Wechsler Memory Scales – 4th Edition

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Theory

- Based on theory that memory and learning are closely linked.
- Learning – process of acquiring new information
- Memory – the persistence of learning in a state that can be revealed at a later time
- Memory is the indicator that learning has occurred
- WMS-IV measures the ability to learn and remember information that is presented verbally and visually.

Process of Learning and Remembering

ENCODING	External information is transformed into mental representations or memories.
CONSOLIDATION	Biological process that solidify information from immediate memory into long-term memory.
RETRIEVAL	Bringing stored information into conscious awareness, or remembering.

Development of Test

- Revision of the WMS-III
- Added items include a brief evaluation of cognitive status
- Revised to include two batteries:
  - An adult battery (ages 16-69)
  - Older Adult battery (ages 65-90)
    - Shorter
    - Developed to decrease testing time, reduce examinee fatigue, and improve the psychometric functioning of the subtests in older adults
    - No manipulatives are required for the older battery, thus increasing kit portability
    - Examinees ages 65-69 may be administered either battery

Development of Test

- Found that memory performance declined during long testing sessions – WMS-IV reduced test time
- Wanted to make sure that the WAIS-IV and WMS-IV didn't test memory in the same way – removed Digit Span and Letter-Number Sequencing Subtests
  - WMS-IV : Focuses on components of visual working memory
  - WAIS-IV : focuses on auditory working memory

Development of Test

- Included a Brief Cognitive Status Exam, designed to identify significant cognitive difficulties that may indicate dementia or other cognitive impairment.
- Conducted three pilots and a tryout phase before Standardization

Standardization

- Co-normed with the WAIS-IV, but WMS-IV continued data collection beyond the WAIS
- 1400 examinees included
  - 900 completed Adult Battery
  - 500 completed Older Adult Battery
- Equal number of male and female examinees in each age group
  - Older age group contained more females than males

Standardization

- Race/Ethnicity
  - Based on 2005 Census
- Education Level
  - Stratified according to 5 education levels (0-8 yrs, 9-11 yrs, 12 yrs, 13-15 yrs, 16 or more yrs)

