Planning, Attention, Simultaneous and Successive (PASS): 
A Neurocognitive Approach to Defining and Measuring Intelligence

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Topical Outline

• Traditional IQ
• PASS neurocognitive perspective on thinking
• Using PASS to uncover learning strengths and weaknesses
• Illustrative Cases with validity
• Conclusions
Traditional IQ and Achievement Tests

- 1975 Charles Campagne Elementary, Bethpage, NY
- Typical psychoeducational assessment
  - Draw A Person
  - Bender-Gestalt
  - WISC
  - Peabody Individual Achievement Test
  - Sentence Completion Test
  - Developmental history
  - other measures as needed

PASS: A new way to think about and measure intelligence

Traditional IQ and Achievement Tests

- I noticed that parts of the WISC I was administering was VERY similar to parts of the achievement test I was giving
- HOW DOES THAT MAKE SENSE?
- WHY DO WE HAVE THIS PROBLEM?
From Alpha/Beta to Wechsler IQ

Yoakum & Yerkes (1920) summarized the methods used by the military to

- Army Alpha
  - Synonym- Antonym
  - Disarranged Sentences
  - Number Series
  - Arithmetic Problems
  - Analogies
  - Information

- Army Beta
  - Maze
  - Cube Imitation
  - Cube Construction
  - Digit Symbol
  - Pictorial Completion
  - Geometrical Construction

PASS: A new way to think about and measure intelligence
Thinking vs Knowing

- Scales on IQ tests that are confounded by knowledge
  - WISC-V
    - Verbal Comprehension: Vocabulary, Similarities, Information & Comprehension
    - Fluid Reasoning: Figure Weights, Picture Concepts, Arithmetic
  - WJ-IV
    - Comprehension Knowledge: Vocabulary & General Information
    - Fluid Reasoning: Number Series & Concept Formation
    - Auditory Processing: Phonological Processing
  - K-ABC
    - Knowledge / GC: Riddles, Expressive Vocabulary, Verbal Knowledge

Measure Thinking not Knowing

- What does the student have to know to complete a task?
  - This is dependent on educational opportunity (e.g., Vocabulary, Arithmetic, phonological skills, etc.)

- How does the student have to think to complete a task?
  - This is dependent on the brain’s neurocognitive processes
Measure Thinking not Knowing

- What do we mean – Thinking
- Thinking has many names
  - Metacognition, executive function, mindfulness, cognitive processing, IQ, intelligence, attention, reasoning, problem solving, memory etc.
- Psychologists have used these terms when defining thinking -- especially intelligence
- We use a neurocognitive approach to define thinking so we can teach students to THINK SMART.

Intelligence in the 21st Century Conceptualized as brain function

Our Amazing Brains!
Das and Naglieri proposed a neurocognitive theory of intelligence called PASS and a way to measure it (Cognitive Assessment System (Naglieri & Das, 1997) and the CAS2 (Naglieri, Das, & Goldstein, 2014.).

- The CAS was the first intelligence test to be built on a specific theory of intelligence.

How did we identify ‘basic psychological processes’?
- We used research from cognitive and neuropsychology to construct a model to test
- We did not assign new labels to traditional IQ subtests
- We recognized the limitations of developing a theory from factor analysis – “a research program dominated by factor analyses of test intercorrelations is incapable of producing an explanatory theory of human intelligence” (Lohman & Ippel, 1993, p. 41)
PASS Neurocognitive Theory

Three Functional Units described by A. R. Luria (1972)

- **Planning** = THINKING ABOUT HOW YOU DO WHAT YOU DECIDE TO DO
- **Attention** = BEING ALERT AND RESISTING DISTRACTIONS
- **Simultaneous** = GETTING THE BIG PICTURE
- **Successive** = FOLLOWING A SEQUENCE

PASS = ‘basic psychological processes’

From: Essentials of CAS2 Assessment. Naglieri & Otero, 2017
**Planned Codes 1**

- Child fills in the codes in the empty boxes
- Children are encouraged to think of a good way to complete the page

