



# Equitable Assessment of Gifted Students: Choose Wisely

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# Naglieri's Nonverbal Tests: 1985 to Present

## ➤ First and Second Versions



MAT Short and Expanded Forms 1985

- The goal was to provide efficient ways to evaluate *general ability* for ALL students and especially “intellectually gifted children from disadvantaged backgrounds (Naglieri, 1985, p. 3).”
- Two options: The MAT: Expanded Form for individual and the MAT: Short Form for group administration.

### Validity Results:

1. Males Females differences were trivial (< 1 point) on MAT:EF (452) & MAT:SF (N = 2,636)
2. Differences by Race were trivial (< 1 point) on MAT:EF (N = 110) and MAT:SF (N = 672)
3. MAT:SF correlations with reading and math achievement were substantial across grades K-12 (N = 3,022)

# Naglieri's Nonverbal Tests: 1985 to Present

## ➤ Research on Six Versions of the Naglieri Nonverbal Tests

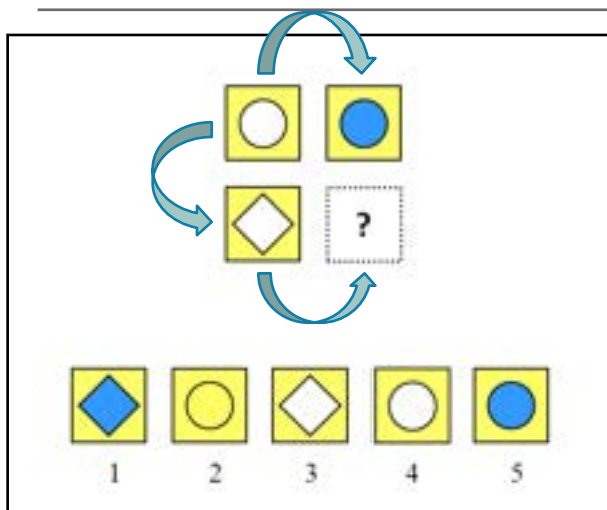


MAT Short and Expanded Forms 1985    Naglieri Nonverbal Ability Test 1997    NNAT-Individual, 2003    NNAT-2 2008    NNAT3 2016

Each of these versions of the NNAT showed similar scores by RACE, ETHNICITY, & SEX and had strong correlation with achievement

This research convinced me that measuring intelligence using test questions that measured how well a student can think was a valid and equitable way to measure general intelligence ‘g’.

## Which Tests Measure Thinking or Knowing?



Girl is woman as  
boy is to \_\_\_\_\_?

3 is to 6 as  
4 is to \_\_\_\_\_?

C<sup>7</sup> is to F as  
E<sup>7</sup> is to \_\_\_\_\_?

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I realized that we should  
measure intelligence in a  
way that was not  
dependent on knowledge

My career as a test developer  
began with this goal



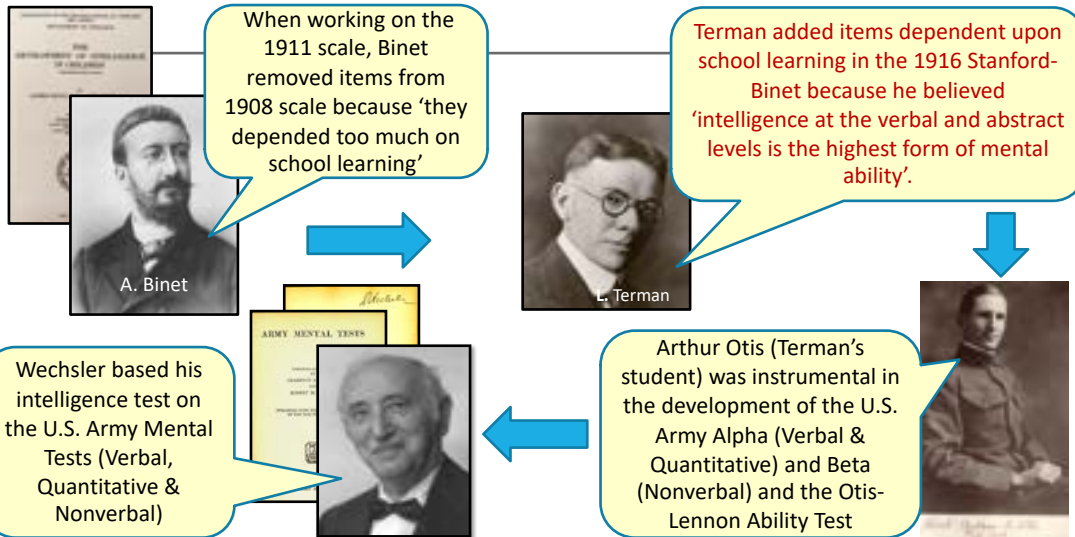
# Why do we measure intelligence the way we do?