Sampling Sites

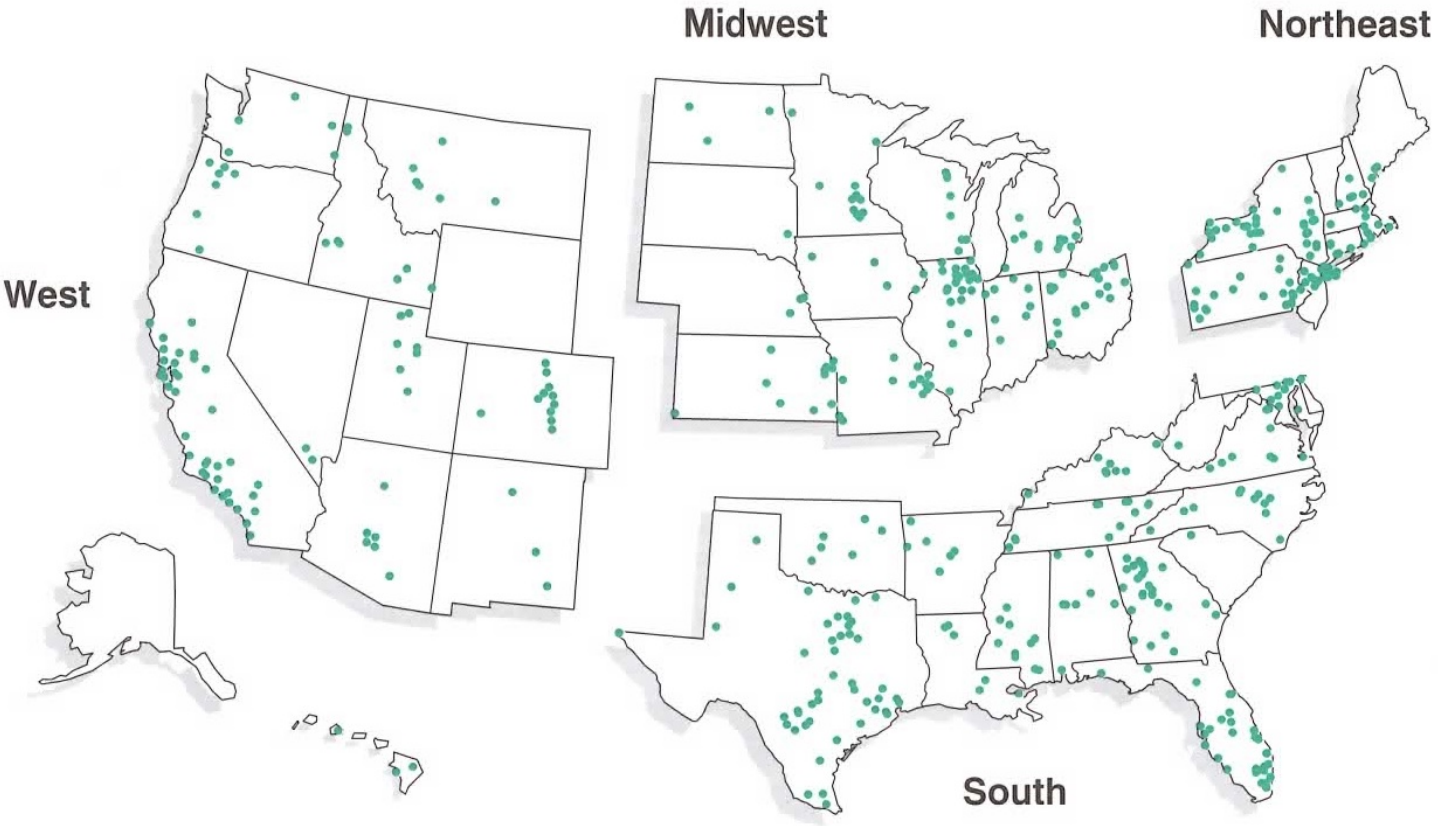
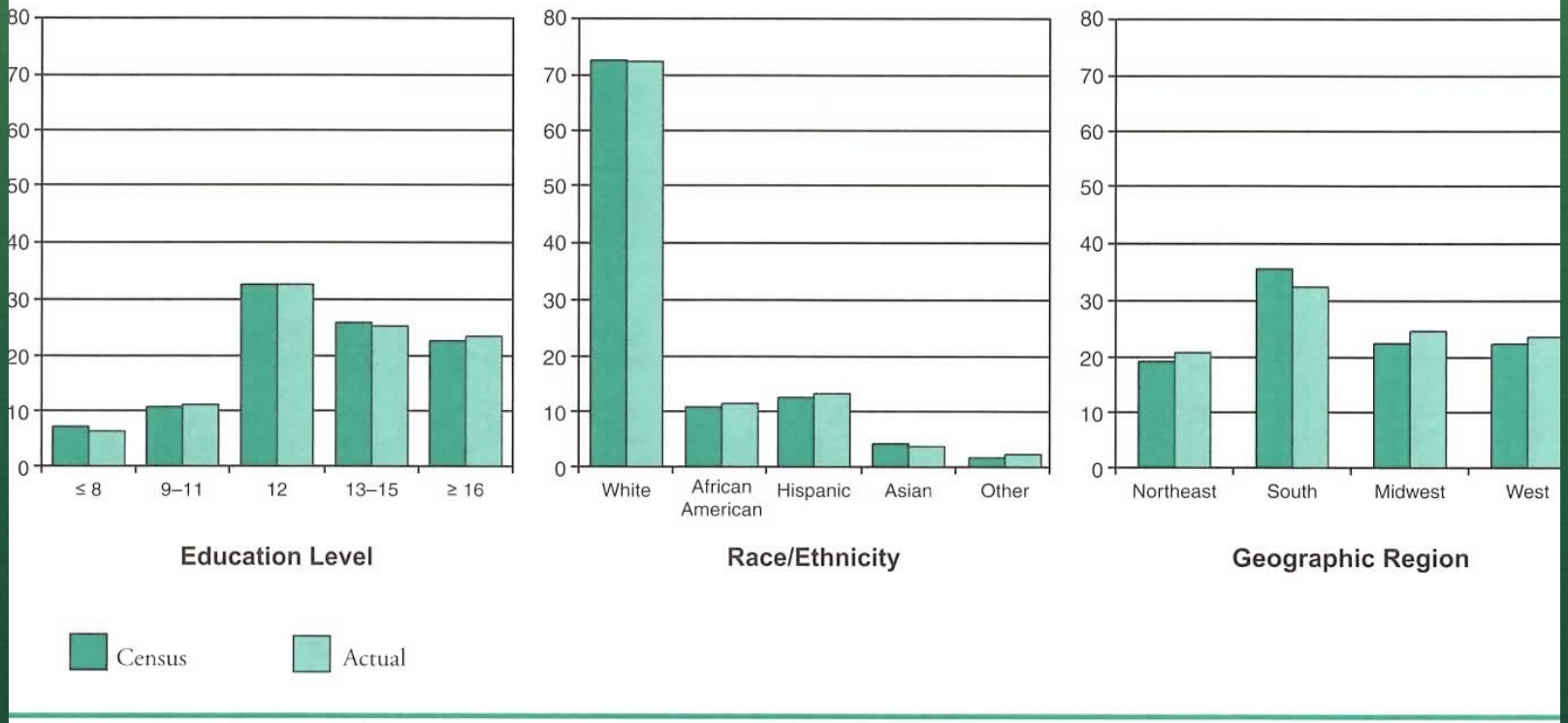


