



Equitable Assessment Using the Naglieri General Ability Tests: Verbal, Nonverbal and Quantitative

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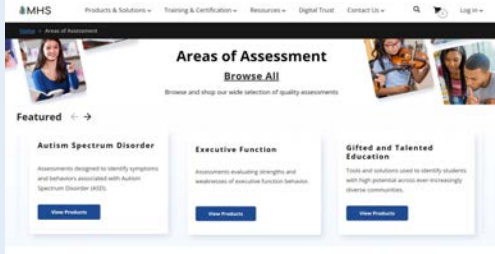



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Naglieri General Ability Tests
New Findings

Inequity in Gifted Testing

Achieving Equity



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Did you know...

- The origin of the most widely used intelligence tests?
- That the most widely used group and individual intelligence tests have lengthily verbal instructions, measure vocabulary and include Arithmetic word problems like those found on achievement tests?
- Does that feel right?

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Traditional IQ and Achievement Tests

- Working as a school psychologist in 1975 I noticed that items on the WISC we were VERY similar to parts of the achievement tests
 - The *Peabody Individual Achievement Test* (1970) had a General Information and Arithmetic subtests JUST LIKE THE WISC!
 - THAT DID NOT MAKE SENSE
 - In 1977 → UGA for Ph.D. With Alan Kaufman who said VIQ=achievement



1975 Charles Champagne Elementary, Bethpage, NY

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My Feelings - Confirmed

Teaching intellectual assessment to school psychology students at Northern Arizona University

Was it reasonable to measure 'intelligence' with questions that required knowledge?

Testing in Havasupai answered that question



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1981

Test Results and Interpretations

On the WISC-R, Ananda earned a **Performance IQ of 85.7** which falls in the average range of intelligence and at the 37th percentile rank in comparison to the children her age in the standardization sample. **In contrast to this score of average non-verbal intelligence was her Verbal IQ of 62.7.** This score is quite low and indicates that her level of **proficiency with the English language falls at about the 1st percentile rank. This score was NOT** considered an estimate of verbal intelligence because Ananda speaks mostly Hindi and little English. Due to the large difference between these scores, no Full Scale IQ was computed.

Within the WISC-R a clear pattern emerged: Ananda performed well on tasks that required little or no English language comprehension or expression, and poorly on all tasks which did require these linguistic skills. In fact, even if a task was visual and non-verbal, but required English language comprehension of instructions, she performed more poorly.

WISC-V Full Scale

Subtest	Raw Score	Standard Score	Percentile Rank
Block Design	18	85.7	37
Matrix Reasoning	15	75.0	15
Visual Spatial	12	60.0	5
Block Design	10	50.0	2
Block Design	8	35.0	1
Block Design	6	20.0	0
Block Design	4	5.0	0
Block Design	2	0.0	0

Naglieri, J. A. (1982). Does the WISC-R measure verbal intelligence for non-English speaking children? *Psychology in the Schools*, 19, 478-479.

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Naglieri's Nonverbal Tests: 1985 to Present

- Research on Six Versions of the Naglieri Nonverbal Tests

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

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

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'.

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Tests that Measure Thinking or Knowing?

Girl is woman as boy is to **man** ?

3 is to 6 as 5 is to **10** ?

C⁷ is to F as E⁷ is to **A** ?

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Why do we measure intelligence the way we do?

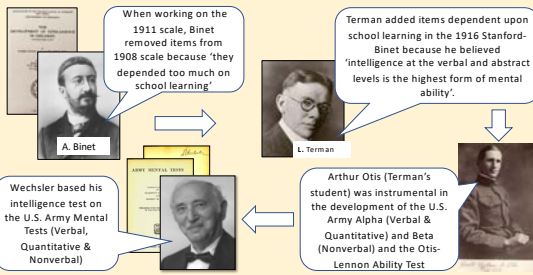


The History of IQ tests

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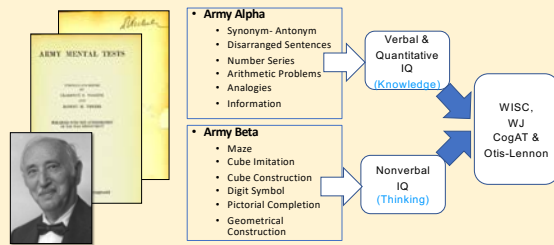
Binet → Stanford-Binet → Army Mental Tests → WISC, CogAT, Olsat