## The History of IQ tests



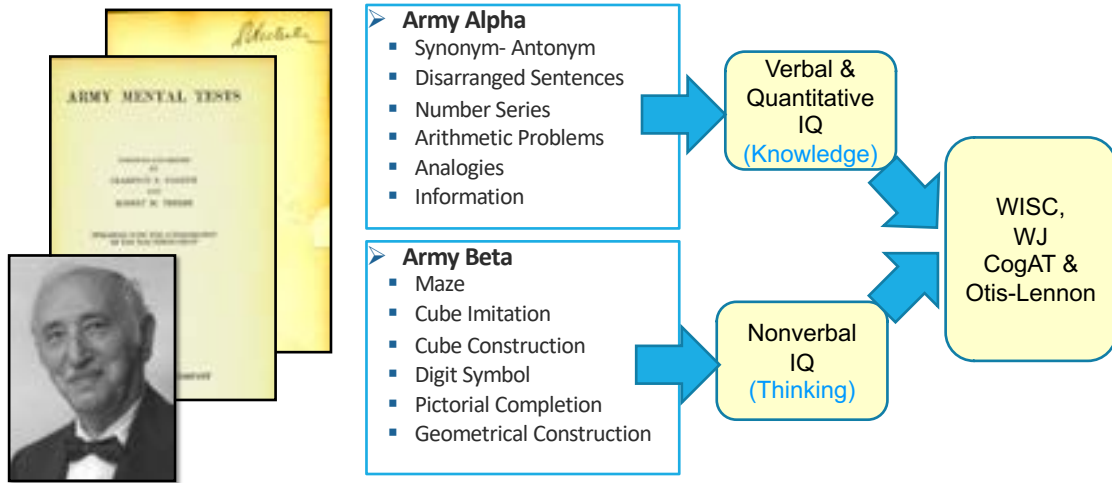
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### Binet → Stanford-Binet → Army Mental Tests → WISC, CogAT, Olsat



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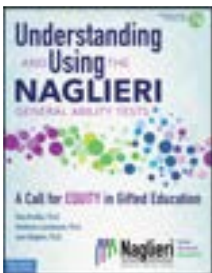
# Alpha & Beta → Wechsler



# Knowledge is Included in “Ability” Tests

Stanford-Binet-5	WISC-V	WJ-IV	KABC-II	OLSAT	CogAT
<ul style="list-style-type: none"> <li>• Verbal</li> <li>• Knowledge</li> <li>• Quantitative Reasoning</li> <li>• Vocabulary</li> <li>• Verbal Analogies</li> </ul>	<ul style="list-style-type: none"> <li>• Verbal Comprehension</li> <li>• Vocabulary, Similarities, Information &amp; Comprehension</li> <li>• Fluid Reasoning</li> <li>• Figure Weights, Arithmetic</li> </ul>	<ul style="list-style-type: none"> <li>• Comprehension</li> <li>• Knowledge: Vocabulary &amp; General Information</li> <li>• Fluid Reasoning: Number Series &amp; Concept Formation</li> <li>• Auditory Processing: Phonological Processing</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge / GC</li> <li>• Riddles,</li> <li>• Expressive Vocabulary,</li> <li>• Verbal Knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Verbal</li> <li>• Following directions</li> <li>• Verbal Reasoning</li> <li>• Quantitative</li> <li>• Verbal Arithmetic Reasoning</li> </ul>	<ul style="list-style-type: none"> <li>• Verbal Scale</li> <li>• Analogies</li> <li>• Sentence Completion</li> <li>• Verbal Classification</li> <li>• Quantitative</li> <li>• 45 pages of oral instructions</li> </ul>

## Race and Ethnic Differences for Traditional and Second-Generation Ability Tests



Note: Even though traditional intelligence tests may not show psychometric bias (Worrell, 2019) the large mean score differences suggest they are unfair (Brulles, et al., 2022).