Figure 2.1 Normative Sampling Sites

Demographic Characteristics



ure 2.2 Demographic Characteristics of the Normative Sample Compared to the U.S. Population

Reliability

Internal Consistency Reliability

- Calculated using split-half and alpha methods
- Stability coefficients were used on subtests for which Internal Consistencies were not appropriate

Index	Average r (Ages 16-69)	Average r (Ages 65-90)
Auditory Memory	.95	.95
Visual Memory	.96	.97
Visual Working Memory	.93	
Immediate Memory	.95	.95
Delayed Memory	.94	.92

Test-Retest Reliability

- Adult Battery Indexes: .77-.95 (VWMI = .29)
- Older Adult Battery Indexes: .69-.88

Content Validity

- Ensure that the items included in the WMS-IV adequately sample the domains of memory functioning
- Comprehensive literature and expert reviews were used to evaluate content validity
- Using an expert panel, modifications were made if necessary

Construct Validity

Using Factor-Analytic Studies

- Model 1 = Visual memory, Auditory Memory
- Model 2 = Visual Memory, Visual Working Memory, Auditory Memory
- Adjusted Goodness of Fit Index (AGFI) : should be greater than .90 or .95
- Root Mean Squared Error of Approximation (RMSEA) : .05 or less is a close model fit and up to .08 represent adequate model fit with reasonable errors
- Tucker-Lewis nonnormed fit index (TLI) : Two-factor model returns slightly better TLI values than Three-factor model

Construct Validity

Table 4.4 Normative Sample Goodness-of-Fit Statistics for Confirmatory Factor Analysis

Model	Goodness-of-Fit Index				
	x^2	*df*	AGFI	RMSEA	TLI
Adult					
Ages 16–24 (*n* = 300)					
Model 1	2.62	8	.992	.000	1.000
Model 2	1.50	6	.994	.000	1.000
Ages 25–44 (*n* = 300)					
Model 1	12.68	8	.963	.044	0.977
Model 2	9.85	6	.960	.046	0.975
Ages 45–69 (*n* = 300)					
Model 1	12.05	8	.966	.041	0.977
Model 2	10.65	6	.958	.051	0.965
Overall 16–69 (*n* = 900)					
Model 1	18.54	8	.982	.038	0.982
Model 2	17.11	6	.977	.045	0.975

Concurrent Validity

- Examines the relationship between the WMS-IV test scores and other measures.
- WMS-IV Indexes to WISC-IV FSIQ = ..49-.68
- WMS-IV Indexes to WAIS-III FSIQ = .58-.67

Test Kit

Test Structure

Five Index Scores:

- Auditory Memory (AMI)
- Visual Memory (VMI)
- Visual Working Memory (VWMI)
- Immediate Memory (IMI)
- Delayed Memory (DMI)

Seven Subtests:

- Logical Memory
- Verbal Paired Associates
- Designs
- Visual Reproduction
- Spatial Addition
- Symbol Span

Also included is a Brief Cognitive Status Exam

Test Structure

- **Auditory Memory (AMI)** = ability to remember orally-presented information
- **Visual Memory (VMI)** = ability to remember visually-presented information
- **Visual Working Memory (VWMI)** = capacity to remember and manipulate visually-presented information in short-term memory storage
- **Immediate Memory (IMI)** = ability to remember both visually- and orally-presented information immediately after it is presented
- **Delayed Memory (DMI)** = ability to remember both visually- and orally-presented information after a 20-30 minute delay.