**CAS2 Expressive Attention**

- The child says the color not the word
- Score is time and number correct

**PASS:** A new way to think about and measure intelligence
Word Recall

• Man Cow Key
• Book Shoe Girl Dog Car
• Girl Book Dog Car Wall Cow Key Shoe

Visual Digit Span

4 3 8 6 1
Simultaneous Matrices

PASS: A new way to think about and measure intelligence

Verbal-Spatial Relations

Which picture shows a boy behind a girl?
PASS Learning Curves

- Learning depends upon many factors especially PASS
- At first, PASS plays a major role in learning
- When a task is well learned it requires less thinking (PASS) and becomes a skill
- Helping students to use the COMBINATION of PASS and Skills is our goal

![Graph showing the role of PASS and Knowledge & Skills over time]

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

PASS is A Theory of Cognition and Learning

Cognitive Assessment System: Redefining Intelligence From a Neuropsychological Perspective

Jack A. Naglieri and Tulio M. Otero

INTRODUCTION

Pediatric neuropsychology has become an important field for understanding and treating developmental, psychiatric, psychosocial, and learning disorders. By addressing both brain functions and environmental factors intrinsic in complex behaviors, such as thinking, reasoning, planning, and the variety of executive capacities, clinicians are able to offer needed services to children with a variety of learning, psychiatric, and developmental disorders. Brain-behavior relationships are investigated by neuropsychologists by interpreting several aspects of an individual's cognitive, language, emotional, social, and motor behavior. Standardized instruments are used by neuropsychologists to collect information and derive inferences about brain-behavior relationships. Technology, such as magnetic resonance imaging (MRI), functional MRI (fMRI), positron emission tomography, computerized tomography, and diffusion tensor imaging, has reduced the need for neuropsychological tests to localize and access brain damage. Neuropsychological tests, however, such tools should not only measure cognitive processes necessary for effective learning. They also provide the data necessary to make decisions and address the question of whether a person is impaired.

FROM NEUROPSYCHOLOGICAL TO ASSESSMENT

Luria's theoretical account not only has come to be recognized, perhaps one of the most astute and prescient (1980). Luria conceptualized brain-behavior relations in terms of the mutual and orderly interactions between brain, the functional role of brain-skill syndromes and impairments. He developed the theoretical framework and clinical methods of neurological evaluation, leading to the conceptualization of brain-behavior relations. Luria's work is foundational and has been influential in the field of neuropsychology.

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Handbook of Pediatric Neuropsychology

Andrew S. Davis, Editor
PASS Comprehensive System
(Naglieri, Das, & Goldstein, 2014)

- **CAS2 Rating Scale** (4 subtests)
  - Total Score
  - Planning
  - Simultaneous
  - Attention
  - Successive

- **CAS2 Brief** (4 subtests)
  - Total Score
  - Planning
  - Simultaneous
  - Attention
  - Successive

- **CAS2 Core** (8 subtests)
  - Full Scale
  - Planning
  - Simultaneous
  - Attention
  - Successive

- **CAS2 Extended** (12 subtests)
  - Full Scale
  - Planning
  - Simultaneous
  - Attention
  - Successive
  - Supplemental Scales
    - Executive Function
    - Working Memory
    - Verbal / Nonverbal
    - Visual / Auditory

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CAS2 & CAS2-Espanol (Ages 5-18 yrs.) Psychologists
CAS2 – Psychologist Level

- 8 (40 minutes) or 12 (60 minutes) subtest versions
- PASS and Full Scales provided (100 & 15) subtests (10 and 3)

Supplemental Scales

- We have these scores so you can relate findings on CAS2 to other tests
  - Executive Function
  - Working Memory
  - Verbal
  - Nonverbal
  - Visual - Auditory comparison
Narrative report can be obtained in Word or PDF.

**CAS2 Cognitive Assessment System**

Second Edition

Scoring and Interpretive Report
Jack A. Naglieri

Name: Jack Nag
Age: 8
Gender: Male
Date of Birth: 07-12-2005
Grade: 5
School: East Lake

This computerized report is intended for use by qualified individuals. Information can be found in the CAS2 Interpretive Manual.

**PASS and Full Scale Scores**

**CAS2: Brief (Ages 4-18 years) for Teachers**
CAS2: Brief

- Give in 20 minutes
- Good for reevaluations
- Yields PASS and Total standard scores (Mn 100, SD 15)
- All items are different from CAS2
  - Planned Codes
  - Simultaneous Matrices
  - Expressive Attention
- New Subtest
  - Successive Digits (forward only)

CAS2 Rating Scales (Ages 4-18 yrs.)