From: Brulles, D., Lansdowne, K. & Naglieri, J. A. (2022). Understanding and Using the Naglieri General Ability Tests: A Call to Equity in Gifted Education. Minneapolis, MN: Free Spirit Publishing.

Race and Ethnic Standard Score Differences Across Intelligence Tests	By Race	By Ethnicity
<b>Tests that require knowledge</b>	<b>Mn = 11.5</b>	<b>Mn = 9.2</b>
Otis-Lennon School Ability Test (distric wide)	13.6	
Stanford-Binet IV (normative sample)	12.6	
WISC-V (normative sample)	11.6	
WI- III (normative sample)	10.9	10.7
CogAT7 (Nonverbal scale)	11.8	7.6
WISC-V (statistical controls normative sample)	8.7	
<b>Tests that require minimal knowledge</b>	<b>Mn = 4.1</b>	<b>Mn = 2.6</b>
K-ABC (normative sample)	7.0	
K-ABC (matched samples)	6.1	
CAS-2 (normative sample)	6.3	4.5
CAS (statistical controls normative sample)	4.8	4.8
CAS-2 (statistical controls normative sample)	4.3	1.8
CAS-2 Brief (normative samples)	2.0	2.8
NNAT (matched samples)	4.2	2.8
Naglieri General Ability Test-Verbal	2.2	1.6
Naglieri General Ability Test-Nonverbal	1.0	1.1
Naglieri General Ability Test-Quantitative	3.2	1.3

Notes: The results summarized here were reported for the Otis-Lennon School Ability Test by Avant and O'Neal (1986); Stanford-Binet IV by Wasserman (2000); Woodcock-Johnson III race differences by Edwards & Oakland (2006) and ethnic differences by Sotelo- Dynega, Ortiz, Flanagan & Chaplin (2013); CogAT7 by Carman, Walther and Bartsch (2018); WISC-V by Kaufman, Raiford & Coalson (2016); Kaufman Assessment Battery for Children-II by Lichenberger, Sotelo- Dynega and Kaufman (2009); CAS by Naglieri, Rojahn, Matto & Aquilino (2005); CAS-2 and CAS2-Brief by Naglieri, Das & Goldstein, 2014; Naglieri Nonverbal Ability Test by Naglieri and Ronning (2000), and Naglieri General Ability Tests by Naglieri, Brulles and Lansdowne (2021).

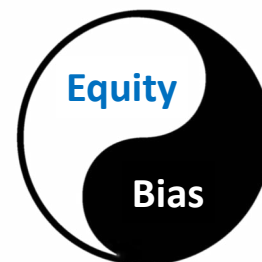
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## Test Bias vs Test Equity

According to the *Standards for Educational and Psychological Testing* (AERA, APA, NCME, 2014) Psychometric TEST BIAS and EQUITY are two different ways of measuring test fairness.



- ... if a person has had limited opportunities to learn the content in a test of intelligence, *that test may be considered unfair* (because it penalizes students for not knowing the answers) even if there is no evidence of psychometric test bias.
- Evidence of EQUITY is examined by test content and mean score differences

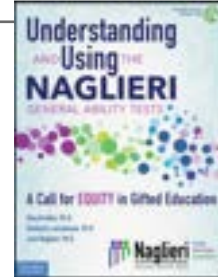


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# Numbers of Gifted Students Missed = 1,235,434

