What I Learned about Intelligence Testing over 50 Years as a School Psychologist: From ID to Gifted

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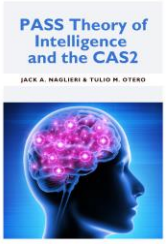
Disclosures

Executive Function | SEL & Impairment | Autism | Gifted Identification | PASS Neurocognitive Theory: Assessment & Intervention Handouts

FOR MORE INFORMATION PLEASE GO TO MY WEB PAGES

PASS Theory and CAS2 Information



The goal of this e-book is to describe the context in which the PASS Theory of Intelligence was conceived and explain why it guided the construction of the Cognitive Assessment System and its various versions, and the second edition.

Download Free E-Book

Free CAS2 Access for Univ Professors

Neurodiversity Podcast

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The WHY behind What I Learned

- I will explain how my study of psychology shaped my view of the concept of intelligence and the tests we use to measure it.
- My emphasis has always been to rely on the research evidence – **the science**
- My goal: improve outcomes for the students

- Today I ask that you look closely at the science I will share and reflect on how **WE CAN DO BETTER** for the students we are trying to help.
- As Charles Barrett says: It's all about the kids!

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What I Learned – The BIG Picture

- The comprehensive assessments we provide alter the course of a student's life; making this one of the most important tasks we have.
- We need Intellectual assessment that
  - Informs teachers and students about academic strengths & weaknesses and interventions
  - Helps us understand cognitive variability and diagnosis SLD, ADHD, ID, etc.
  - Helps us understand WHY a student fails
  - Is fair for students from diverse populations
- These goals can be achieved if we use second-generation tests that measure the way students THINK to LEARN
  - The definition of THINKING should be based on BRAIN function
  - PASS theory is a way of defining THINKING and the Cognitive Assessment System-2nd Edition measures a student's neurocognitive abilities

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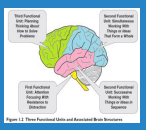
What I Learned



From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

My Professional Journey
- I Learned About Traditional Intelligence Tests

A Theory Based on Brain Function
- I Learned a New Way to Measure Intelligence

From PASS to CAS2
- I Learned the Power of PASS

Research Update
- I Learned the Science of Intelligence Testing

Introduction

- Teaching guitar made me wonder about learning
- Interest in intelligence and instruction

Getting Started in School Psychology

1970

1973

- In **1972 I learned about A. R. Luria** in my Neuropsychology of Learning Disabilities course.
- Luria's neuropsychological work was gaining international attention
- As much as I liked Luria's description of brain function **there was no way to measure his concepts of the functional units** so what did I do?

Traditional IQ and Achievement Tests

- Working as a school psychologist in 1975 I used the WISC
- I noticed that items on the WISC we were VERY similar to items on the achievement test
  - General Information, Vocabulary and Arithmetic subtests JUST LIKE THE WISC!
  - **THAT DID NOT MAKE SENSE**
  - **I applied to Ph.D. programs**

1975 Charles Champagne Elementary, Bethpage, NY

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A Pivotal Event That Changed my Life

1976

1977

Years later I received the University of Georgia ***Lifetime Achievement Award***

2022

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1977-1979 University of Georgia

- I worked with the Kaufmans to develop the KABC using the research described by Das, et al book
- Kaufman suggested that the Verbal scale of the WISC-R could be conceptualized **as achievement**
- I reviewed Mercer's book *Labeling the Mentally Retarded* (1973)
  - She stated that intelligence tests should **measure the processes involved in learning** rather than culture specific **accumulation of knowledge**.
- In 1978 I wrote that "**A test of intellectual ability based upon a theory of processing rather than acquired knowledge may prove to be the next step toward improved assessment of intelligence**." Feb 11, 1984

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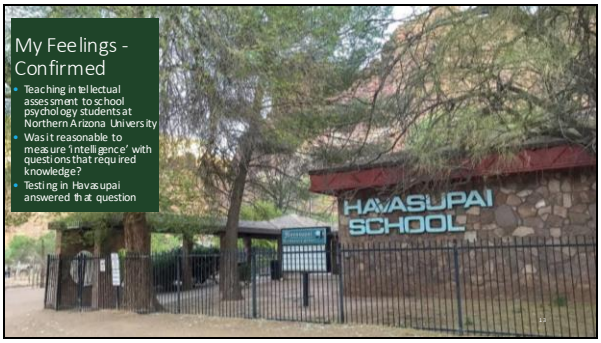
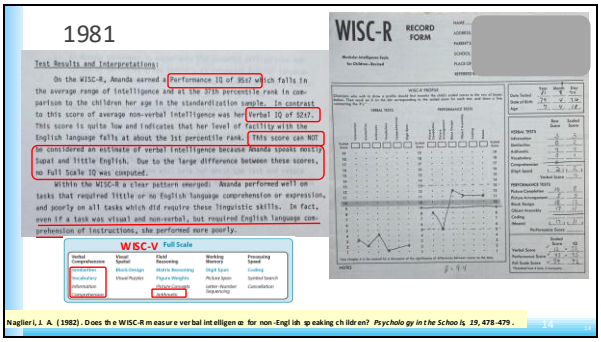
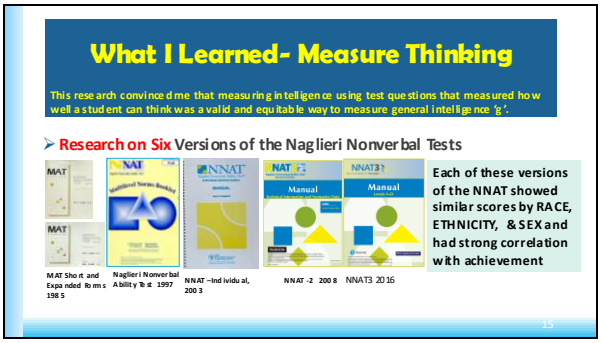

My Feelings - Confirmed
Teaching intellectual assessment to school psychology students at Northern Arizona University
Was it reasonable to measure 'intelligence' with questions that required knowledge?
Testing in Havasupai answered that question
HAVASUPAI SCHOOL

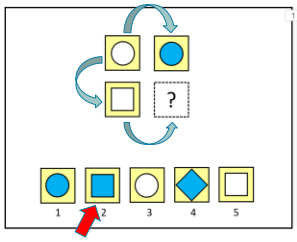

1981
Test Results and Interpretations:
On the WISC-R, Ananda earned a Performance IQ of 85±7 which falls in the average range of intelligence and at the 37th percentile rank in comparison to the children her age in the standardization sample. In contrast to this score of average non-verbal intelligence was her Verbal IQ of 62±7. This score is quite low and indicates that her level of facility with the English language falls at about the 1st percentile rank. This score can NOT be considered an estimate of verbal intelligence because Ananda speaks mostly Supai 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
WISC-R RECORD FORM
Naglieri, J. A. (1982). Does the WISC-R measure verbal intelligence for non-English speaking children? Psychology in the Schools, 19, 478-479.


What I Learned- Measure Thinking
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'.
Research on Six Versions of the Naglieri Nonverbal Tests
MAT
NNAT
Manual
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
NNAT –Individual, 2003
NNAT-2 2008
NNAT3 2016

My research on the NNAT led me to realize that we should measure Thinking not knowing

My career as a test developer began with this goal and the Matrix Analogies Test

Tests that Measure Thinking or Knowing?



Girl is woman as boy is to man ?

3 is to 9 as 4 is to 16 ?

C^7 is to F as E^7 is to A ?

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My Intelligence Tests Measure Thinking not Knowing

Traditional Tests

1. Naglieri, J.A. (1985). ***Matrix Analogies Test*** - *Expanded Form*. San Antonio: The Psychological Corporation.
2. Naglieri, J.A. (1985). ***Matrix Analogies Test - Short Form***. San Antonio: The Psychological Corporation.
3. Naglieri, J.A. (1997). ***Naglieri Nonverbal Ability Test***. San Antonio, TX The Psychological Corporation.
4. Naglieri, J.A., & Bardos, A. N. (1997). ***General Ability Scale for Adults*** San Antonio, TX Pearson.
5. Naglieri, J.A. (2003). ***Naglieri Nonverbal Ability Test - Individual Form***. San Antonio, TX Pearson.
6. Wechsler, D., & Naglieri, J.A. (2006). ***Wechsler Nonverbal Scale of Ability***. San Antonio, TX Pearson.
7. Naglieri, J.A. (2008). ***Naglieri Nonverbal Ability Test – 2nd Edition***. San Antonio, TX Pearson.
8. Naglieri, J.A. (2016). ***Naglieri Nonverbal Ability Test – Third Edition***. San Antonio, TX: Pearson.

Second Generation

9. Naglieri, J.A., & Das, J.P. (1997). ***Cognitive Assessment System***. *Austin: ProEd*
10. Naglieri, J.A., Das, J.P., Goldstein, S. (2014). ***Cognitive Assessment System Second Edition***. Austin, ProEd.
11. Naglieri, J.A., Das, J.P., & Goldstein, S. (2014). ***Cognitive Assessment System Second Edition - Brief***. Austin, ProEd.
12. Naglieri, J.A., Moreno, M.A., & Otero, T.M. (2017). ***Cognitive Assessment System – Español***. Austin, ProEd.
13. Naglieri, J.A., Das, J.P., & Otero (2025). ***Cognitive Assessment System – Digital***. Austin, ProEd

13. Naglieri, J.A. (2022). ***Naglieri General Ability Test: Nonverbal***. Markham, Canada: MHS.
14. Naglieri, J.A. & Brulles, D. (2022). ***Naglieri Ability Test: Verbal***. Markham, Canada: MHS.
15. Naglieri, J.A. & Lansdowne, K. (2022). ***Naglieri Ability Test: Quantitative***. Markham, Canada: MHS.