- The CAS2: Rating measures behaviors associated with PASS constructs
- Normed on a nationally representative sample of 1,383 students rated by teachers
CAS2 Rating Scales – By & for Teachers

- The CAS2: Rating form contains 40 items
- 10 items for each PASS scale
- PASS and Total scales are set to have a mean of 100 and standard deviation of 15

Case of PAUL
Case of Paul by 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

Paul – age 9 years

<table>
<thead>
<tr>
<th>WISCV</th>
<th>Composite Score</th>
<th>Range</th>
<th>Percentile Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Comprehension</td>
<td>89</td>
<td>Below Average</td>
<td>23%</td>
</tr>
<tr>
<td>Visual Spatial</td>
<td>84</td>
<td>Below Average</td>
<td>14%</td>
</tr>
<tr>
<td>Fluid Reasoning</td>
<td>82</td>
<td>Below Average</td>
<td>12%</td>
</tr>
<tr>
<td>Working Memory</td>
<td>72</td>
<td>Very Low</td>
<td>3%</td>
</tr>
<tr>
<td>Processing Speed</td>
<td>76</td>
<td>Very Low</td>
<td>6%</td>
</tr>
<tr>
<td>Full Scale Score</td>
<td>81</td>
<td>Below Average</td>
<td>10%</td>
</tr>
<tr>
<td>WIAT III Reading</td>
<td>87</td>
<td>Below Average</td>
<td>19%</td>
</tr>
<tr>
<td>WIAT III Math</td>
<td>90</td>
<td>Average</td>
<td>25%</td>
</tr>
<tr>
<td>WIAT III Writing</td>
<td>94</td>
<td>Average</td>
<td>34%</td>
</tr>
</tbody>
</table>
FAR Phonological Index Subtests

Paul – age 9 years

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

Nonsense Word Decoding – requires the student to decode a series of nonsense words presented in order of increasing difficulty.

<table>
<thead>
<tr>
<th>Score</th>
<th>Percentile</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td>3%</td>
<td>Moderately Below Average</td>
</tr>
</tbody>
</table>

Irregular Word Reading Fluency – the student reads a list of phonologically irregular words arranged in order of increasing difficulty in 60 seconds.

<table>
<thead>
<tr>
<th>Score</th>
<th>Percentile</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>37%</td>
<td>Average</td>
</tr>
</tbody>
</table>
Paul – age 9 years

<table>
<thead>
<tr>
<th></th>
<th>CAS-2</th>
<th>STANDARD SCORE</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>92</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>Simultaneous</td>
<td>92</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>Attention</td>
<td>110</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>Successive</td>
<td>75</td>
<td>Very Low</td>
<td></td>
</tr>
<tr>
<td>Full Scale is not reported</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Cognitive Assessment System - 2</th>
<th>Difference from PASS Mean of:</th>
<th>Significantly Different (at p &lt; .05) from</th>
<th>Strength or Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS Scales</td>
<td>Standard Score</td>
<td>92.3</td>
<td>Strength</td>
</tr>
<tr>
<td>Planning</td>
<td>92</td>
<td>-0.3</td>
<td>No</td>
</tr>
<tr>
<td>Simultaneous</td>
<td>92</td>
<td>-0.3</td>
<td>No</td>
</tr>
<tr>
<td>Attention</td>
<td>110</td>
<td>17.8</td>
<td>Yes</td>
</tr>
<tr>
<td>Successive</td>
<td>75</td>
<td>-17.3</td>
<td>Yes</td>
</tr>
</tbody>
</table>

WISC-V and CAS2

- Why are the WISC-V and CAS2 scores so different?
- Because the two tests measure VERY different things
- The only similarity is:

<table>
<thead>
<tr>
<th>Verbal Comprehension</th>
<th>Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attention</td>
</tr>
<tr>
<td></td>
<td>Simultaneous</td>
</tr>
<tr>
<td></td>
<td>Successive</td>
</tr>
<tr>
<td>Fluid Reasoning</td>
<td></td>
</tr>
<tr>
<td>Working Memory</td>
<td></td>
</tr>
<tr>
<td>Processing Speed</td>
<td></td>
</tr>
</tbody>
</table>

- But note, Working Memory on WISC-V includes Digit span Backwards which is Successive and Planning (Schofield & Ashman)
Does he have SLD?