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Alpha & Beta → Wechsler



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Wechsler's View of General ability

- Wechsler "believed that his Verbal and Performance Scales represented different ways to access **g (general ability)**", but he never believed [in verbal and] nonverbal intelligence as being separate from g. Rather he saw the **Performance Scale as the most sensible way** to measure the general intelligence of people with ... limited proficiency in English. (Kaufman, 2008)

"The aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment (1939)"



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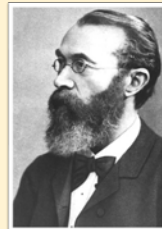
CONCEPT OF GENERAL INTELLIGENCE 61

The Criteria of a Test of Intelligence. — Influenced both by the theoretical discussion of general intelligence and by the empirical work of testing, we have arrived at certain requirements for a good test of intelligence, which we may discuss under the four following headings:

1. Tests must be relatively new. — A good intelligence test must avoid as much as possible anything that is commonly learned by the subjects tested. In a broad sense this rests upon a differentiation between knowledge and intelligence. To use as a test of intelligence something that is commonly taught in school is not desirable, because those children who have reached the particular grade in which this is generally taught have memorized this fact, whereas other children of equal or greater intelligence may have had no opportunity to learn this same fact, simply because they may not have reached this particular grade in their school work. To ask the question, "Who discovered America?" would be indicative of the school progress or general cultural environment of the child rather than of his general intelligence. Failure to answer might indeed be due to lack of intelligence in the case of school children of a certain grade in which this had been a matter of instruction, but on the other hand a very intelligent child might fail to answer owing to the fact of his not being in the grade in which this was taught.

Pintner (Intelligence Testing, 1923)

- This is a social justice issue for those from disadvantaged communities and those with limited education



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Knowledge is Included in "Ability" Tests

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

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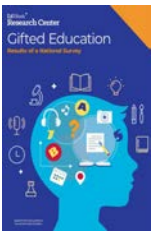
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What is the Practical Impact of intelligence tests that are confounded by knowledge?

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National Survey of Gifted Education




These tests have verbal and quantitative questions and lengthy verbal directions

Measurement	Percentage
CogAT	34%
Exceptional Intelligence Scale for Children	25%
Teacher/Parental Ability Tests	21%
Woodcock Johnson	20%
ITBS	22%
DISC-WISC	15%
Intelligence Assessment (Elementary Grades) - Stanford-Binet 4.4	13%
Test of Nonverbal Intelligence	11%
Stanford-Binet assessment	10%
ACT	9%
Elision Programmatic Matrix	7%
Test of Mathematical Ability of Gifted Students	5%
SAT	5%
MAP	2%
SSA	1%
Nonverbal Matrix	-1%
Other	42%

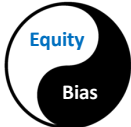
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Test Bias vs Test Equity

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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Academic Learning Loss & COVID

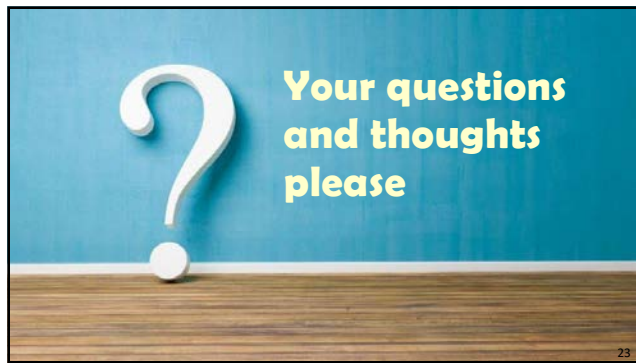
- COVID-19 has increased the impact of disparities in access and opportunity for students of color and they are even further behind than they were before.
- Their **scores on traditional intelligence tests** which demand knowledge are **even more inaccurate**.
- **Solutions:**
 - For traditional tests, 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_e

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The Naglieri General Ability Tests: Verbal, Nonverbal and Quantitative


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2016 – 2022 Developmental Process

Naglieri General Ability Tests  Verbal
Nonverbal
Quantitative

- 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** using:
 - 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.
 - Online (and paper) administration for group or individual assessment
 - Universal assessment using local and national norms

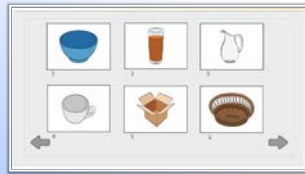
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The Naglieri-V measures general ability using pictures of objects representing verbal concepts. The items are comprised of universally recognized pictures that do not rely on knowledge acquired in academic settings.