	N in Public Education K-12 in 2020	N Potentially Gifted (8%; 92 %tile)	N Students in gifted programs	Difference Between Potential and Identified
White	23,834,458	1,906,757	1,937,350	30,593
Black	7,754,506	620,360	330,774	-289,586
Hispanic	14,337,467	1,146,997	600,498	-546,499
Native American/ Alaska Native	484,766	38,781	27,712	-11,069
Two or More Races	1,641,817	131,345	105,371	-25,974
<b>Total Non-Whites</b>	<b>24,218,556</b>	<b>1,937,484</b>	<b>1,064,355</b>	<b>-873,129</b>



873,129 +



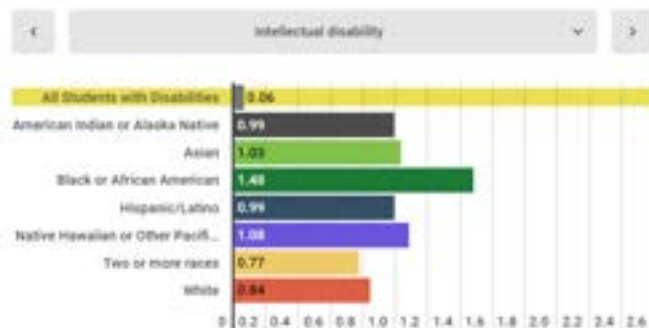
Percent of Schools that do not Identify	41.5%
Additional non-white gifted students = 41.5% of 873,129	N = 362,305
<b>Total non-white gifted students missed</b>	<b>N = 1,235,434</b>

**OSEP** Office of Special Education Programs  
Office of Special Education and Rehabilitative Services

**OSEP Fast Facts: Race and Ethnicity of Children with Disabilities Served under IDEA Part B**

For the purposes of this fact sheet, racial/ethnic groups are defined in the IDEA Part B Child Count and Educational Environments for School Year 2019-2020, OSEP Data Documentation. <https://www2.ed.gov/info/acts/osep08a918-data/collection/documentation/data-documentation/files/part-b-child-count-and-educational-environments/idea-partb-childcountandedenvironment-2019-20.pdf>

Risk Ratio of Students with Disabilities by Disability Category and by Specific Race and Ethnicity, Ages 5 (in kindergarten) through 21: SY 2019-20



The relative risk ratio of students with disabilities under IDEA by race and Ethnicity is the probability of a student with a disability being identified for intellectual disability. The higher the number, the larger the probability. Nationally, **Black Students are 1.48 times more likely to be identified with intellectual disability** compared to all students with disabilities.

<https://sites.ed.gov/idea/osep-fast-facts-race-and-ethnicity-of-children-with-disabilities-served-under-idea-part-b/>  
[https://ldaamerica.org/lda\\_today/disproportionate-identification-of-students-of-color-in-special-education/](https://ldaamerica.org/lda_today/disproportionate-identification-of-students-of-color-in-special-education/)

## Academic Learning Loss & COVID

- COVID-19 has increased the impact of disparities in access and opportunity for students of color and they are even further behind than they were before.
- Their **scores on traditional intelligence tests** which demand knowledge **are even more inaccurate**.
- **Solutions:**
  - For traditional tests, use post-COVID norms only.
  - Use intelligence tests that are not dependent upon knowledge



Education in a Pandemic: The Disparate Impacts of COVID-19 on America's Students. US Dept. of Ed- Office of Civil Rights. June, 21, 2021. <https://www2.ed.gov/about/offices/list/ocr/docs/20210608-impacts-of-covid19.p>

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## Measuring General Ability Equitably Using the Naglieri General Ability Tests: Verbal, Nonverbal and Quantitative (Naglieri, Brulles & Lansdowne, 2022)

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## *Naglieri General Ability Tests*



- We **explicitly made tests for equitable identification** of students from diverse cultural, linguistic, or socioeconomic backgrounds
- We used the traditional Verbal, Nonverbal and Quantitative formats to **measure general ability** and to ensure equity we used:
  - Test questions that do not require academic knowledge,
  - Verbal and Quantitative test questions that can be solved using any language,
  - Animated instructions remove the need for comprehension of directions,
  - A multiple-choice response removes the need for verbal expression.
  - Universal assessment using local and national norms

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## Naglieri General Ability Test – Verbal (Naglieri & Brulles, 2022)

The **Naglieri–V** measures general ability using pictures of objects representing verbal concepts. The items are comprised of universally recognized pictures that do not rely on knowledge acquired in academic settings.