His IQ on WISCV and achievement scores are similar, so no, he is a slow learner?

Traditional Discrepancy Approach

- Discrepancy between high IQ and low achievement test scores

PASS: A new way to think about and measure intelligence
SLD Eligibility: We can do better

  - based on theoretically defined measures of neurocognitive processes rather than traditional IQ achievement discrepancy
  - The Pattern of Strengths and Weaknesses (PSW) will be based on basic psychological processing scores combined with academic test scores

Discrepancy Consistency Method (DCM)

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

PASS: A new way to think about and measure intelligence
**Discrepancy Consistency Method - Paul**

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

**Discrepancy Consistency Method**

- Poor Successive + Poor Phonological = SLD in Reading Decoding
- Planning = 92
- Simultaneous = 92
- Attention = 110
- Nonsense Word Decoding = 71
- Successive = 72

**Kathleen’s Intervention Plan for Paul**

- **Be Intentional and Transparent**
  - Explain his PASS scores to him
- **Build on His Strengths**
  - Help him use his Planning, Attention, Simultaneous and Strengths to support his learning challenges with Successive Processing
- **Develop Effective Skill Sets** to remediate his weaker skills
- Offer and encourage the use of metacognitive strategies that can improve his Successive Processing skills.
- **Encourage a Growth Mindset** and Self Efficacy
Making Successive Processing Sticky

- Work with Paul to find ways of remembering sequences...
  - Spelling
    - Segmenting Words
    - Clapping, Tapping, Moving Visualizing, etc. Which one works best...
  - Sentence Structure
    - Silly Sentences
  - Paragraphs and Essays
    - Graphic organizers

IS there an SLD Profile on PASS for those with a phonological weakness?
Naglieri & Goldstein (2011)

GROUP PROFILES BY ABILITY TEST

Because ability tests play such an important role in the diagnostic process, it is crucial to understand the sensitivity each test may have to any unique characteristics of those with an SLD or attention deficit. Clinicians need to know if an adolescent or adult has a specific deficit in ability that is related to a specific academic learning problem. There has been considerable research on, for example, Wechsler subtest profile analysis, and most researchers conclude that no profile has diagnostic utility for individuals with SLD or ADHD (Kavale & Forness, 1995). The failure of subtest profiles has led some to argue (e.g., Naglieri, 1999) that scale, rather than subtest, variability should

1. We need to know if intelligence tests yield distinctive profiles

2. Subtest profile analysis is UNSUPPORTED so use scale profiles instead
PASS Profiles and Educational Placement

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.

PASS: A new way to think about and measure intelligence
SLD Profiles on CAS (Huang, Bardos, D'Amato, 2010)

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

Leesa V. Huang, Achilles N. Bardos, and Rik Carl D'Amato

Abstract

The detection of cognitive patterns in children with learning disabilities (LD) has been a priority in the identification process. Subtest profile analysis from traditional cognitive assessment has drawn sharp criticism for inaccurate identification and weak connections to educational planning. Therefore, the purpose of this study is to use a new generation of cognitive tests with megacaliper analysis to augment diagnosis and the instructional process. The Cognitive Assessment System uses a contemporary theoretical model in which composite scores, instead of subtest scores, are used for profile analysis. 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. The majority of the LD profiles were unique compared with profiles obtained from the general education sample. The implications of this study substantiate the usefulness of profile analysis on composite scores as a critical element in LD determination.

Johnson, Bardos & Tayebi, 2003

- “this study suggests that the CAS...yields information that contributes to the differential diagnosis of students suspected of having a learning disability in writing”
Canivez & Gaboury (2010)

• “the present study demonstrated the potential of the CAS to correctly identify students who demonstrated behaviors consistent with ADHD diagnosis.”