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*.



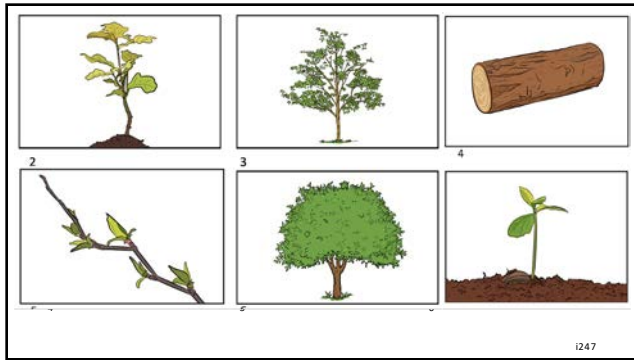
Naglieri General Ability Test – Verbal (Naglieri & Brulles)

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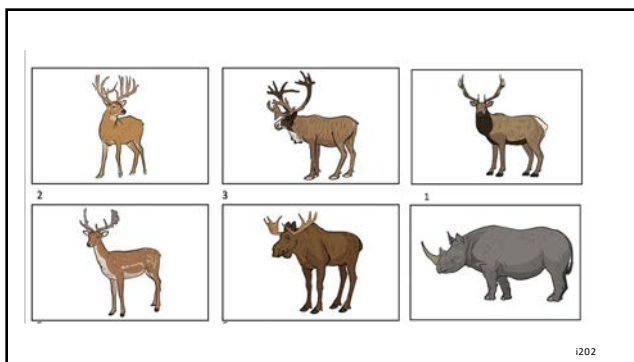


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The Naglieri-NV measures general ability using questions that require a student to recognize the relationships among the shapes.

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.

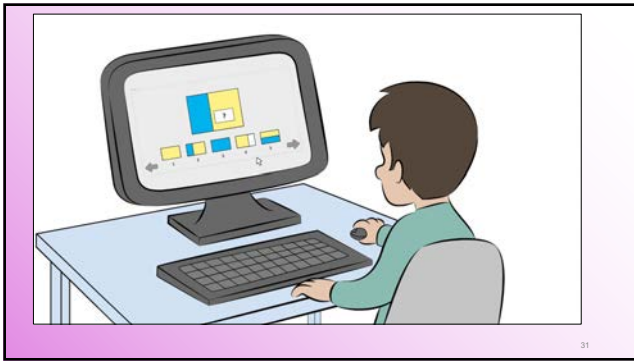
This nonverbal test is conceptually similar to the NNAT3 but it contains many NEW kinds of items not included before.



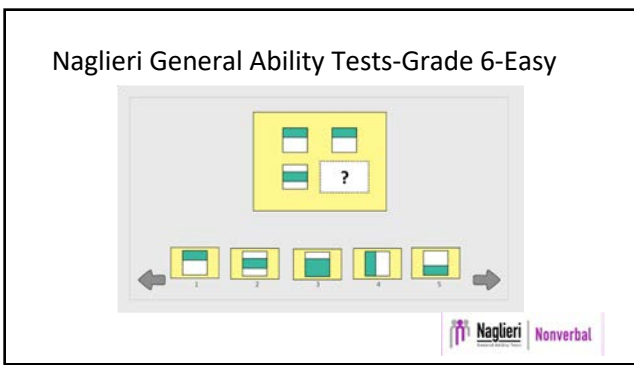
Naglieri Nonverbal
General Ability Test

Naglieri General Ability Test – Nonverbal (Naglieri)

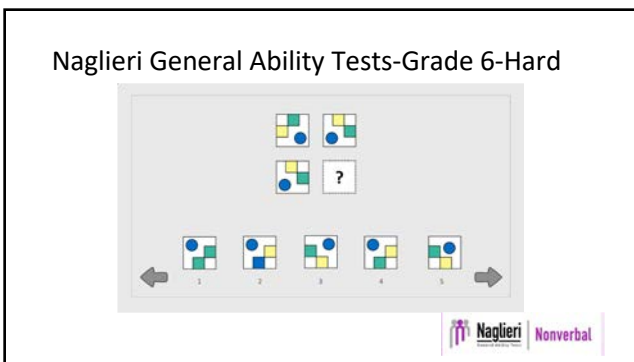
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The Naglieri-Q measures general ability using numbers and/or symbols. Students must decipher the logic behind the relationships among the numbers and symbols to identify the answer.