The student's task is to identify which of the six pictures does *not* represent the verbal concept shared by the other five.

The test items require close examination of *the relationships among the pictures*.



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## Naglieri General Ability Test - Nonverbal (Naglieri, 2022)

The **Naglieri–NV** measures general ability using questions that require a student to recognize the relationships among the shapes.

The structure of the items varies, but all items require that the student decipher the logic behind *the relationships among the shapes*, sequences, spatial orientations, patterns, and other distinguishing characteristics.

This nonverbal test is conceptually similar to the NNAT3 but it contains many NEW kinds of items not included before.



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## Naglieri General Ability Test – Quantitative

(Naglieri & Lansdowne)

The Naglieri–Q **measures general ability** using numbers and/or symbols. Students must decipher the logic behind *the relationships among the numbers and symbols* to identify the answer.

Items require the student to determine equivalency of simple quantities, analyze a matrix of numbers and solve mathematical sequences,

Items require minimal academic knowledge, and the calculation requirements are simple.



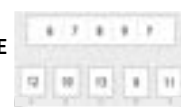
The items have no verbal requirements (i.e., no math word problems) so that they can be solved regardless of the language used by the student.



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## Research Evidence of Equity

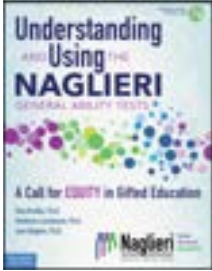
Selvamenan, M., Paolozza, A., Solomon, J., Naglieri, J. A., & Schmidt, M. T. (submitted for publication, Nov. 2020). Race, Ethnic, Gender, and Parental Education Level Differences on Verbal, Nonverbal, and Quantitative Naglieri General Ability Tests: Achieving Equity.

<b>NONVERBAL TEST</b> 	<b>VERBAL TEST</b> 	<b>QUANTITATIVE TEST</b> 
<ul style="list-style-type: none"> <li>N= 3,630 Sample closely matches the US population on key demographics</li> <li><b>No GENDER differences</b> found between <b>males</b> and <b>females</b> for raw score across all forms</li> <li><b>No RACE/ETHNICITY differences</b> among <b>White, Black, &amp; Hispanic</b> for raw score across all forms</li> <li><b>No PARENTIAL EDUCATIONAL differences</b> among five education levels (No high school diploma; High School graduate; Some college/Associate's degree; Bachelor's degree; Graduate/professional degree) for raw score across all forms</li> </ul>	<ul style="list-style-type: none"> <li>N= 2,482 Sample closely matches the US population on key demographics</li> <li><b>No GENDER differences</b> found between <b>males</b> and <b>females</b> for raw score across all forms</li> <li><b>No RACE/ETHNICITY differences</b> among <b>White, Black, &amp; Hispanic</b> for raw score across all forms</li> <li><b>No PARENTIAL EDUCATIONAL differences</b> among five education levels (No high school diploma; High School graduate; Some college/Associate's degree; Bachelor's degree; Graduate/professional degree) for raw score across all forms</li> </ul>	<ul style="list-style-type: none"> <li>N= 2,841 Sample closely matches the US population on key demographics</li> <li><b>No GENDER differences</b> found between <b>males</b> and <b>females</b> for raw score across all forms</li> <li><b>No RACE/ETHNICITY differences</b> among <b>White, Black, &amp; Hispanic</b> for raw score across all forms</li> <li><b>No PARENTIAL EDUCATIONAL differences</b> among five education levels (No high school diploma; High School graduate; Some college/Associate's degree; Bachelor's degree; Graduate/professional degree) for raw score across all forms</li> </ul>

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WE CAN DO

BETTER

We Must do Better

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**Naglieri** Verbal Nonverbal Quantitative  
General Ability Tests

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