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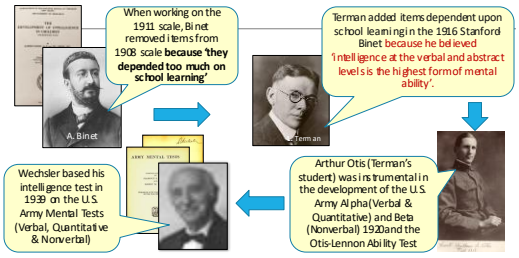
Why do we measure intelligence the way we do?

The History of IQ tests

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



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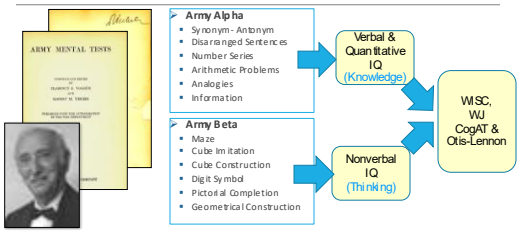
Alpha & Beta → Wechsler



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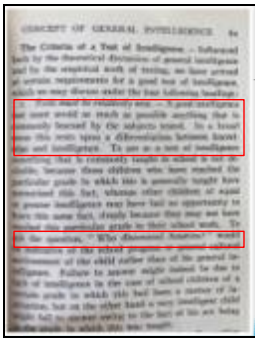
Wechsler's View of General ability

- 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)"



Pintner
(Intelligence Testing, 1923)

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

The US Army Alpha Test (Verbal)

tobacco	1. Bull Durham is the name of
fruit	2. The Mackintosh Red is a kind of
typewriter	3. The Oliver is a
Mogul	4. A passenger locomotive type is the
engineers	5. Stone & Webster are well know
Superbas	6. The Brooklyn Nationals are called
fabric	7. Pongee is a
corn	8. Country Gentleman is a kind of
Mckinley	9. The President during the Spanish War was
cigarette	10. Fatima is a make of

From: Psychological Examining the United States Army (Yerkes, 1921, p. 213)

Knowledge is Included in Intelligence Tests

Stanford-Binet-5	WISC-V	WJ-IV	KABC-II	OLSAT	CogAT
• Verbal • Knowledge • Quantitative Reasoning • Vocabulary • Verbal Analogies	• Verbal Comprehension Vocabulary, Similarities, Information & Comprehension • Fluid Reasoning Figure Weights, Arithmetic	• Comprehension Knowledge: Vocabulary & General Information • Fluid Reasoning: Number Series & Concept Formation • Auditory Processing: Phonological Processing	• Knowledge / GC • Riddles, • Expressive Vocabulary, • Verbal Knowledge	• Verbal • Following directions • Verbal Reasoning • Quantitative • Verbal Arithmetic Reasoning	• Verbal Scale • Analogies • Sentence Completion • Verbal Classification • Quantitative • 45 pages of oral instructions

Not only test content, but also comprehension of verbal instructions and oral expression (individually administered tests only).

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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 **can be 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

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-on-covid-19.p

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

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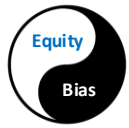
Test Bias, Test Equity & Test Fairness

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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Race and Ethnic Differences Individually Administered Intelligence Tests

	Race	Ethnicity
Traditional Tests that require knowledge	**Mn = 9.7**	**Mn = 8.0**
Stanford-Binet IV (normative sample)	12.6	
WISC-V (normative sample)	11.6	9.1
WJ- III (normative sample)	10.9	10.7
KABC-11 Nonverbal Index	10.0	7.0
KABC II Fluid-Crystallized Index	9.3	10.5
WISC-V (normative sample adjusted for sex and parental ed)	8.7	3.7
KABC-II MPI (conorming sample)	8.1	8.2
K-ABC II MPI (normative sample)	7.9	5.9
KABC II MPI (normative sample adjusted for sex and PEL)	7.9	8.9
Second Generation Tests with minimal knowledge	**Mn = 4.4**	**Mn = 3.5**
CAS-2 (normative sample)	6.3	4.5
CAS (statistical controls for normative sample)	4.8	4.8
CAS-2 (statistical controls for normative sample)	4.5	1.8
CAS-2 Brief (normative sample)	2.0	2.8

Note: The results summarized here were reorganized for the Stanford-Binet V by Wasserman (2013); Woodcock-Johnson III race differences by Edwards and Oakland (2006); ethnic differences by Glen-Oyenga, Ortiz, Flanagan, and Chaplin (2013); WISC-V by Kaufman, Raiford and Coalson (2016); Kaufman Assessment Battery for Children-II by Lichtenberger, Voeller, Kaufman & Kaufman (2018); and Schaller, C., Kaufman, A.S. What is of the Three KABC-II Global Scores is the Least Biased? Journal of Pediatric Neuropsychology 1, 17–30 (2015). CAS by Naglieri, Rojahn, Matto, and Aquilino (2005); CAS-2 and CAS-2 Brief by Naglieri, Das, and Goldstein, 2014 and 2014b.

	Race	Ethnic
Tests that require knowledge	**8.5**	**4.8**
Otis-Lennon School Ability Test (one school district)	13.6	-
CogAT7 Nonverbal (one school district)	11.8	7.6
CogAT-Total (V, Q, & NV)	7.0	4.5
CogAT7 - Verbal	6.6	5.3
CogAT- Nonverbal	6.4	2.9
CogAT7-Quantitative	5.6	3.6
Tests that require minimal knowledge	**3.8**	**1.7**
Naglieri General Ability Test-Verbal (normative sample)	6.2	1.0
Naglieri General Ability Test-Quantitative (normative sample)	5.5	4.4
Naglieri General Ability Test-Nonverbal (normative sample)	4.4	0.3
NNAT (matched samples)	4.2	2.8
NNAT (matched samples English Spanish)	-	1.3
Naglieri General Ability Test-Quantitative (matched to US)	3.2	1.3
Naglieri General Ability Test-Verbal (matched to US)	2.2	1.6
Naglieri General Ability Test-Nonverbal (matched to US)	1.0	1.1

Race and Ethnic Differences on Group Administered Ability Tests

Traditional and Second-Generation Intelligence Tests' Race and Ethnic Differences

Tests that require knowledge	Race Mn = 9.2	Ethnicity Mn = 6.8
Otis-Lennon School Ability Test (one school district)	13.6	-
Stanford-Binet IV (normative sample)	12.6	-
CogAT Nonverbal (one school district)	11.8	7.6
WISC-V (normative sample)	11.6	9.1
WI - III (normative sample)	10.9	10.7
KABC-II Nonverbal Index	10.0	7.0
KABC II Fluid-Crystallized Index	9.3	10.5
WISC-V (normative sample adjusted for sex and parentaled)	8.7	3.7
KABC-II (MPI conorming sample)	8.1	8.2
K-ABC II MPI (normative sample)	7.9	5.9
KABC II MPI(normative sample adjustedfor sex and parental ed)	7.9	8.9
CogAT Total (V, Q&NV)	7.0	4.5
CogAT - Verbal	6.6	5.3
CogAT- Nonverbal	6.4	2.9
CogAT- Quantitative	5.6	3.6
Tests that require minimal knowledge	**Mn = 4.0**	**Mn = 2.3**
CAS-2 (normative sample)	6.3	4.5
Naglieri General Ability Test-Verbal(normative sample)	6.2	1.0
Naglieri General Ability Test-Quantitative (normative sample)	5.5	4.4
CAS (statistical control for normative sample)	4.8	4.8
CAS-2 (statistical control for normative sample)	4.5	1.8
Naglieri General Ability Test-Nonverbal(normative sample)	4.4	0.3
NNAT(matched samples)	4.2	2.8
NNAT(matched samples English Spanish)	-	1.3
Naglieri General Ability Test-Quantitative (matched to US)	3.2	1.3
Naglieri General Ability Test-Verbal(matched to US)	2.2	1.6
CAS-2 Brief (normative sample)	2.0	2.8
Naglieri General Ability Test-Nonverbal(matched to US)	1.0	1.1

Note The results summarized herewere reported for the **Otis-Lennon** School Ability Test byA vant andO'Neal(1986); S**tanford-Binet** IV by Wasserman(2000); **Woodcock-Johnson III** racedifference by Edwards and Oakland (2006) andethnic differences bySotelo-Dynega, Ortiz, Flanagan, and Chaplin (2013); **CogAT7** byCarman, Walther and Bartsch(2018) andLohman (2016); **WISC-V** byKaufman, Raiford, and Coalson(2016); **KABC-II** by Lichtenberger, Volker, Kaufman & Kaufman, (2018) and Schneider and Kaufman (2015); **CAS** byNaglieri, Rojahn, Matto, andA quilino (2003); **CAS-2** and **CAS2-Brief** byNaglieri, Das, and Goldstein, 2014a and 2014b; **Naglieri Nonverbal Ability Test** byNaglieri andRonning(2000), and **Naglieri General Ability Tests** byNaglieri, Brulles, and Lansdowne (2022 & 2024).

Numbers of Gifted Students Missed = 1,266,708

Gifted Enrollment by Race and Ethnicity as of 2020 (updated 2024).