Georgiou & Das (2013)

University Students With Poor Reading Comprehension: The Hidden Cognitive Processing Deficit

George K. Georgiou, PhD¹ and J. P. Das, PhD¹

Abstract

The present study aimed to examine the nature of the working memory and general cognitive ability deficits experienced by university students with a specific reading comprehension deficit. A total of 32 university students with poor reading comprehension but average word-reading skills and 60 age-matched controls with no comprehension difficulties participated in the study. The participants were assessed on three verbal working memory tasks that varied in terms of their processing demands and on the Das-Naglieri Cognitive Assessment System, which was used to operationalize intelligence. The results indicated that the differences between poor and skilled comprehenders on working memory were amplified as the processing demands of the tasks increased. In addition, although poor comprehenders as a group had average intelligence, they experienced significant difficulties in simultaneous and successive processing. Considering that working memory and general cognitive ability are highly correlated processes, these findings suggest that the observed difference between poor and skilled comprehenders is likely a result of a deficient information processing system.
REASON FOR REFERRAL

- **Academic:**
  - Could not identify letters/sounds
  - October 2013: Could only count to 39
  - All ACCESS scores of 1
- **Behavior:**
  - Difficulty following directions
  - Attention concerns
  - Refusal/defiance

CASE STUDY: ALEJANDRO (C.A. 7-0 GRADE 1)
WISC-IV ASSESSMENT

Assessing Brain Function is Different

PASS: A new way to think about and measure intelligence
Alejandro and PASS (by Dr. Otero)

- Alejandro is not a slow learner.
- He has good scores in basic psychological processes:
  - Simultaneous = 96 and Planning = 102
- He has a “disorder in one or more of the basic psychological processes”
  - Attention = 67 and Successive = 84
- And he has academic failure which equals an SLD determination.

Discrepancy Consistency Model for SLD

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

PASS: A new way to think about and measure intelligence
Hispanic and non-Hispanic children’s performance on PASS cognitive processes and achievement

Jack A. Naglieri, Johannes Rojahn, and Holly C. Matto

Abstract
Hispanic children typically come from working-class homes with parents who have limited English language skills and educational training. This presents challenges to psychologists who assess these children using traditional IQ tests because of the considerable verbal and academic (e.g., quantitative) content. Some researchers have suggested that intelligence conceptualized on the basis of psychological processes may have utility for assessment of children from culturally and linguistically diverse populations because verbal and quantitative skills are not included. This study examined Hispanic children’s performance on the Cognitive Assessment System (CAS; Naglieri, J.A., and Das, J.P. [1997] Cognitive Assessment System, Itasca, IL: Riverside) which is based on the Planning, Attention, Simultaneous, and Successive (PASS) theory of intelligence. The scores of Hispanic (N=244) and White (N=396) children on the four PASS processes were obtained and the respective correlations between PASS and achievement compared. Three complimentary sampling methodologies and data analysis strategies were chosen to compare the Hispanic groups. Sample size was maximized using nationally representative groups and demographic group differences were minimized using smaller matched samples. Small differences between Hispanic and non-Hispanic children were found when ability was measured with tests of basic PASS processes. In addition, the correlation between the PASS constructs and achievement were substantial for both Hispanic and non-Hispanic children and were not significantly different between the groups.

Published by Elsevier Inc.

PASS scores – English and Spanish

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

Jack A. Naglieri
George Mason University

Tulio Otero
Columbia College, Elgin Campus

Brianna DeLauder
George Mason University

Holly Matto
Virginia Commonwealth University

School Psychology Quarterly

This study compared the performance of groups on the Planning, Attention, Simultaneous, and Successive scores measured by English and Spanish versions of the CAS (Naglieri & Das, 1997a). The results show that the bilingual children earned their lower scores regardless of the language used during test administration. The means of the English Simultaneous and Successive scales were similar, but the Specific subtests within the Simultaneous and Successive scales were different.
English & Spanish CAS

Means, SDs, d-ratios, Obtained and Correction Correlations Between the English and Spanish Version of the CAS (N = 55).