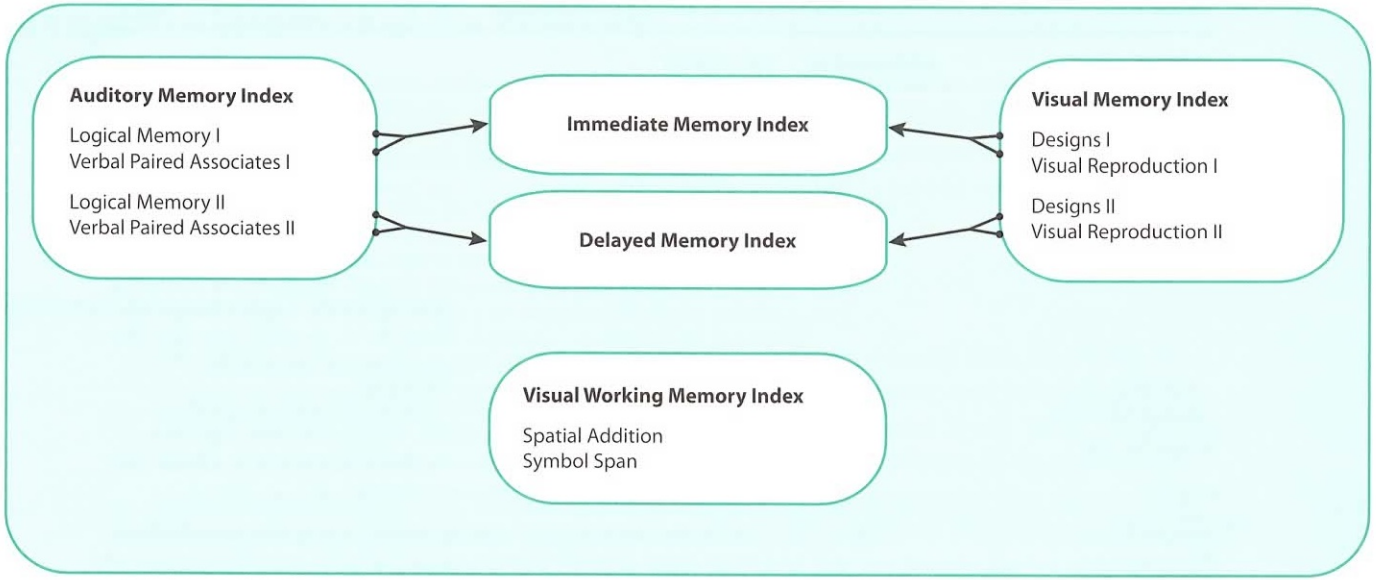


Figure 1.1 Test Framework of the WMS–IV: Adult Battery

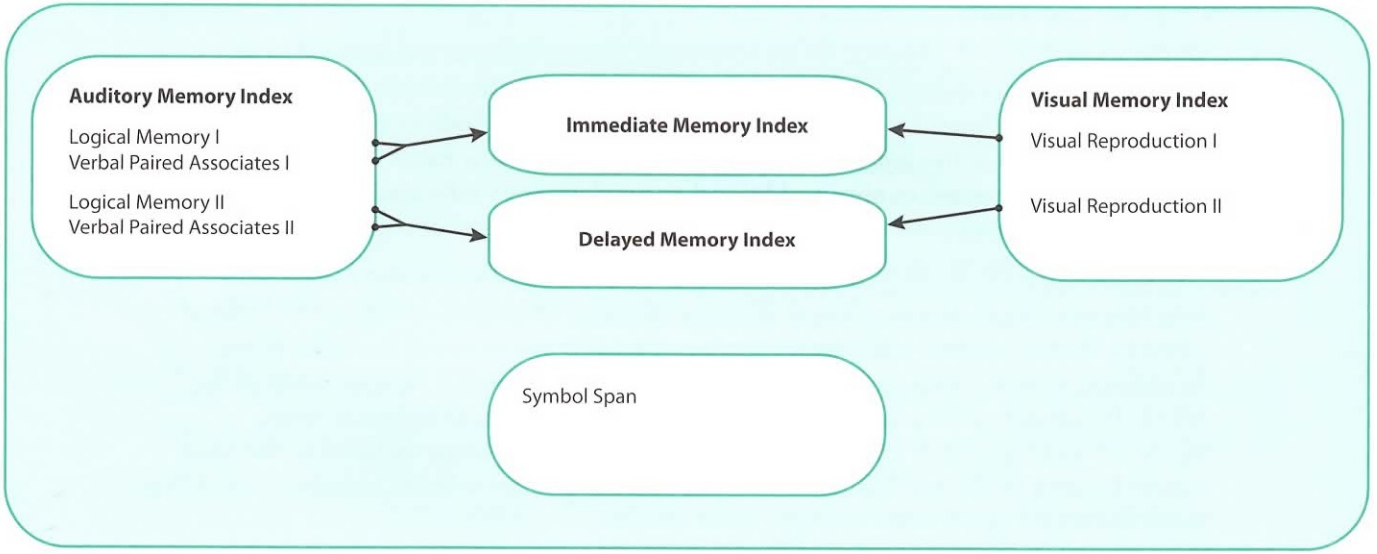


Figure 1.2 Test Framework of the WMS–IV: Older Adult Battery

Types of Scores

- Primary Subtest Scaled Scores

  (mean = 10, sd = 3; range = 1-19)

- Index Scores

  (mean = 100, sd = 15; range = 40-160)

- Process Scores

- Contrast Scaled Scores
  - Answers hypothesis about an examinee's performance relative to his/her performance on other measures.