	N in Public Education K-12 in 2020	N Potentially Gifted (8%; 92 percentile)	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 Americans	748,000	59,840	26,700	-33,140
Two or More Races	1,641,817	131,345	105,371	-25,974
Total Non-Whites	24,481,790	1,958,543	1,063,343	**-895,200**

1. Representation Ratio formula: N in Gifted Education / Potential N in Gifted Education.
2. Total Enrollment data from Table 203.60. Enrollment and percentage distribution of enrollment in public elementary and secondary schools, by race/ethnicity and level of education: Fall 1999 through fall 2027. https://nces.ed.gov/programs/digest/d17/tables/dt17_203.60.asp
3. Gifted Enrollment data from Table 204.90. Number of public school students enrolled in gifted and talented programs, by sex, race/ethnicity, and state: selected years, 2004 through 2013-14. https://nces.ed.gov/programs/digest/d17/tables/dt17_204.90.asp
4. From: Brulles, D., Lansdowne, K. & Naglieri, J. A. (2022). Understanding and using the Naglieri General Ability Tests: *A tool to equity in gifted Education*. Minneapolis, MN: Free Spirit Publishing.
5. Native American data from: Steven C. Haas, Associate Director, Indigenous Students Leap Ahead (ISLA) Project.

Percent of Schools that do not Identify	41.5%
Additional non-white gifted students = 41.5% of 895,200	N = 371,508
Total non-white gifted students missed	**N = 1,266,708**

895,200

371,508

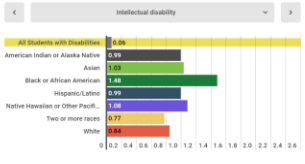
OSEP Office of Special Education Programs

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/programs/osepidea/618-data/collection-documentation/data-documentation-files/part-b/child-count-and-educational-environment/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://idaamerica.org/ida_today/disproportionate-identification-of-students-of-color-in-special-education/

Naglieri, J.A., & Rojahn, J. (2001). Intellectual classification of Black and White children in special education programs using the WISC-III and the Cognitive Assessment System. American Journal on Mental Retardation, 106(4), 359–367.

Intellectual Classification of Black and White Children in Special Education Programs Using the WISC-III and the Cognitive Assessment System

Jack A. Naglieri, George Mason University; Johnmark Rojahn, Tri-City Mental Health Authority

White children earned similar scores on the Verbal and Performance scales

Black children earned lower VIQ than PIQ scores → low Full Scale

Black children earned ***higher*** Full Scale scores on CAS than whites

Fewer Black children would be identified as intellectual disability based on Full Scale scores using CAS than WISC-III

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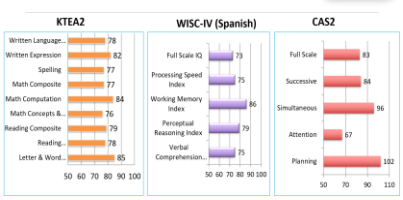
CASE by Tulio Otero: ALEJANDRO (C.A. 7-0 GRADE 1)

REASON FOR REFERRAL

- Does he have ID?
- Academic:
  - Could not identify letters/sounds
  - October. Could only count to 39
  - All ACCESS scores of 1
- Behavior:
  - Difficulty following directions
  - Attention concerns
  - Refusal/defiance



Note: this is not a picture of Alejandro

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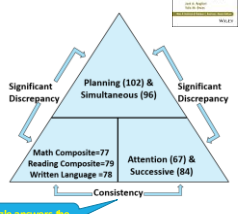
Alejandro and PASS (by Dr. Otero)

- Alejandro is not a slow learner.
- He has good processing scores:
  - Simultaneous = 96 and Planning = 102
- He has a "disorder in one or more of the basic psychological processes"
  - Attention = 67 and Successive = 84
- Using the **Discrepancy Consistency Method** (1999, 2017) he meets criteria for SLD (see Naglieri & Otero, 2017).
- Evidence of Dyslexia (low Successive) and Inattentive Type of ADHD (low Attention)



The Consistency portion of the triangle answers the question: "Why does the student fail?"

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I Learned that we should Measure Thinking not knowing

Take a few minutes to…

- Talk with your colleagues
- How do you feel about separating thinking from knowing?
- Is it hard to reconceptualize subtests like Vocabulary and Similarities and others like those as knowledge not intelligence?
- Is there a counter argument?

How Can we Test my Hypothesis that Knowledge Confounds the Measurement of General Intelligence?

Create general intelligence tests that include verbal and quantitative content but do not rely on academic knowledge!

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

(Naglieri, Brulles & Lansdowne, 2022)

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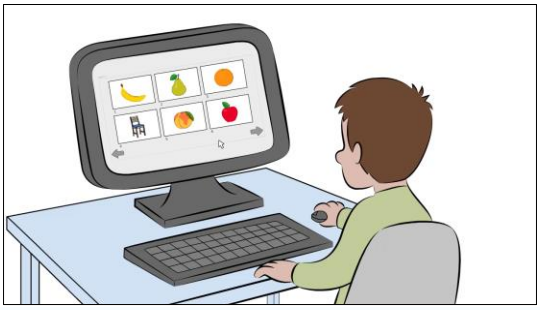
Naglieri General Ability Tests

- We **explicitly made tests for accurate 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
  - Confirmatory factor analysis supported the measurement of general ability.

41



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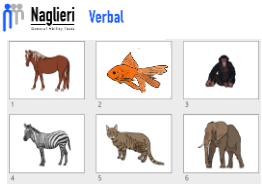
Naglieri General Ability Test – Verbal
(Naglieri & Brulles, 2022)

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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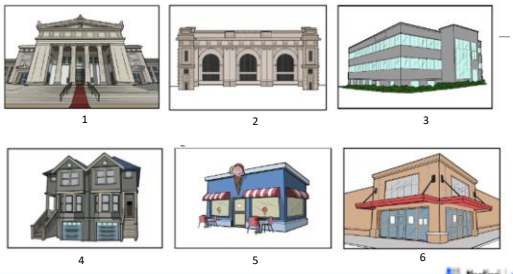
6th Gr. Hard



Naglieri General Ability Test - Nonverbal
(Naglieri, 2022)

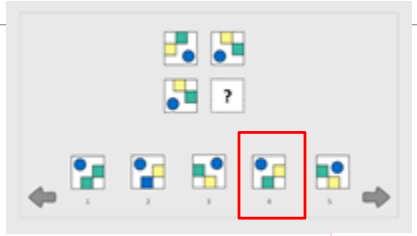
The **Naglieri–NV measures general ability** using questions that require a student to recognize the relationships among the shapes.

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.

45

6th Gr. Hard



Naglieri Nonverbal

Naglieri General Ability Test – Quantitative

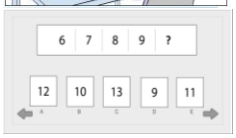
(Naglieri & Lansdowne)

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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Naglieri General Ability Tests-Grade 1-Hard

Naglieri Quantitative

Naglieri Quantitative

Naglieri General Ability Test – Quantitative (Naglieri & Lansdowne)

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Research Evidence of Equity

Sekaran, M., Paolozza, A., Sobmon, J., Naglieri, J.A., & Schmidt, M.T. (Psychology in the Schools, 2004). Race, Ethnic, Gender, and Parental Education Level Differences on Verbal, Nonverbal, and Quantitative Naglieri General Ability Tests: Achieving Equity.

NONVERBAL TEST

- N = 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 PARENTAL 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

VERBAL TEST

- N = 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 PARENTAL 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

QUANTITATIVE TEST

- N = 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 PARENTAL 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

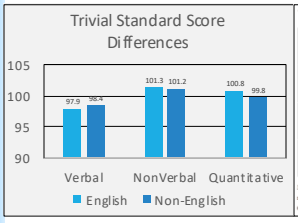

Table 6.31. Group Differences by Primary Language Spoken: Naglieri General Ability Tests

Test	Language Spoken	Descriptives		Differences		
		M	SD	Cohen's d	95% CI	t
Naglieri-V	English	97.9	14.5	-0.04	-0.07, 0.13	-0.32
	Non-English	98.4	14.8			
Naglieri-NV	English	101.3	14.1	0.00	-0.17, 0.02	0.04
	Non-English	101.2	13.5			
Naglieri-Q	English	100.8	14.1	0.07	-0.07, 0.13	0.65
	Non-English	99.8	12.9			

Note. $N = 14$ for each English and Non-English group. *t* statistic produced from a Welch Two Sample *t*-test. Cohen's *d*: small effect size = 0.20 to 0.49; medium effect size = 0.50 to 0.79; large effect size ≥ 0.80. Positive *d* values indicate 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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Urban and Suburban Childrens' Performance on the Naglieri Verbal, Nonverbal and Quantitative General Ability Tests

Naglieri, Farmus & Brulles (submitted for publication, July 2025)

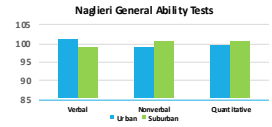
Abstract

The purpose of this study was to examine general intelligence test scores among children in urban and suburban settings using the Naglieri General Ability Tests: Verbal, Nonverbal, and Quantitative (Naglieri, Brulles, & Lansdowne, 2021). The two samples included children aged 4–17 years who were closely matched to the U.S. population based on gender, race, ethnicity, geographic region, and parental education level. Few differences were found on preliminary versions of the Naglieri General Ability Tests—Verbal (Naglieri & Brulles, 2021; N = 2,078), Nonverbal (Naglieri, 2021; N = 1,665), and Quantitative (Naglieri & Lansdowne, 2021; N = 1974). These findings suggest that this approach to measuring general ability may have utility for more equitable identification of students from diverse backgrounds for possible inclusion in gifted education programs.