<table>
<thead>
<tr>
<th></th>
<th>CAS English</th>
<th>CAS Spanish</th>
<th>d-ratio</th>
<th>Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Mean 92.6</td>
<td>Mean 92.6</td>
<td>.00</td>
<td>.96</td>
</tr>
<tr>
<td>Simultaneous</td>
<td>Mean 89.0</td>
<td>Mean 93.0</td>
<td>-.30</td>
<td>.90</td>
</tr>
<tr>
<td>Attention</td>
<td>Mean 94.8</td>
<td>Mean 95.1</td>
<td>-.02</td>
<td>.98</td>
</tr>
<tr>
<td>Successive</td>
<td>Mean 78.0</td>
<td>Mean 83.1</td>
<td>.40</td>
<td>.82</td>
</tr>
<tr>
<td>Full Scale</td>
<td>Mean 84.6</td>
<td>Mean 87.6</td>
<td>-.22</td>
<td>.96</td>
</tr>
</tbody>
</table>

Otero, Gonzales, Naglieri (2012)

- SLD and PASS scores

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

Tulio M. Otero
Department 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

This study examined the performance of referred Hispanic English-language learners (N = 40) on the English and Spanish versions of the Cognitive Assessment System (CAS; Naglieri & Das, 1997). The CAS assesses basic neuropsychological processes based on the Planning, Attention, Simultaneous, and Successive (PASS) theory (Naglieri & Das, 1997; Naglieri & Otero, 2011). Full Scale (FS) scores as well as PASS processing scale scores were compared, and no significant differences were found in FS scores or any of the PASS processes. The CAS FS scores on the English (M = 86.4, SD = 8.73) and Spanish (M = 87.0, SD = 7.94) versions correlated .94 (uncorrected) and .89 (corrected for range restriction). Students earned their lowest scores in Successive processing regardless of the language in which the test was administered. PASS cognitive profiles were similar on English and Spanish versions of the PASS scales. These findings suggest that students scored similarly on both versions of the CAS and that the CAS may be a useful measure of these four abilities for Hispanic children with underdeveloped English-language proficiency.
### Multigroup Confirmatory Factor Analysis of U.S. and Italian Children’s Performance on the PASS Theory of Intelligence as Measured by the Cognitive Assessment System

**Jack A. Nogler**  
University of Virginia and Devereux Center for Resilient Children  
**Stefano Taddei**  
University of Florence

Kevin Williams  
Multi-Health Services, Toronto, Ontario, Canada

CAS in Italy

A new way to think about and measure intelligence

CAS in Italy

Multigroup Confirmatory Factor Analysis of U.S. and Italian Children’s Performance on the PASS Theory of Intelligence as Measured by the Cognitive Assessment System

**Table 5**  
Means and SDs for Italian Children (N = 809) on the CAS Subtests and PASS and Full Scales Using U.S. Norms and Comparisons to U.S. Sample (N = 1,174), Matched by Age

<table>
<thead>
<tr>
<th>Subtests and scales</th>
<th>M</th>
<th>SD</th>
<th>n</th>
<th>U.S. M</th>
<th>SD</th>
<th>n</th>
<th>F</th>
<th>p</th>
<th>d-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS composite scales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning</td>
<td>97.7</td>
<td>13.4</td>
<td>809</td>
<td>100.5</td>
<td>15.4</td>
<td>1,174</td>
<td>18.1</td>
<td>&lt;.01</td>
<td>−.19</td>
</tr>
<tr>
<td>Simultaneous</td>
<td>103.0</td>
<td>13.9</td>
<td>809</td>
<td>101.1</td>
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<td>9.3</td>
<td>&lt;.01</td>
<td>.14</td>
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<tr>
<td>Attention</td>
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<td>13.7</td>
<td>809</td>
<td>100.6</td>
<td>14.4</td>
<td>1,174</td>
<td>32.2</td>
<td>&lt;.01</td>
<td>.26</td>
</tr>
<tr>
<td>Successive</td>
<td>99.0</td>
<td>12.5</td>
<td>809</td>
<td>100.5</td>
<td>14.5</td>
<td>1,174</td>
<td>5.1</td>
<td>.02</td>
<td>−.11</td>
</tr>
<tr>
<td>Full Scale</td>
<td>100.9</td>
<td>12.9</td>
<td>809</td>
<td>100.5</td>
<td>14.8</td>
<td>1,174</td>
<td>2.3</td>
<td>.13</td>
<td>.03</td>
</tr>
</tbody>
</table>