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.



Naglieri Quantitative
General Ability Test


*Naglieri General Ability Test – Quantitative
(Naglieri & Lansdowne)*

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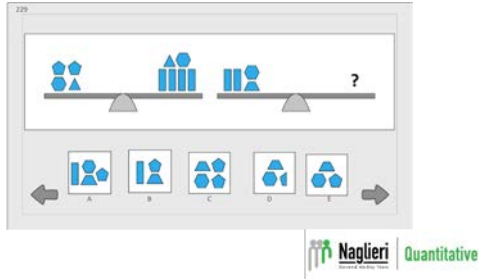
Naglieri General Ability Tests-Grade 1-Easy



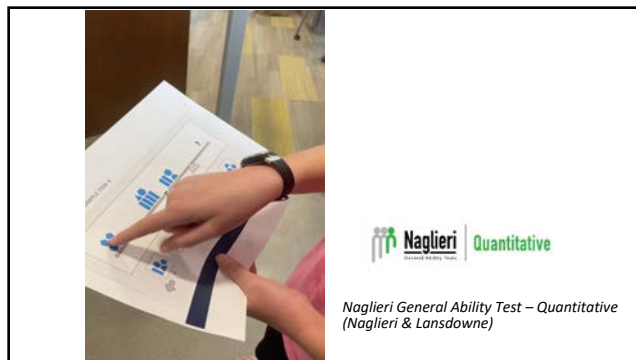
Naglieri Quantitative
General Ability Test

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Naglieri General Ability Tests-Grade 1-Hard



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Research Evidence of Equity

Schwamm, M., Pasolunza, 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.

NONVERBAL TEST	VERBAL TEST	QUANTITATIVE TEST
<ul style="list-style-type: none"> No 3,630 Sample closely matches the US population on key demographics No GENDER differences found between males and females for raw score across all forms No RACE/ETHNICITY differences among White, Black, & Hispanic for raw score across all forms No PARENTIAL EDUCATIONAL differences 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 	<ul style="list-style-type: none"> No 2,482 Sample closely matches the US population on key demographics No GENDER differences found between males and females for raw score across all forms No RACE/ETHNICITY differences among White, Black, & Hispanic for raw score across all forms No PARENTIAL EDUCATIONAL differences 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 	<ul style="list-style-type: none"> No 2,841 Sample closely matches the US population on key demographics No GENDER differences found between males and females for raw score across all forms No RACE/ETHNICITY differences among White, Black, & Hispanic for raw score across all forms No PARENTIAL EDUCATIONAL differences 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

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Group Differences by Primary Language Spoken

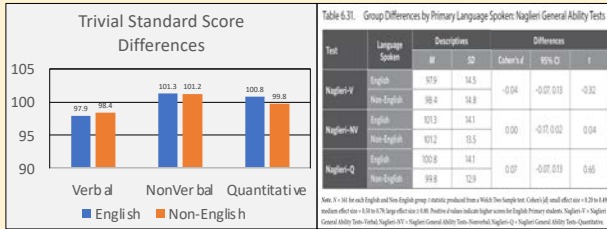


Table 6.31. Group Differences by Primary Language Spoken: Naglieri General Ability Tests

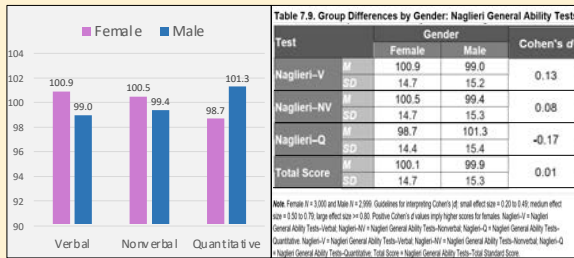
Test	Language Spoken	Descriptives		Differences		
		M	SD	Cohen's d	95% CI	r
Naglieri-V	English	97.9	14.5	-0.04	[-0.07, 0.03]	-0.32
	Non-English	98.4	14.8			
Naglieri-NV	English	101.3	14.1	0.00	[-0.07, 0.02]	0.04
	Non-English	101.2	15.5			
Naglieri-Q	English	100.8	14.1	0.07	[-0.07, 0.13]	0.45
	Non-English	99.8	12.9			

Note. N = 36 for each English and Non-English group. Metrics produced from a Welch Two-Sample t-test. Cohen's d, small effect size = 0.20 to 0.40; medium effect size = 0.50 to 0.70; large effect size = 0.80. Positive Cohen's d values imply higher scores for English Primary students. Naglieri-V = Naglieri General Ability Tests-Verbal; Naglieri-NV = Naglieri General Ability Tests-Nonverbal; Naglieri-Q = Naglieri General Ability Tests-Quantitative.