Table 1

Comparison of Urban vs Suburban Mean Scores Across Verbal, Nonverbal, and Quantitative Test V

	N	Urban M (SD)	Suburban M (SD)	M Diff (95% CI)
Verbal	2078	101.07 (14.96)	98.73 (14.83)	2.34 (1.06, 3.46)
Nonverbal	1665	99.02 (13.73)	100.38 (15.46)	-1.36 (-2.91, 0.17)
Quantitative	1974	99.71 (14.69)	100.61 (15.04)	-0.90 (-2.25, 0.46)



POST COVID National Norms

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

Table 1. National Norm Sample Characteristics.

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

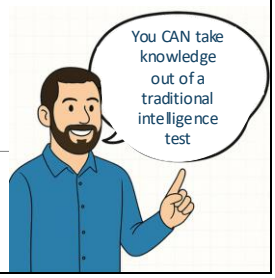
Note. U.S. population derived from the 2019 American Community Survey.[a]

American Consortium for Equity in Education 2024 Awards

https://www.ace-ed.org/

Diversity and Inclusion Solution – PreK-12

I Learned that verbal, nonverbal and quantitative tests of general ability that do not demand academic knowledge can identify students who are very smart but may not be academically advanced



Using group and individually administered tests for Gifted Identification can be tricky

- Use the Three Naglieri General Ability Tests: Verbal, Nonverbal and Quantitative for **UNIVERSAL ASSESSMENT** to identify the students with very high scores
- Use national or local norms to identify students who meet the cutoff score
- **INDIVIDUAL ASSESSMENT** by the school psychologist must include an intelligence test that measures THINKING (g) not KNOWING (CAS2)

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Time for Questions and Answers

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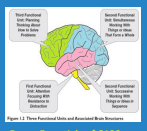
Let's consider the benefits of **going beyond tests of general ability**

Time to Consider an Alternative to Traditional Intelligence Tests

What I Learned



From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

My Professional Journey
- I Learned About Traditional Intelligence Tests

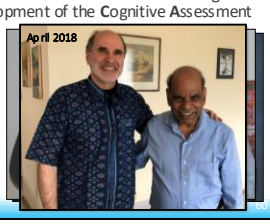
A Theory Based on Brain Function
- I Learned a New Way to Measure Intelligence

From PASS to CAS2
- I Learned the Power of PASS

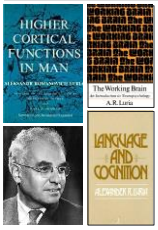
Research Update
- I Learned the Science of Intelligence Testing

Intelligence as Neurocognitive Functions

- In my first working meeting with JP Das (February 11, 1984) we proposed that intelligence was better REinvented as neurocognitive processes andwe began development of the **C**ognitive **A**ssessment **S**ystem (Naglieri & Das, 1997).
- We conceptualized intelligence as Planning, Attention, Simultaneous, and Successive (PASS) neurocognitive processes based on Luria's concepts of brain function.



PASS Neurocognitive Theory



- **P**lanning = The THINKING used to figure out how to do something
- **A**ttention = The THINKING used to focus and resist distractions
- **S**imultaneous = The THINKING used to understand how things are interrelated
- **S**uccessive = The THINKING used to work with information in a specific order

PASS = 'basic psychological processes'

NOTE: Easy to understand concepts!

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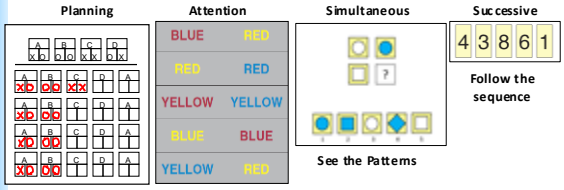
I Learned the Importance of having a Theory based on brain function

PASS Theory: Four Ways of Thinking



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PASS constructs are easy to explain, especially to the students

The first step in the PASS intervention Protocol is to explain the four PASS processes to the STUDENT

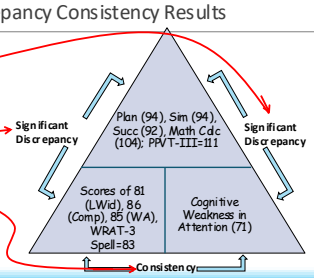
PASS is Easy to Explain

This is not a picture of Frankie

- Frankie was struggling in school at age 11
- Referred by parents after a history of reading and self esteem problems
- High level of anxiety
  - he was too anxious to look closely at the words
  - he rushed to get tasks completed
  - Frankie could not attend to the details of the sequence of letters for correct spelling, and the order of sound–symbol associations

Frankie's Discrepancy Consistency Results

- **Discrepancy** between high and low processing scores
- **Discrepancy** between high processing and low achievement
- **Consistency** between low processing and low achievement



Frankie: in 1999

- I informed Frankie of his PASS scores, and everything changed
- He learned to manage his attention problem by using good Planning which helped him
  - recognize when he is off task
  - Think of possible ways to manage his attention
  - recognize when he needed a change in the environment to reduce distractions
- Perhaps most importantly: He was given hope – that he could succeed

25 Years later (2024)

- Frankie graduated High School and went to college
- Is married with children
- He is a graphic designer
- He uses his good Planning, Simultaneous and Successive processing to manage any obstacles he may still have with attention

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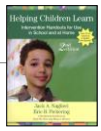
Intervention Protocol (Kryza & Naglieri)



- Explain PASS scores to the students:
  - For example: The part of your brain that makes learning challenging for you is the part that PLANS (PFC).
  - We're going to work on using your strength(s) so you can do better.
- Give STUDENTS the PASS handouts
  - For example: *"The test showed that your brain is strong in seeing the BIG PICTURE (Simultaneous Processing) and recognizing sequences. (Successive Processing) Does that make sense to you?*
  - *YOU CAN do better if you THINK SMART and use your strengths to manage what is hard for you.*

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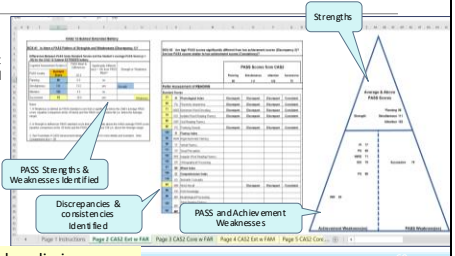
CAS2 PSW Analyzer for WJ4, KTEA3, FAR, FAM, Bateria

- Enter PASS and Achievement test standard scores and all comparisons are evaluated



FREE – on www.jacknaglieri.com

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We are half way through the presentation

What I Learned

From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

- **My Professional Journey**
  - I Learned About Traditional Intelligence Tests
- **A Theory Based on Brain Function**
  - I Learned a New Way to Measure Intelligence
- **From PASS to CAS2**
  - I Learned the Power of PASS
- **Research Update**
  - I Learned the Science of Intelligence Testing

CAS2 Options

20 min | 40 min | 40 min | 60 min

- **CAS2 Core & Extended English & Spanish** for comprehensive Assessment
- **CAS2 Brief** for re-evaluations, instructional planning, gifted screening
- **CAS2 Rating Scale** for teacher ratings

CAS2 Rating Scale (4 subtests)	CAS2 Brief (4 subtests 20 minutes)	CAS2 DIGITAL (8 subtests 40 minutes)	CAS2 Core (8 subtests 40 minutes)	CAS2 Extended (12 subtests 60 minutes)
Total Score	Total Score	Total Score	Full Scale	Full Scale
Planning	Planning	Planning	Planning	Planning
Simultaneous	Simultaneous	Simultaneous	Simultaneous	Simultaneous
Attention	Attention	Attention	Attention	Attention
Successive	Successive	Successive	Successive	Successive
				Supplemental Scales
				Executive Function
				Working Memory
				Verbal / Nonverbal
				Visual / Auditory
				Speed / Fluency

PASS Theory Based on Brain Function – Planning, Attention, Simultaneous and Successive Neurocognitive processes

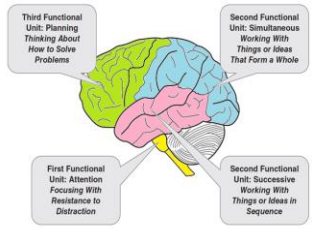

Figure 1.2 Three Functional Units and Associated Brain Structures
From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

PASS Theory: Planning

- Planning is a term used to describe a neurocognitive function similar to metacognition and executive function
- Planning is needed for setting goals, making decisions, predicting the outcome of one's own and others actions, impulse control, strategy use and retrieval of knowledge
- Planning refers to **THINKING ABOUT HOW TO SOLVE ANY KIND OF A PROBLEM** from academics to social situations and life in general
- Math calculation, written expression, etc

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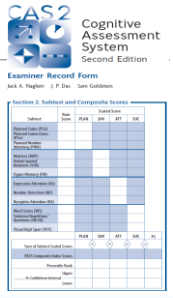
Planning Subtests

Planned Codes

Planned Connections

Planned Number Matching

5176	5761	5167	1576	5176	1567



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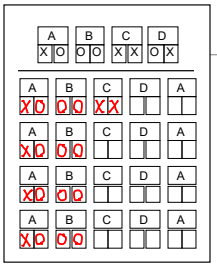
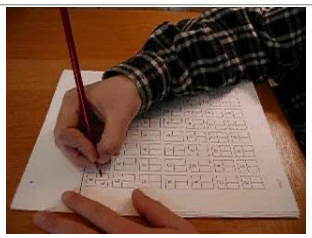