Note. CAS = Cognitive Assessment System.  
Designations for d-ratios are as follows: S = small (.2), M = medium (.5), and L = large (.8). For all F values the dfs a

**Italian mean = 100.9 & US mean = 100.5 using US NORMS**

PASS: A new way to think about and measure intelligence
Race Differences

Table 1.6 Standard Score Mean Differences by Race on Traditional and Nontraditional Intelligence Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional IQ Tests</td>
<td></td>
</tr>
<tr>
<td>SB-IV (matched samples)</td>
<td>12.6</td>
</tr>
<tr>
<td>WISC-IV (normative sample)</td>
<td>11.5</td>
</tr>
<tr>
<td>WJ-III (normative sample)</td>
<td>10.9</td>
</tr>
<tr>
<td>WISC-IV (matched samples)</td>
<td>10.0</td>
</tr>
<tr>
<td>Nontraditional Tests</td>
<td></td>
</tr>
<tr>
<td>K-ABC (normative sample)</td>
<td>7.0</td>
</tr>
<tr>
<td>K-ABC (matched samples)</td>
<td>6.1</td>
</tr>
<tr>
<td>KABC-II (matched samples)</td>
<td>5.0</td>
</tr>
<tr>
<td>CAS2 (normative sample)</td>
<td>6.3</td>
</tr>
<tr>
<td>CAS (demographic controls of normative sample)</td>
<td>4.8</td>
</tr>
<tr>
<td>CAS2 (demographic controls of normative sample)</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Note: The data for these results are reported for the Stanford-Binet IV from Wasserman (2000); Woodcock-Johnson III from Edwards and Oakland (2006); Kaufman Assessment Battery for Children from Naglieri (1986); Kaufman Assessment Battery for Children II from Lichtenberger, Soto-Dynega, and Kaufman (2009); CAS from Naglieri, Rojahn, Matto, and Aquilino (2005); CAS2 from Naglieri, D. and Goldstein (2014a); and Wechsler Intelligence Scale for Children IV (WISC-IV) from O’Donnell (2009).

Effect of Verbal Knowledge on Ability

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

Johannes Rojahn
The Ohio State University

PASS: A new way to think about and measure intelligence
**Naglieri & Rojahn (2001)**

- White children earned the same mean scores on WISC-III and CAS
- Black children earned lower VIQ than PIQ scores due to language / achievement tasks
- Black children earned higher scores on CAS than whites
- Fewer Black children would be identified as having intellectual disability using CAS than WISC-III

**Intelligence Testing & Social Justice**

- **WHY did the US Army include the Beta (nonverbal) tests?**
1927 Army Testing (Yoakum & Yerkes)

Men who fail in alpha are sent to beta in order that injustice by reason of relative unfamiliarity with English may be avoided. Men who fail in beta are referred for individual examination by means of what may appear to be the most suitable and altogether appropriate procedure among the varied methods available. This reference for careful individual examination is yet another attempt to avoid injustice either by reason of linguistic handicap or accidents incident to group examining.

Note there is no mention of measuring verbal and nonverbal intelligences – it was a social justice issue.

Spearman’s g

of nonverbal assessment many paces forward. In addition, the emphasis in the WNV Manual that the Full Scale measures general ability nonverbally— and not nonverbal ability— is an important distinction that further ties the WNV to Dr. Wechsler. Although his Intelligence tests in the 1930s and 1940s departed from the one-score Stanford-Binet by offering separate Verbal and Performance IQs as well as a profile of scaled scores, Dr. Wechsler remained a firm believer in Spearman’s g theory throughout his lifetime. He believed that his Verbal and Performance Scales represented different ways to access g, but he never believed in 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 hearing impairments, language disorders, or limited proficiency in English. And that is precisely what the WNV is intended to do.
Verbal intelligence or achievement?

