complementary							
Naming Speed	NSI	160	78	7	72-89	Very Low	4.50
Symbol Translation	STI	319	106	66	99-112	Average	3.67
Storage & Retrieval	SRI	184	89	23	83-96	Low Average	3.35

Ancillary index scores are reported using scaled scores and complementary index scores are reported using standard scores.

Ancillary and Complementary Analysis

ANCILLARY & COMPLEMENTARY ANALYSIS						
Index Level Pairwise Difference Comparisons						
Index Comparison	Score 1	Score 2	Difference	Critical Value	Significant Difference	Base Rate
Ancillary						
GAI - FSIQ	109	103	6	3.04	Y	9.6%
GAI - CPI	109	98	11	9.75	Y	22.5%
WMI - AWMI	88	81	7	6.91	Y	21.3%
Complementary						
NSI - STI	78	106	-28	11.38	Y	5.7%

Statistical significance (critical values) at the .05 level.
 Base rates are reported by overall sample.

Ancillary and Complementary Analysis

ANCILLARY & COMPLEMENTARY ANALYSIS

Index Level Pairwise Difference Comparisons

Index Comparison	Score 1	Score 2	Difference	Critical Value	Significant Difference	Base Rate
Ancillary						
GAI - FSIQ	109	103	6	3.04	Y	9.6%
GAI - CPI	109	98	11	9.75	Y	22.5%
WMI - AWTMI	88	81	7	6.91	Y	21.3%
Complementary						
NSI - STI	78	106	-28	11.38	Y	5.7%

Statistical significance (critical values) at the .05 level.
 Base rates are reported by overall sample.

Process Analysis

Process Level Pairwise Difference Comparisons (Scaled Scores)

Process Score Comparison	Score 1	Score 2	Difference	Critical Value	Significant Difference	Base Rate
BD - BDn	11	10	1	3.40	N	17.1%
BD - BDp	11	14	-3	3.11	N	3.6%
DSf - DSb	7	6	1	3.69	N	41.3%
DSf - DSs	7	7	0	3.63	N	
DSb - DSs	6	7	-1	3.66	N	42.9%
LN - DSs	7	7	0	3.38	N	
CAr - CAs	10	10	0	3.59	N	

Statistical significance (critical values) at the .05 level.

Deriving Contrast Scores

DSb Scaled Score	DSf Scaled Score								DSb Scaled Score
	1-3	4-5	6-7	8-9	10-11	12-13	14-15	16-19	
1	4	2	1	1	1	1	1	1	1
2	6	4	2	2	2	1	1	1	2
3	7	5	3	3	3	2	2	1	3
4	8	6	5	4	4	3	3	2	4
5	9	8	6	5	5	4	4	3	5
6	10	9	7	6	5	5	5	4	6
7	11	9	8	7	6	6	6	5	7
8	12	10	9	8	7	7	7	6	8
9	13	11	11	9	8	8	8	6	9
10	14	12	12	11	10	9	9	7	10
11	15	14	13	12	11	10	9	8	11
12	16	15	14	13	12	11	10	9	12
13	17	16	15	14	13	12	11	10	13
14	18	17	16	15	14	13	12	11	14
15	19	18	17	16	15	14	13	12	15
16	19	19	18	18	16	16	14	13	16
17	19	19	19	19	18	17	16	14	17
18	19	19	19	19	19	19	17	16	18
19	19	19	19	19	19	19	19	18	19

Interpreting Contrast Scores

DSf vs. DSb Interpretive Summary		
DSfvDSb	DSf	Interpretation Hypotheses
Low	Low	global attention difficulties, difficulties with mental manipulation
	Average	average attention, difficulties with mental manipulation, difficulty with effortful processing
	High	good span, difficulties with mental manipulation
Average	All	mental manipulation ability is as expected, given attention and basic span ability
High	Low	global attention difficulties, good mental manipulation of limited information
	Average	average attention, good mental manipulation, improved attention or strategy on the Backward task
	High	good span, good mental manipulation

See Appendix C in the WISC-V Technical and Interpretive Manual.

Process Analysis

Total Raw Score to Base Rate Conversion			
Process Score		Raw Score	Base Rate
Longest Digit Span Forward	LDSf	5	88.1%
Longest Digit Span Backward	LDSb	3	91.5%
Longest Digit Span Sequence	LDSs	4	84.5%
Longest Picture Span Stimulus	LPSs	-	-
Longest Picture Span Response	LPSr	-	-
Longest Letter-Number Sequence	LLNs	3	95.1%
Block Design Dimension Errors	BDde	0	>25%
Block Design Rotation Errors	BDre	0	<=15%
Coding Rotation Errors	CDre	-	-
Symbol Search Set Errors	SSse	-	-
Symbol Search Rotation Errors	SSre	-	-
Naming Speed Literacy Errors	NSLe	0	>25%
Naming Speed Quantity Errors	NSQe	2	<=2%

Base rates are reported by overall sample for the span and sequence scores and by age group for the error scores.



Based on his WISC-V profile, what are your hypotheses about Twelve's academic achievement?

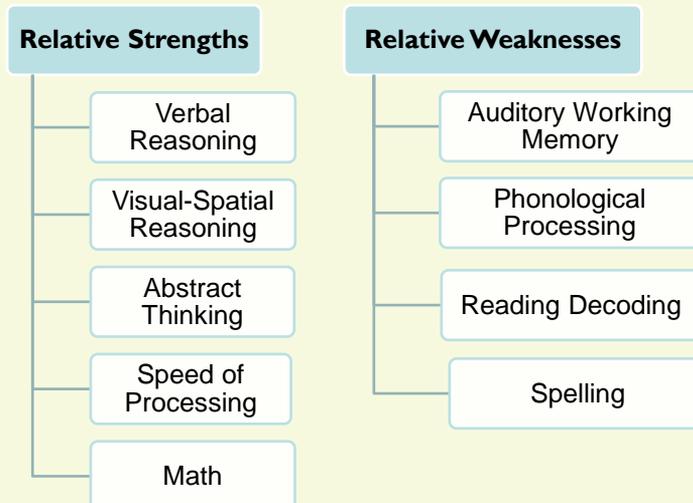
WIAT-III Scores

Composite/Subtest	Standard Score	Percentile Rank
Basic Reading	87	19
• Word Reading	90	25
• Pseudoword Decoding	84	14
Reading Comprehension and Fluency	87	19
• Reading Comprehension	93	32
• Oral Reading Fluency	88	21
Mathematics	110	75
• Math Problem Solving	110	75
• Numerical Operations	108	70
Written Expression	82	12
• Spelling	78	7
• Sentence Composition	88	21
• Essay Composition	90	25

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Integration of Data



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