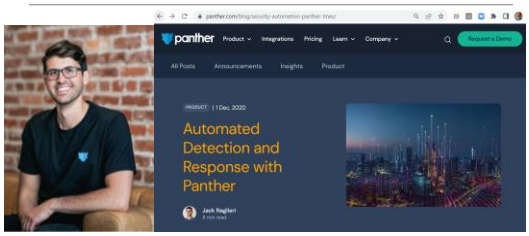
Planned Codes Page 1

- Jack Jr. at age 5
- Child fills in the codes in the empty boxes
- After being told the test requirement, examinees are told: "You can do it any way you want"

Planned Codes Page 2 Jack Jr age 10

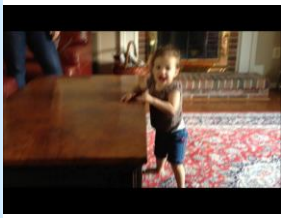


25 Years Later Planning is the Key to Success



A 13 month old's Plan

At 19 months
Planning & Knowledge



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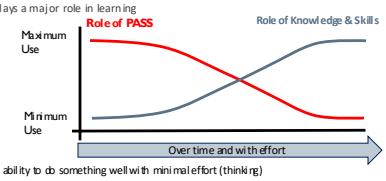
Planning Learning Curves

- Learning depends upon many factors especially PASS
- When a task is practiced and learned it requires less thinking (PASS) and becomes a skill
- At first, PASS plays a major role in learning



Note: A **skill** is the ability to do something well with minimal effort (thinking)

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Planning (EF) and Skills

- Given that **Planning (EF) demands intentionality**, that means that planning processing is something that occurs over time and with effort.
- **Skills** are things we do with very little thinking. Automatic actions do not afford the time for thinking (planning) but rather immediate responding.
- Therefore, Planning and EF should not be described as 'skills'
- Your thoughts?

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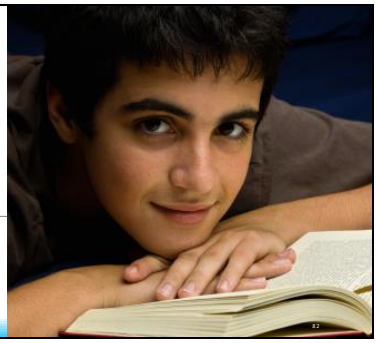
The Case of Rocky

Strengths with Specific Learning Disability and ADHD



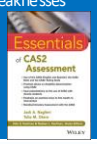
The case of Rocky

- Rocky[1] went to school in a large middle-class district
- In first grade Rocky was significantly below grade benchmarks in reading, math, and writing.
  - He received group reading instruction weekly and six months of individual reading instruction but minimal progress →retained
- By the middle of his second year in first grade he still struggling
  - decoding, phonics, and sight word vocabulary; math problems, addition, problem solving activities and focusing and paying attention."
- After two years of special team meetings and special reading instruction he is now working two grade levels below his peers in reading, writing, and math

Note: This child's name and other potentially revealing data have been changed to protect his identity.

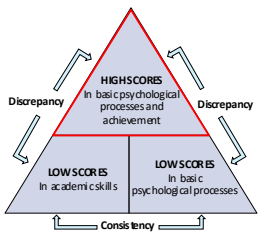
Discrepancy Consistency Method for SLD Determination

Naglieri & Otero (2017) Pattern of Strengths and Weaknesses



this IS A *Strength Based* Method

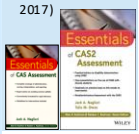
Knowing a student's GOOD scores is just as important as knowing their LOW scores



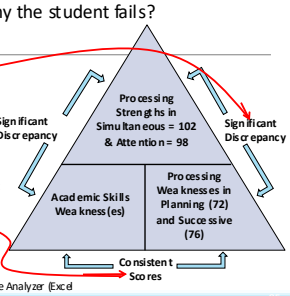
Naglieri, J. A. (n.d.). CAS2, CAS2 Brief, CAS2 Rating Scale Analyzer (Excel tools). JackNaglieri.com. https://jacknaglieri.com/pass-score-analyzers

Answering the Question: Why the student fails?

- The Discrepancy Consistency Method (DCM) was first introduced in 1999 (most recently in 2017)

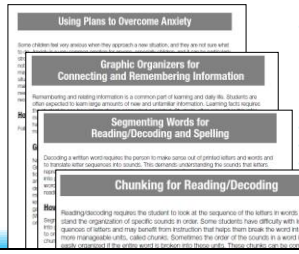


- Discrepancy between high and low processing scores
- Discrepancy between high processing and low achievement
- Consistency between low processing and low achievement

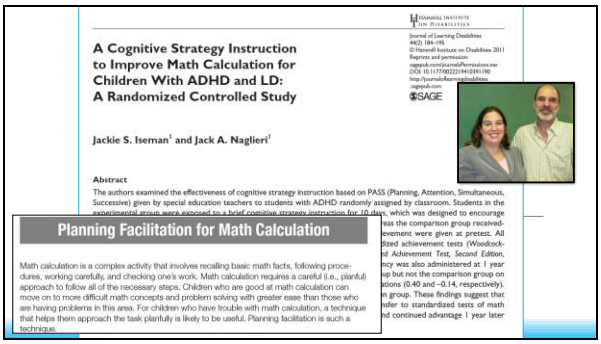


Naglieri, J. A. (n.d.). CAS2, CAS2 Brief, CAS2 Rating Scale Analyzer (Excel tools). JackNaglieri.com. https://jacknaglieri.com/pass-score-analyzers

Interventions for Rocky



- Helping Children Learn Intervention Handouts for Use in School and at Home, *Second Edition*
  By Jack A. Naglieri, Ph.D., & Eric B. Pickering, Ph.D.,
- Spanish handouts by
- Tulio Otero, Ph.D., &
- Mary Moreno, Ph.D.



Instructional Sessions

- Math lessons were organized into "instructional sessions" delivered over 13 consecutive days
- Each instructional session was 30-40 minutes
- Each instructional session was comprised of three segments as shown below

10 minutes	10-20 minutes	10 minutes
10 minute math worksheet	Planning Facilitation or Normal Instruction	10 minute math worksheet

Experimental Group
19 worksheets with Planning Facilitation

Vs.

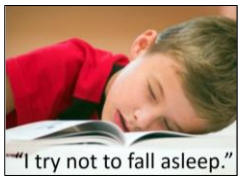
Control Group
19 worksheets with Normal Instruction

Planning Facilitation: Asking vs. Telling

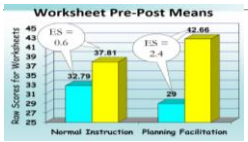
- Teachers facilitated discussions to help students become more self-reflective about use of strategies
- Teachers asked questions like:
  - What was your goal?
  - Where did you start the worksheet?
  - What strategies did you use?
  - How did the strategy help you reach your goal?
  - What will you do again next time?
  - What other strategies will you use next time?

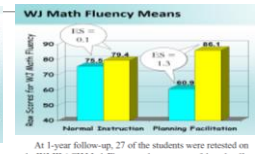
Student Comments During Planning Facilitation

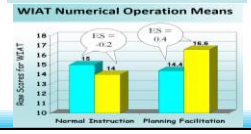
- My goal was to do all of the easy problems on every page first, then do the others.
- I do the problems I know, then I check my work.
- The problems that have more steps take more time, so I skip them
- I did all the problems in the brain-dead zone first.



Pre-Post Means and Effect Sizes for the Students with LD and ADHD







At 1-year follow-up, 27 of the students were retested on the WJ-III ACH Math Fluency subtest as part of the school's typical yearly evaluation of students. This group included 14 students from the comparison group and 13 students from the experimental group. The results indicated that the improvement of students in the experimental group ($M = 16.08$, $SD = 19$, $d = 0.85$) was significantly greater than the improvement of students in the comparison group ($M = 3.21$, $SD = 18.21$, $d = 0.09$).