Social Justice

- Does the removal of Verbal and Quantitative tests make the CAS2 less valid?
- Profiles work
- PASS scores are very similar across race, ethnic, and cultural boundaries
- And correlation to achievement is ...
SLD Eligibility: We can do better

- Average correlations between IQ Scales with total achievement scores from Naglieri & Otero (2017)

<table>
<thead>
<tr>
<th>Test Scores</th>
<th>All Scales</th>
<th>Scales without achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Comprehension</td>
<td>.74</td>
<td>.53</td>
</tr>
<tr>
<td>WIAT-III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual Spatial</td>
<td>.46</td>
<td>.47</td>
</tr>
<tr>
<td>N = 201</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid Reasoning</td>
<td>.40</td>
<td></td>
</tr>
<tr>
<td>Working Memory</td>
<td>.63</td>
<td></td>
</tr>
<tr>
<td>Processing Speed</td>
<td>.34</td>
<td></td>
</tr>
<tr>
<td>WAJ IV Cog</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehension Knowledge</td>
<td>.50</td>
<td>.54</td>
</tr>
<tr>
<td>WIJ IV Ach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WJ IV Cog</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehension Knowledge</td>
<td>.50</td>
<td>.54</td>
</tr>
<tr>
<td>N = 825</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid Reasoning</td>
<td>.71</td>
<td>.50</td>
</tr>
<tr>
<td>Auditory Processing</td>
<td>.52</td>
<td></td>
</tr>
<tr>
<td>Short Term Working Memory</td>
<td>.55</td>
<td>.50</td>
</tr>
<tr>
<td>Cognitive Processing Speed</td>
<td>.55</td>
<td>.50</td>
</tr>
<tr>
<td>Long-Term Retrieval</td>
<td>.43</td>
<td></td>
</tr>
<tr>
<td>Visual Processing</td>
<td>.45</td>
<td></td>
</tr>
<tr>
<td>KABC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequential/Gsm</td>
<td>.43</td>
<td>.53</td>
</tr>
<tr>
<td>WJ-III Ach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simultaneous/Gv</td>
<td>.42</td>
<td>.48</td>
</tr>
<tr>
<td>N = 167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning/Gl</td>
<td>.50</td>
<td></td>
</tr>
<tr>
<td>Planning/Gf</td>
<td>.59</td>
<td></td>
</tr>
<tr>
<td>Knowledge/Gc</td>
<td>.70</td>
<td></td>
</tr>
<tr>
<td>CAS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning</td>
<td>.57</td>
<td></td>
</tr>
<tr>
<td>WJ-III Ach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simultaneous</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>N = 1,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention</td>
<td>.50</td>
<td></td>
</tr>
<tr>
<td>Successive</td>
<td>.60</td>
<td></td>
</tr>
</tbody>
</table>

Note: All correlations are reported in the ability tests’ manuals. Values per scale were averaged within each ability test using Fisher z transformations.

Social Justice

- Does the removal of Verbal and Quantitative tests make the CAS2 less valid?
- Profiles work
- PASS scores are very similar across race, ethnic, and cultural boundaries
- And correlation to achievement is ...
- And INTERVENTION ...

PASS: A new way to think about and measure intelligence
PASS and Intervention...

One of many studies

Iseman & Naglieri (2010)
http://www.jacknaglieri.com/cas2.html

A Cognitive Strategy Instruction to Improve Math Calculation for Children With ADHD and LD: A Randomized Controlled Study

Jackie S. Iseman and Jack A. Naglieri

Abstract
The authors examined the effectiveness of cognitive strategy instruction (Successive) given by special education teachers to students with ADHD. The experimental group were exposed to a brief cognitive strategy instruction development and application of effective planning for mathematical computation. Students completed math worksheets throughout the experimental group. Johnson Tests of Achievement, Third Edition, Math Fluency and Working Memory test (Numerical Operations) were administered pre- and post-intervention. Large pre-post effect sizes were found for students in the experimental group. At 1 year follow-up, the experimental group continued to outperform the comparison group. These findings suggest that...
Design of the Study

Experimental and Comparison Groups

- 7 worksheets with Normal Instruction

Experimental Group
- 19 worksheets with Planning Facilitation

Comparison Group
- 19 worksheets with Normal Instruction

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 ($M = 3.21$, $SD = 18.21$, $d = 0.09$).
Take Away Messages

- All traditional IQ tests are contaminated by knowledge which distort the IQ score
- We can do better with the PASS neurocognitive approach to defining and measuring intelligence because research shows
  - Profiles for special populations
  - Smaller differences across race, ethnic and culture
  - Clear relevance to intervention

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