Diagnostic Use

- Alzheimer's Disease
- Mild Cognitive Impairment
- Major Depression
- Traumatic Brain Injury
- Right and Left Temporal Lobectomy
- Schizophrenia
- ADHD
- Reading Disorder
- Mathematics Disorder
- Autism
- Intellectual Disability

With any Memory Concerns!
☺

Literature Review

When compared to the WMS-III single factor solution, Hoelzle (2011) found that the WMS-IV factor structure is multidimensional and reflects important auditory and visual memory. Findings show that the "WMS-IV is an improved, useful instrument to evaluate auditory and visual memory" (Hoelzle, 2011).

Carlozzi, Grech, Tulsky (2013) describes the WMS-IV as "a valid tool for evaluating memory functioning in individuals with TBI" (p. 913).

Miller, Davison, Schindler, and Messier (2011) published a study evaluating the factor analysis of the WAIS-IV and WMS-IV. Although they found their scaled scores for subtests were relatively close to the published norms, they discussed the "need for new, independent samples to be collected and compared against the normative one" (Miller et all., 2013).

Personal Review & Impression

- Short and easy to administer
- All instructions in stimulus books
- WMS-IV evaluates memory within different contexts (visual, auditory, etc.)
- Uses Wechsler format that we are all familiar with, including Start Points, Discontinues and Reversal Rules
- Must be familiar with administration, as unfamiliarity and unclear instructions could affect how well the examinee remembers and is able to perform task
- Designs subtest uses a lot of cards, but it is easy to administer if you keep the design cards organized.
- Spatial addition is the most difficult subtest to administer

Subtest Descriptions

Brief Cognitive Status Exam

This optional subtest assesses a variety of cognitive functions. The examinee performs simple tasks in a number of different areas including:

- Orientation to time,
- Mental control,
- Clock drawing,
- Incidental recall,
- Automatically and inhibitory control, and
- Verbal production.

Logical Memory

- Assesses narrative memory
- Logical Memory I
  - Two short stories are presented orally
  - For older adults, one story is presented twice
  - The examinee is asked to retell each story from memory immediately after hearing it.
- Logical Memory II
  - Examinee is asked to retell both stories
  - Asked yes/no questions about both stories

Verbal Paired Associates

- Assesses verbal memory for associated word pairs.
- Verbal Paired Associates I
  - Examiner reads 10 or 14 word pairs
  - Then examiner reads first word of each pair, and asks examinee to provide the corresponding word
- Verbal Paired Associates II
  - Examiner provides first word and examinee provides corresponding word
  - Examinee is read a list of word pairs and asked to identify if the word pair is one they already heard or a new word pair.
  - During the optional word recall task, examinee is asked to say as many of the words from the pairs as he or she can recall.

Visual Reproduction

Assesses memory for nonverbal visual stimuli

Scoring Templates are used for scoring.

- Visual Reproduction I
  - A series of 5 designs is shown, one at a time, for 10 seconds each
  - After each design is presented, the examinee is asked to draw the design from memory.
- Visual Reproduction II
  - First, examinee is asked to draw designs, from memory, in Visual Reproduction I
  - Second, examinee examinee is asked to choose which of six designs on a page match the original design
  - Third, for an optional copy task, the examinee is asked to draw designs while looking at them.

Designs

Assesses spatial memory for unfamiliar visual material

- Designs 1
  - Examiner shows examinee a grid with 4-8 designs ona page for 10 seconds, then removes the page from examiner view.
  - Examinee then selects the design from a set of cards and places the cards in a grid in the same place as shown.
- Designs 2
  - Examinee is asked to recreate the pages shown earlier with the cards and grid.
  - Then he or she is shown a series of grids and asked to select the two designs that are correct and in the same place as on the pages shown in Design 1

Spatial Addition (ages 16-69)

Assesses visual-spatial working memory using a visual addition task.

- Examiner shows examinee, sequentially, two grids with blue and red circles.
- Then examinee is asked to add or subtract the location of the circles based on a set of rules.

Symbol Span

Assesses visual working memory using novel visual stimuli.

- Examinee is briefly shown a series of abstract symbols on a page and then asked to select the symbols in an array of symbols, in the same order that they were presented on the previous page.

References

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