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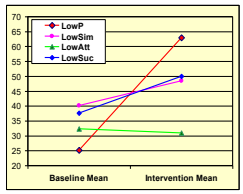
Pre-Post Changes for the Students with LD and ADHD

- The students with a weakness in Planning, Simultaneous or Successive processing scales benefited from the Planning Facilitation method
- Importantly, the students with a weakness in Planning improved the most
- This has been the case in all the studies of Planning Facilitation
- COGNITION PREDICTS RESPONSE TO INTERVENTION



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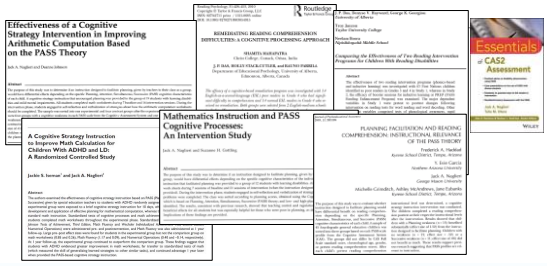
Summary of PASS Intervention Research in Essentials of CAS2



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Time for Questions and Answers

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PASS Theory Based on Brain Function — Attention

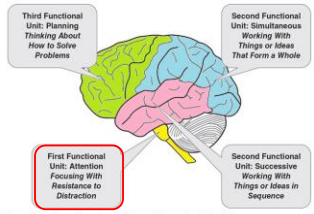

Figure 1.2 Three Functional Units and Associated Brain Structures

From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

PASS Theory: Attention

- Attention is a basic psychological process we use to
  - **THINKING THAT INVOLVES ATTENDING AND RESISTING DISTRACTION**
  - Selectively attend to some stimuli and ignoring others
  - Focus our cognitive activity
  - Selective attention
  - Resistance to distraction
  - Listening, as opposed to hearing

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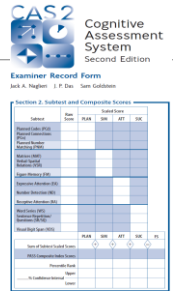
Attention Subtests



Expressive Attention

RED	RED	BLUE
YELLOW	YELLOW	RED
BLUE	RED	YELLOW

Number Detection

Find the numbers that look like this: 1 2						
1	5	1	4	2	2	5

Receptive Attention

Nn	Tr	bt
TR	nb	Aa

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Priming the Examinee on Attention Tests

- First, we ask the students to the numbers 1 2
- among about 200 numbers on the page

Find the numbers that look like this: 1 2

5	2	1	2	3	1	4	3	6	3	3	4
5	2	1	1	4	6	6	4	4	6	1	5

- Then we ask the students to find

  1 2 5 6

- This is how we measure Resistance to distraction and focused attention

Find the numbers that look like this: 1 2 5 6

4	3	1	5	1	4	2	2	5	1	3	4
1	4	2	6	3	6	3	5	3	5	3	6

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Jose reading problems and the teacher these concerns:

phonemic awareness, reading fluency, reading comprehension math problem-solving, spelling, written expression

Jose also receives ELL services and his current ACCESS scores are as follows: Listening 5.8, Speaking 1.9, Reading 2.8, Writing 3.5.

2018 WISC4 Spanish :

VCI 55, PRI 92, WM 86, PS 91

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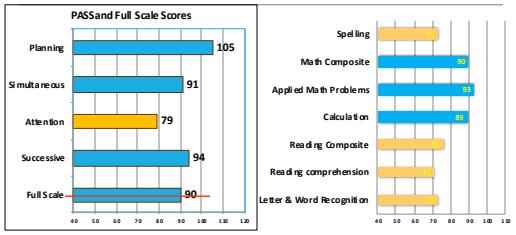
CAS2 and KTEA-III Scores (January 2020)



100

Jose was given this simple intervention

Remember to check how well you are attending. If you are having a problem, use a plan and look at this (taped to his desk).

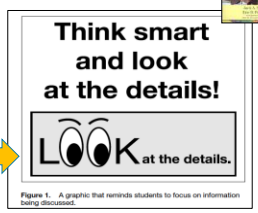


Figure 1. A graphic that reminds students to focus on information being discussed.

From: Naglieri, J. A., & Pickering, E. B. (2010). *Helping Children Learn: Intervention Handouts for Use at School and Home (Second Edition).* Baltimore, MD: Brookes Publishing.

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Two weeks later!

- Teacher reported that José has increased his reading accuracy by at least 80%.
- He read 16 words correctly out of a list of 20.
- He has done this over the last 3. sessions.

PASS Theory Based on Brain Function - Simultaneous Processing

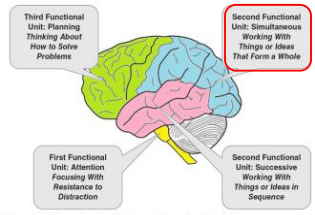
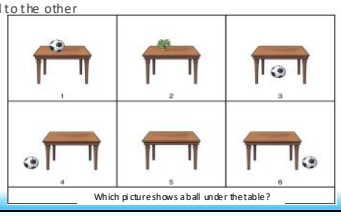


Figure I.2 Three Functional Units and Associated Brain Structures
From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

A Verbal TEST demands Simultaneous

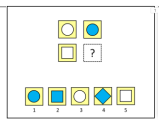
- **Simultaneous** processing is used to integrate stimuli into groups
  - **THINKING ABOUT HOW THINGS OR IDEAS ARE INTER-RELATED**
  - Each piece must be related to the other
  - Stimuli are seen as a whole
- Academics:
  - Reading comprehension
  - geometry
  - math word problems
  - whole language
  - verbal concepts



Which picture shows a ball under the table?

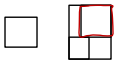
Simultaneous

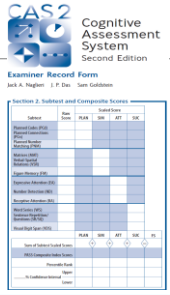
Matrices



Verbal Spatial Relations

Figure Memory





Case of Alexandra (Tulio Otero)

- Alex is 8-years-old in the 3rd grade.
- Her home language is primarily Spanish, although she speaks English with siblings
- Alex has difficulty when encountering most reading and written language tasks.
- Alex was previously evaluated for special education
  - The test results indicated her overall cognitive abilities were in the Low Average range (WISC5).
  - Significant difficulty with reading fluency and automatic word recognition skills
  - Has strong decoding and phonological skills.
  - Spanish literacy achievement results in word reading and spelling fell within the Average range.
  - Her struggles were ascribed to attention problems stemming from ADHD and not a specific learning disability.
- She continues to have significant reading and writing difficulties, limited self-confidence, and struggle to complete her work.

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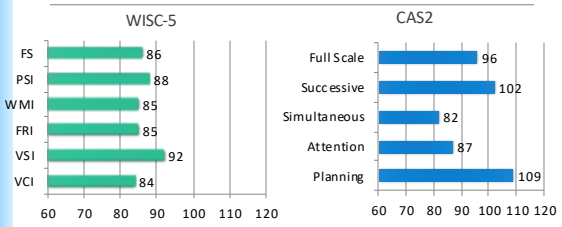
Case of Alexandra (orthographic)



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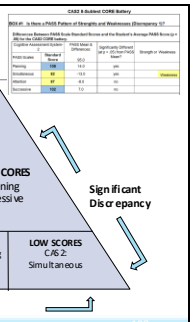
Case of Alexandra - SLD

Composite/Subtest	Standard Scores	Percentile Rank
Reading Composite	105	63
Letter & Word Recognition	111	77
Reading Comprehension	99	47
Nonsense Word Decoding	80	9
Silent Reading Fluency	82	12
Math Composite	90	25
Math Concepts & Applications	88	21
Math Computation	95	37
Spelling	98	45



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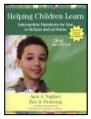
Be Intentional and Transparent

- Give Alex the PASS handouts
  - *"The test showed that your brain is strong in seeing the BIG PICTURE (Simultaneous Processing) and*
  - *Recognizing strategies to use. (Planning Processing) Does that make sense to you?*
- Explain to him the PASS areas that are challenges for him
  - The part of your brain that makes learning challenging for you is the part that helps pay close attention, not get distracted by things around you, and keep all kinds of information in sequence (in order).
  - We're going to work on using your strengths and helping you develop more skills.



PASS Theory Based on Brain Function – Successive Processing

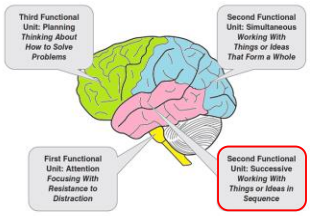


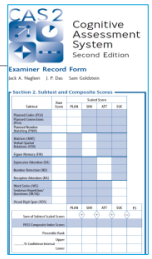
Figure 1.2 Three Functional Units and Associated Brain Structures
From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

PASS Theory: Successive

- **Successive** processing is a basic psychological process we use to manage stimuli in a specific serial order
  - **THINKING ABOUT THE SEQUENCE OF THINGS**
  - Stimuli form a chain-like progression
  - Recall a series of words
  - Decoding words
  - Letter-sound correspondence
  - Phonological tasks
  - Understanding the syntax of sentences
  - Comprehension of written instructions

Successive Subtests

- Word Series - Man Cow Key
- Visual Digit Span – 4 3 8 6
- Sentence Repetition (ages 5-7)
  - Child repeats sentences exactly as stated by the examiner:
  - ***The red greened the blue with a yellow.***
- Sentence Questions (ages 8-18)
  - Child answers a question about a statement made by the examiner:
  - ***The red greened the blue with a yellow. Who got greened?***



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Case of Paul: gr. 4 Dyslexia (Steve Feifer)

- **Case of Paul** -A 9-year-old in 4th grade
  - Problems in reading and math
  - Can't remember the sequence of steps when doing math and math facts
  - Good memory for details
  - Can't sound out words
  - Poor spelling
  - Poor reading comprehension

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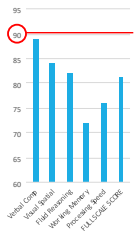
Paul – age 9 years

Presenting Concerns: Reading, Math Word Problems, Anxiety

WISCV	COMPOSITE SCORE	RANGE	PERCENTILE RANK
Verbal Comprehension	89	Below Average	23%
Visual Spatial	84	Below Average	14%
Fluid Reasoning	82	Below Average	12%
Working Memory	72	Very Low	3%
Processing Speed	76	Very Low	6%
FULL SCALE SCORE	81	Below Average	10%
WIAT II Reading	87	Below Average	19%
WIAT II Math	90	Average	25%
WIAT II Writing	94	Average	34%



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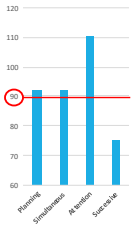
Paul – age 9 years