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Female (N = 3,000) Male (N = 2,999) Differences



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National and Local Norms

National Norms

- Established norms are established using a large sample of students who represent the general population, including all 50 states, the District of Columbia, and territories and possessions. These norms are used as a benchmark to determine what performance is typical within other national groups.
- Use national norms when:
 - You wish to compare the national demographics.
 - You are looking to identify the top percent of the population.
 - You are interested in how your students compare to other students who were part of the national norming.

Local Norms

- Local norms allow you to compare performance to students in your own district rather than comparing to students from other districts. This method of norming allows you to compare your group directly against other local groups who were part of the norming process.
- Use local norms when:
 - You are looking for more information about the local population.
 - You are interested in how your students compare to other students in your district.
 - You are looking to identify the top percent of the population.
 - You are looking to identify the top percent of the population.
 - You are looking to identify the top percent of the population.

Equity in Gifted Identification

Gifted and talented students are not evenly distributed across all demographics. Identification of gifted programs can be made more equitable when we use local norms to compare students to other students in their own district. The use of local norms allows us to identify students who are gifted and talented within their own district.

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POST COVID National Norms

Grade-based National Norms 1,000 students pre grade (K to grade 5).

Table 1. National Norm Sample Characteristics.

Demographic	N	%	U.S. Census (%)	Difference (%)	
Race/Ethnicity	Asian	235	3.9	4.7	-0.8
	Black	919	15.3	12.9	2.4
	Hispanic	1,261	21.0	23.3	-2.3
	White	2,914	48.6	46.1	2.5
	Other	671	11.2	12.9	-1.7
U.S. Region	Northeast	804	13.4	15.9	-2.5
	Midwest	1,270	21.2	20.2	1.0
	South	2,328	38.8	38.1	0.7
	West	1,598	26.6	25.7	0.9
Total National Norm Sample	6,000	100.0			

Note: U.S. population derived from the 2019 American Community Survey.*

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How do *different* tests use the *same* ability?

- Even though the tests have different content (shapes, words, numbers) they all rely on **general ability ('g')**
- They all require understanding relationships among things or ideas

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The test you choose determines the results you receive, the decisions you make, and the future of your students

That is the *Practical Impact* of test selection

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Summary: Equitable Assessment of Intelligence

- **Equitable evaluation of intelligence** demands test questions that can be solved regardless of the amount of academic knowledge and facility with language a student has
- We have shown that
 - General ability (*g*) can be **measured equitably** across Verbal, Quantitative and Nonverbal content if the tests do not require academic knowledge
- Verbal, Quantitative and Nonverbal are a **description of the content of the tests'** questions **NOT** different types of intelligence
- Equitable tests measure THINKING in a manner that is minimally influenced by KNOWING

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We do the best we can with what we know, and when we know better, we do better.
— Maya Angelou —

Change Demands Courage to Think Differently

Socially just identification of gifted students requires self-reflection and self-correction in response to current research

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QUESTIONS

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Maybe It's Time to Let the Old Ways Die

Thank You !

NYASP 2022
Legends in School
Psychology
Award
Interview

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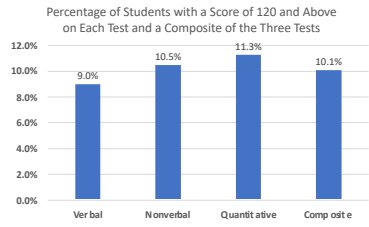
Advanced Interpretive Considerations

- The suite of Naglieri General Ability tests is composed of three separate tests designed to measure "general ability, or g"
- The three tests use questions that have different content- Verbal, Nonverbal and Quantitative and different authors.
- This provides MULTIPLE measures of general ability and 3 TOTAL SCORES
- We examined how many students in the normative sample would be identified if various combinations of the three tests were given.
- The question: "How many students had a score of, for example 120 (91st percentile) on one, two or all three of these tests.

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How many students were found (top 10%)



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