CAS-2	STANDARD SCORE	Classification
Planning	92	Average
Simultaneous	92	Average
Attention	110	Average
Successive	75	Very Low

Differences Between PASS Scale Standard Scores and the Student's Average PASS Score Required for Significance for the CAS2 12-Subtest EXTENDED battery AGES 8-18 Years

Ages 8-18 YEARS	Cognitive Assessment System - 2		Difference from PASS Mean of:	Significantly Different (at $p < .05$) from	Strength or Weakness	
	PASS Scales	Standard Score	92.3			
	Planning	92	-0.3	no		
	Simultaneous	92	-0.3	no		
	Attention	110	17.8	yes	Strength	
	Successive	75	-17.3	yes		Weakness



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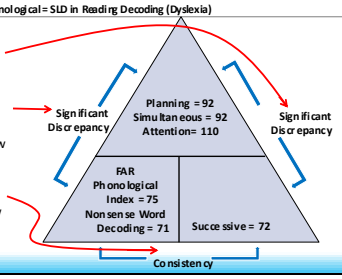
Discrepancy Consistency Method - Paul

Poor Successive + Poor Phonological = SLD in Reading Decoding (Dyslexia)

- Discrepancy between high and low processing scores
- Discrepancy between high processing and low achievement
- Consistency between low processing and low achievement



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Achievement and PASS Processes

Requires Successive Processing

Requires Successive Processing

Requires Simultaneous Processing

FAR index	Standard score (95%CI)	Percentile	Qualitative descriptor
Phonological Index	75	5%	Moderately Below Average
Fluency Index	92	30 %	Average
Mixed Index	81	10 %	Below Average
Comprehension Index	97	42 %	Average
FAR Total Index	84	14%	Below Average

KEY INTERPRETATION	Score	Percentile	Descriptor
Nonsense Word Decoding – requires the student to decode a series of nonsense words presented in order of increasing difficulty.	71	3%	Moderately Below Average
Irregular Word Reading Fluency – the student reads a list of phonologically irregular words arranged in order of increasing difficulty in 60 seconds.	95	37 %	Average

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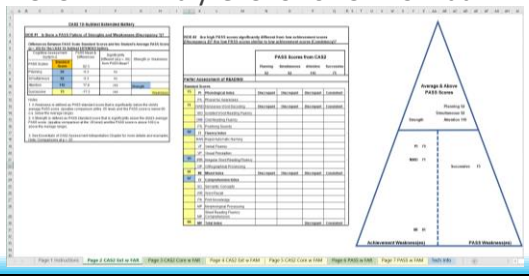
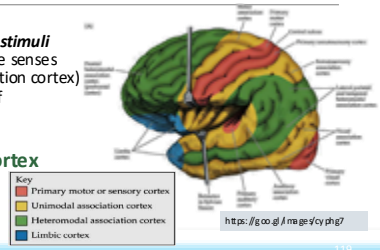
CAS2 FAR Analyzer Shows PSW for Paul



Heteromodal Association Cortex (Goldberg, 2006)

- Our brains ***merge stimuli*** coming in from the senses (unimodal association cortex) into one stream of information in the **Heteromodal association cortex**
- (green areas)



https://goo.gl/images/cyphg7

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Time to Turn and Talk

Share What Strengths & Weaknesses you see in the CAS2 and PASS scores?

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What I Learned

From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

- **My Professional Journey**
  - I Learned About Traditional Intelligence Tests
- **A Theory Based on Brain Function**
  - I Learned a New Way to Measure Intelligence
- **From PASS to CAS2**
  - I Learned the Power of PASS
- **Research Update**
  - I Learned the Science of Intelligence Testing

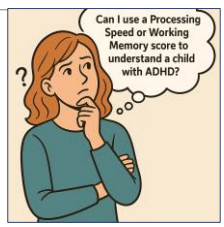
What do we know about the latest research on how to interpret the intelligence tests we currently use?

The research may surprise you !

12

Intelligence testing over the last several decades

- We have seen additional scales added to traditional intelligence tests to measure WORKING MEMORY, PROCESSING SPEED, etc.
- What does the science tell us?



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Which intelligence test scores have enough specific variance to be interpreted?

There is a scientific way to answer this question

Bifactor analysis examines each subtest and scales' correlation with the general factor (g) and what each specific ability factor (subtests and scales) tells us beyond the Full Scale.

This method reveals whether subtests and scales should be used to understand intellectual strengths and weaknesses.

The Validity of 'g' is Supported

1. **WISC-V** (Canivez, et al., 2017)
2. **WAIS–IV** (Canivez, et. A, (2010)
3. **WISC–IV Spanish** (McGill & Canivez, (2017)
4. **Canadian WISC-V** (Watkins, et al., 2017)
5. **Stanford-Binet -Fifth Edition** (Canivez, 2008)
6. **Cognitive Abilities Test** (Cucina & Byle, 2017)
7. **Universal Nonverbal Intelligence Test** (Benson, et al., 2020)
8. **Differential Ability Scales-Second Edition** (Canivez & McGill, 2016)
9. **Woodcock-Johnson IV Cognitive (**Dombrowski, McGill & Canivez (2017)
10. **Kaufman Assessment Battery for Children-II** (McGill & Spurgin, 2017)
11. **CHC model** based on Carroll's Survey of Factor-Analytic Studies (Benson, et al. 2018)
12. **Naglieri General Ability Tests: Verbal, Nonverbal, Quantitative** (Naglieri, Brulles Lansdowne)

Conclusion: The Full Scale (total) score is a valid representation of general intelligence

125

Each of these research studies indicate that the Full Scale score is the *only* score to interpret!

1. **WISC-V** (Canivez, et al., 2017)
2. **WAIS–IV** (Canivez, et. A, (2010)
3. **WISC–IV Spanish** (McGill & Canivez, (2017)
4. **Canadian WISC-V** (Watkins, et al., 2017)
5. **Stanford-Binet -Fifth Edition** (Canivez, 2008)
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7. **Universal Nonverbal Intelligence Test** (Benson, et al., 2020)
8. **Differential Ability Scales-Second Edition** (Canivez & McGill, 2016)
9. **Woodcock-Johnson IV Cognitive (**Dombrowski, McGill & Canivez (2017)
10. **Kaufman Assessment Battery for Children-II** (McGill & Spurgin, 2017)
11. **CHC model** - Carroll's Factor-Analytic Studies (Benson, et al. 2018)
12. **Reynolds Intellectual Assessment Scales** – (Nelson, et al, 2007)

Conclusion: The subtests and scales "have little-to-no interpretive relevance above and beyond that of general intelligence"

Support for 'g' ONLY

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Each of these research studies indicate that the Full Scale score is the *only* score to interpret!

1. **WISC-V** (Canivez, et al., 2017)
2. **WAIS–IV** (Canivez, et. A, (2010)
3. **WISC–IV Spanish** (McGill & Canivez, (2017)
4. **Canadian WISC-V** (Watkins, et al., 2017)
5. **Stanford-Binet -Fifth Edition** (Canivez, 2008)
6. **British Ability Scales, 3rd ed** (Cucina & Byle, 2017)
7. **Universal Nonverbal Intelligence Test** (Benson, et al., 2020)
8. **Differential Ability Scales-Second Edition** (Canivez & McGill, 2016)
9. **Woodcock-Johnson IV Cognitive (**Dombrowski, McGill & Canivez (2017)
10. **Kaufman Assessment Battery for Children-II** (McGill & Spurgin, 2017)
11. **CHC model** - Carroll's Factor-Analytic Studies (Benson, et al. (2018)

Conclusion: The subtests and scales "have little-to-no interpretive relevance above and beyond that of general intelligence"

Support for 'g' ONLY

CAS is an exception

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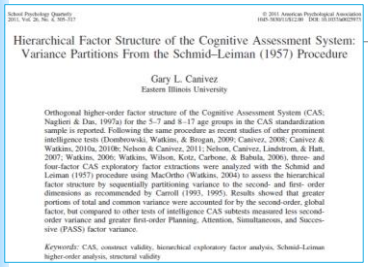

Hierarchical Factor Structure of the Cognitive Assessment System: Variance Partitions From the Schmid–Leiman (1957) Procedure

Gary L. Canivez
Eastern Illinois University

Orthogonal higher-order factor structure of the Cognitive Assessment System (CAS; Naglieri & Das, 1997a) for the 5–7 and 8–17 age groups in the CAS standardization sample is reported. Following the same procedure as recent studies of other prominent intelligence tests (Dombrowski, Watkins, & Brogan, 2009; Canivez, 2008; Canivez & Watkins, 2010a, 2010b; Nelson & Canivez, 2011; Nelson, Canivez, Lindstrom, & Hatt, 2007; Watkins, 2006; Watkins, Wilson, Kotz, Carbone, & Babula, 2006), three- and four-factor CAS exploratory factor extractions were analyzed with the Schmid and Leiman (1957) procedure using MacCallum (Watkins, 2004) to assess the hierarchical factor structure by sequentially partitioning variance to the second- and first- order dimensions as recommended by Carroll (1993, 1995). Results showed that greater portions of total and common variance were accounted for by the second-order, global factor, but compared to other tests of intelligence CAS subtests measured less second-order variance and greater first-order Planning, Attention, Simultaneous, and Successive (PASS) factor variance.

Keywords: CAS, construct validity, hierarchical exploratory factor analysis, Schmid-Leiman higher-order analysis, structural validity

Support for PASS Scales

- "…the CAS subtests had less variance apportioned to the higher-order general factor (g) and *greater proportions of variance apportioned to first-order (PASS…) factors*.
- This is consistent with the subtest selection and construction in an attempt to measure PASS dimensions linked to PASS theory … and neuropsychological theory (Luria)." (p. 311)

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Multidimensional Scaling of the Cognitive Assessment System-2

Interpretation of PASS Scores is Supported: "The current study found that indicators were consistently aligned in the way that they are organized in the PASS derived composite scores on the CAS2."

Presented at the meeting of the National Association of School Psychologists, Seattle WA 2025. Correspondence concerning this poster should be addressed to Ryan J. McGill, Associate Professor of School Psychology, William & Mary School of Education. P.O. Box 8795, Williamsburg, VA 23187 USA. E-mail: **rmcgill@wm.edu**

Original Research Article

Unraveling the Multifaceted Nature of Intelligence: A Correlated Factor Model Approach Grounded in PASS Theory

Assessment
1–18
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DOI: 10.1177/10731911251358705
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SAGE

Timothy C. Papadopoulos[1], George Spanoudis[1], Jack A. Naglieri[2], and Jagannath P. Das[3]

ASSESSMENT

Abstract

Intelligence, a subject of profound interest within psychology, has seen extensive exploration of its psychological and psychometric foundations. This study delves into the multifaceted nature of intelligence, using structural equation modelling techniques to examine theory-driven conceptualizations of the construct. We tested several models, including unidimensional, correlated, higher-order, and bifactor symmetrical and asymmetrical models. To enhance the reliability and generalizability of the findings, we used a large and diverse cohort based on the Planning, Attention, Simultaneous, Successive (PASS) theory and the Cognitive Assessment System 2 (CAS2), which was standardized in the United States. Results showed that the correlated factor model, which reflects relationships among cognitive domains, offers the most fitting representation of intelligence. This outcome aligns with the PASS theory's theoretical foundations, emphasising intelligence's multifaceted nature. Also, our exploration of cultural relevance invariance underscores the importance of considering demographic-related differences in cognitive processes. By endorsing a correlated factor model, our study encourages a subtle understanding of intelligence that acknowledges the diversity and interconnectedness of cognitive processes, with potential implications for education and clinical assessment practices.

Keywords

intelligence, dimensionality, hierarchical models

Papadopoulos, Spanoudis, Naglieri and Das (2025) concluded:

PASS scores have sufficient specific variance to be interpreted.

Fröst, N., Jansson, B. & Partanen, P. (2025). Construct validity of the Scandinavian version of the Cognitive Assessment System 2nd Edition

Manuscript submitted for publication

And the results from the most recent bifactor study on the CAS2 Digital: PASS scores go beyond g

Research Findings:

This study evaluated the construct validity of the Scandinavian version of the CAS-2 using data from 614 children and adolescents in Sweden and Norway.

The bifactor model supported the multidimensional nature of the CAS-2. That is, **CAS2 is more than g and PASS scores CAN BE INTERPRETED**

The results indicate that the CAS-2 is psychometrically sound for use in Scandinavian contexts

How do we Manage this Research? Your thoughts…

- What if the research is inconsistent with what we know?
- Do we have an obligation to follow the science???
- What is the role of Clinical Judgement?

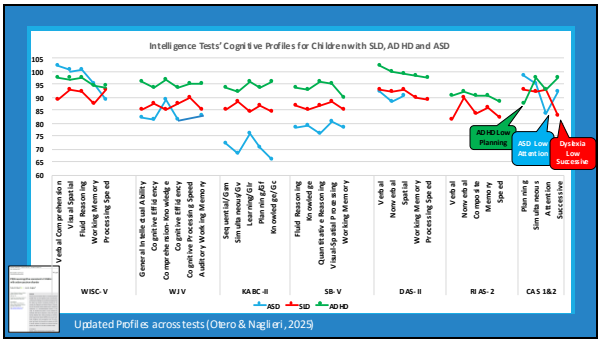
Howard Garb (2013) on Clinical Judgement

- **Clinical judgment is often less valid than statistical or actuarial methods**, especially when clinicians rely on intuition over structured data.
- **Confirmation bias, overconfidence, and selective attention distort clinical decision-making.** Clinicians may unintentionally favor information that supports their initial impressions, leading to diagnostic errors.
- **Structured interviews and standardized assessments methods improve reliability and reduce bias**.
- He encouraged graduate programs to **teach evidence-based assessment**, **critical thinking**, and **statistical reasoning** as foundations for clinical competence.

Garb, H. N. (2013). Clinical judgment and decision making. In J. R. Graham & J. A. Naglieri (Eds.), APA Handbook of Testing and Assessment in Psychology: Vol. 2. Testing and Assessment in Clinical and Counseling Psychology (pp. 453–465). Washington, DC: American Psychological Association. https://doi.org/10.1037/14049-024

PASS

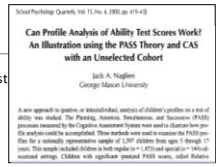
- Given that PASS scales CAN be interpreted it is important to know
  - do PASS scales yield PROFILES that can be used in a Pattern of Strengths and Weaknesses approach to eligibility determination
  - What about all the other tests?



Updated Profiles across tests (Otero & Naglieri, 2025)

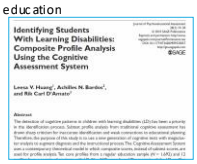
Research on PASS Profiles

Students receiving special education were more than four times as likely to have at least one PASS weakness and a comparable academic weakness than those in regular education


School Psychology Quarterly, Vol. 15, No. 4, 2000, pp. 419-430

Can Profile Analysis of Ability Test Scores Work? An Illustration using the PASS Theory and CAS with an Unselected Cohort

Jack A. Naglieri
George Mason University


Identifying Students With Learning Disabilities: Composite Profile Analysis Using the Cognitive Assessment System

Leesa V. Huang[1], Achilles N. Bardos[2], and Rik Carl D'Amato[1]

"**Ten core profiles** from a regular education sample (N = 1,692) and 12 profiles from a sample of students with LD (N = 367) were found.

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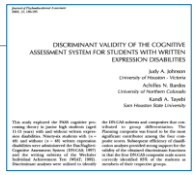
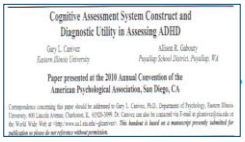
Research on PASS Profiles

- "the CAS… yields information that contributes to the differential diagnosis of students suspected of having a **learning disability in writing**"


DISCRIMINANT VALIDITY OF THE COGNITIVE ASSESSMENT SYSTEM FOR STUDENTS WITH WRITTEN EXPRESSION DISABILITIES

Jaffy A. Johnson
University of Houston - Victoria
Achilles N. Bardos
University of Northern Colorado
Kandi A. Tayeki
Sam Houston State University


Cognitive Assessment System Construct and Diagnostic Utility in Assessing ADHD

Gary L. Canivez
Eastern Illinois University

Allison E. Gaboury
Puyallup School District, Puyallup, WA

Paper presented at the 2010 Annual Convention of the American Psychological Association, San Diego, CA

- "the present study demonstrated the potential of the CAS to correctly identify students who **demonstrated behaviors consistent with ADHD** diagnosis."

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Consistency of PASS Profiles: English & Spanish


Bilingual Hispanic Children's Performance on the English and Spanish Versions of the Cognitive Assessment System

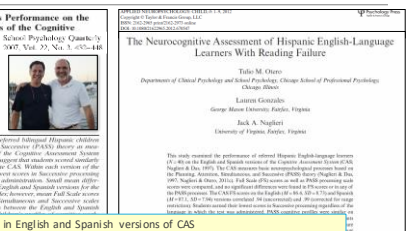
School Psychology Quarterly 2007, Vol. 22, No. 3, 470–485

Jack A. Naglieri
George Mason University

Tulio Otero
Columbia College, Elgin Campus

Brianna DeLauder
George Mason University

Holly Matto
Virginia Commonwealth University


The Neurocognitive Assessment of Hispanic English-Language Learners With Reading Failure

Tulio M. Otero
Departments of Clinical Psychology and School Psychology, Chicago School of Professional Psychology, Chicago, Illinois

Lauren Gonzales
George Mason University, Fairfax, Virginia

Jack A. Naglieri
University of Virginia, Fairfax, Virginia

1. Very similar scores in English and Spanish versions of CAS
2. >**90% agreement** between PASS weakness & strengths using English and Spanish CAS

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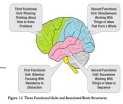
PASS Profiles to Define Neurodiversity



Percentages of Cases in the CAS, CAS2 and CAS2: Brief Normative Samples that Have a PASS Score that is Significantly Different from That Subject's Average PASS Score using the Ipsative method (p=.05 level of significance).

	Planning	Simultaneous	Attention	Successive
CAS (N = 2,200)	21.6	26.6	21.7	32.7
CAS2 (N = 1,342)	33.1	41.5	39.3	39.1
CAS2: Brief (N = 1,417)	39.6	35.6	31.0	30.9
Average (N = 4,959)	**32.7**			

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Change Demands Courage to Think Differently

Improving intellectual assessment requires self-reflection and self-correction in response to the scientific research.

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IN SUMMARY

I Learned the many advantages we get when we embrace a new way to measure intelligence

Let's end with a song

Maybe It's Time to Let the Old Ways Die

NYASP 2022 Legends in School Psychology Award Interview

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